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PLANNING THE NATIONAL CAPITAL

INTRODUCTION

by

Alan K. Hay, M.E.I.C.

Superintendent, The Federal District Commission, Ottawa

An intensive information campaign is being launched for the purpose of selling the idea to Canadian citizens that the time has come for Canada to have a National Capital which will be in keeping with her status as a nation. Various plans for the development of the National Capital have been made over the past 50 years. The significant events during that period are:

(1) The formation of the Ottawa Improvement Commission at the turn of the century, establishing the ground work of Ottawa's extensive park and driveway system.

(2) In 1915 a comprehensive survey and report was made by the Federal Plan Commission. This is usually called the Holt Report.

(3) On the occasion of the celebration of the Jubilee Anniversary of Confederation, the old Improvement Commission was enlarged and merged into the present Federal District Commission.

(4) Following the end of World War II, the National Capital Planning Committee was set up as an advisory body to the Federal District Commission, with Mr. Greber as consultant. The present planning activities are based on the findings of this Committee. Parliament has already voted substantial funds for the National Capital Fund, which will be used for some of the larger projects such as the re-arrangement of the railway facilities.

The National Capital Planning Committee includes in its membership a number of prominent citizens, representatives from the cities of Ottawa and Hull and adjoining areas, two representatives from the E.I.C. and two from the R.A.I.C. The two E.I.C. representatives are Dr. Arthur Surveyer and Mr. E. L. Cousins of Toronto. The Chairman of the Committee and also of the Federal District Commission is Mr. F. E. Bronson, M.E.I.C. Under his energetic direction the Commission has carried out a long series of improvements in the Ottawa-Hull area. The recent long-term planning activities are in no small measure due to his efforts.

PLANNING THE NATIONAL CAPITAL

A paper presented at the Annual General and Professional Meeting of The Engineering Institute of Canada at Quebec City, May 11 to 14, 1949

by

Jacques Greber, M.E.I.C.

Consultant,
National Capital Planning Committee,
Ottawa

An address on town planning to the Engineering Institute of Canada is a great honour for me, but also a challenge, as this distinguished audience is quite conversant with the subject, and would not accept any fantastic statements. But in spite of the challenge, which calls for careful answers, it is, on the other hand, my pleasure to have this opportunity of again repeating my sincere belief, that the practice of town planning is a most beneficial field of reciprocal co-operation for engineers, architects, jurists, sociologists and hygienists associated in fruitful teamwork.

The common aim is simple: public welfare and social equilibrium, obtained through physical harmony and order of plans and by-laws, all equally needed to foster urban progress. If we accomplish that aim, we render valuable service to our fellow citizens. If, on the contrary, we go astray in theoretical controversies or in laboratory research work, which by all means have their merits in the advance of our professions, we perhaps may draw for ourselves useful conclusions and intellectual enjoyment, but we undoubtedly deceive millions of people, who long for immediate solutions to the many problems resulting from the disorder and inefficiency of modern towns. Town planning problems are in fact pathological cases of great emergency, to the treatment of which our efforts must be essentially devoted.

" The Master Plan of the Capital of Canada " is a national enterprise which involves two distinct problems: (1) The normal planning of an existing urban group of nearly 260,000 people, and (2) The chart of development for the Capital of the Canadian nation. This second part of the planning work is a direct and natural consequence of the remarkable growth of Canada as one of the chief nations of the world.

The Problems

Several diffiiculties had to be solved: the cities and towns included in the urban area belong to the historic provinces of Quebec and Ontario; 23 municipalities in Quebec, including the City of Hull; 5 in Ontario with the City of Ottawa. Of the 900 square miles defined by Parliament in 1944 as the Capital Region, 536 are in Quebec, with approximately 60,000 inhabitants, and 364 in Ontario, with about 200,000 people.

The part in Quebec is in majority French and Catholic. The Ontario section is principally Anglo-Saxon and Protestant, but with a large number of French-Canadians and Catholics. Such differences of racial and religious origins are quite representative of the nature of the Canadian population. No better place could have been selected for the development of their Capital, and Ottawa owes its success to the foresight of Queen Victoria.

From the technical standpoint, the survey and the planning of this large region were rather easy matters, as the physical conditions lent themselves to the requirements of demography, circulation, transportation, industry, recreation and

Fig. 1. (on the opposite page), shows the National Institute of Fine Arts proposed in National Capital Plan

A new home for the National Gallery of Canada and other cultural institutions in a National Institute of Fine Arts is proposed by Jacques Greber in the Capital Plan. The recommended site is Cartier Square, now occupied by wartime temporary buildings. A suggested type of building is seen in this photo of the model. The building at the bridge approach (upper centre) is a proposed civic theatre if the space is not required for a new city hall. The proposed Institute would frame the south side of an enlarged Confederation Park in the heart of the Capital. (*Models by National Film Board.*)

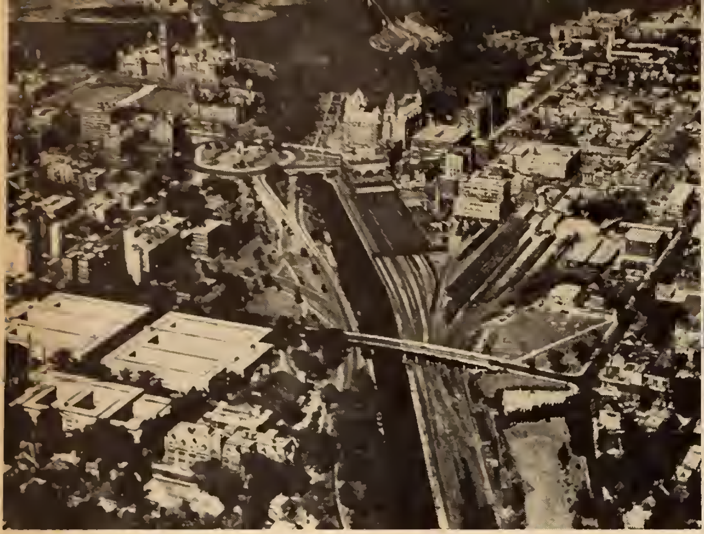

Fig. 2 (left). The Heart of the Capital today. (***R.C.A.F. Photo***)

This area was re-planned by Jacques Greber when he first came to Ottawa in 1937, but the outbreak of war in 1939 prevented completion of his proposals. Confederation Square was built by the Federal Government to provide a suitable site for the National War Memorial for the Royal Visit in 1939, and the City of Ottawa contributed to the improvement of the area by widening and boulevarding Elgin Street at a cost of a million dollars. This photo looks north towards the Parliament Buildings and the city of Hull across the Ottawa River in Quebec. The Union Station and railway yards are seen to the right of the Plaza Bridge (centre) and the Rideau Canal. Lower left are the temporary wartime buildings in Cartier Square which house the Department of National Defence. Ottawa's city hall, destroyed in 1930 by fire, was located in the open space south of the Memorial.

Fig. 3 (right). Ottawa and Hull of the Future, showing proposed improvements.

In this photo of the model of the National Capital, looking north west across the Ottawa River to Hull, an enlarged Confederation Park is seen lower left, with the new bridge over the Rideau Canal between the existing Plaza Bridge (right) and Laurier Avenue bridge (left). Two new bridges are proposed across the Ottawa River to Hull, upper left over the Chaudiere, with a curving viaduct connecting with the west end of Wellington Street. A new road bridge, right, replaces the present Interprovincial road and rail bridge, and extends the Driveway system to a proposed new civic centre in Hull. The large building in Hull, upper right, is the proposed new Government Printing Bureau. New buildings beyond it represent Hull's new railway station and commercial and industrial development of the future. Most of the improvements shown must await relocation of Ottawa and Hull's present railways and industries.

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aesthetics. On the other hand, the implementation of the plans and by-laws embodied in our Report is conditioned upon substantial improvements of the legal machinery now in existence in both provinces. The general legislations, the city charters and the municipal rights are different, also the systems of education.

An attempt to unify them in one new code especially suited to a Capital District, and inspired from the District of Columbia or from other artificial federal districts of certain South American republics, would have upset the prerogatives and traditions of established local authorities, and would have created unnecessary rivalries and discontent, with no practical advantage.

That is why we strongly recommended that the Federal Government take inspiration from similar English or French regional plans (London and Paris, for example), far more extended and complex than the regional plan of the Canadian Capital, which are being successfully implemented without upsetting any of the present local legislations or administrative systems. Our recommendation was largely based on the fact that the modern conception of planning large cities is based on the principle of decentralization and of nuclear aggregation. To make such conception a reality involves no drastic unification, but only coordination and adaptation through co-operative efforts.

Canadian town planners, city administrators and jurists are fully qualified to adapt, transpose and harmonize legal dispositions related to town development, in order to satisfy human needs that are identical or at least comparable, to provide the populations on both sides of the Ottawa River with opportunity for similar progress and welfare.

Again the example of Europe on the matter is worth mentioning: zoning by-laws in England, France, Holland, Belgium and Germany are practically identical, although expressed in five different languages and legislations. This important part of our work has been borne in mind in the preparation of our plans, and has permitted us to eliminate the most difficult obstacles to the accomplishment of our task.

The key problem of the whole plan was the railway situation: five railway lines, with their natural ribbon development of industries and warehouses, and more than a hundred grade crossings, cut the cities of Ottawa and Hull into nine parts. This handicap had already been emphasized in the Holt Report of 1915. The gradual elimination of such obstacles, and the regrouping of adequate grounds reserved and equipped with simpler railway facilities will, in return, result in the following advantages:

1. Better and more economical railroad operation;
2. Utilization of the rights-of-way of abandoned lines to form the basis of a new network of main arteries laid out for definite functions. This will gradually improve the presently unorganized traffic conditions, and provide greater facilities for circulation, access and parking;
3. Large portions of the urban

territory, now blighted by railway entanglements, will rapidly acquire higher values for commercial and residential development, to the advantage of municipal finances;

4. Industrial grounds, to be eventually organized in " trading estates ", will be provided for along the new railway properties, and will remain unhampered by disorderly housing developments, due to proper zoning regulations.

Method of Solution

A master plan of long range and flexible implementation is the safest protection against costly mistakes and against abusive speculation, the worst enemy of public welfare. The treatment of housing developments when hasty and incomplete, often leads to new slum areas and to unsatisfactory community planning, while, if incorporated in the framework of a master plan, they become assets to the community. The construction of large numbers of new homes without the necessary public services, such as schools, churches, shopping and recreational centres, brings sure failure materially and socially.

The far-reaching advantages of decentralization and nuclear aggregation are to prepare better human relations, neighbourhood spirit and local pride, and also to considerably reduce the volume of undesired traffic; local short movements made possible and attractive for pedestrians replace wasteful rides and parking congestion.

The distribution of independent residential units forms harmonious groups of various types of neighbourhoods. These are designed in accordance with their particular topography and functions, and their relative densities; main highways bind them together but do not cross them; green spaces or belts bind them together and are laid out on grounds of poor building value; along creeks or on existing woodlands, to form the necessary network of green spaces, of unspoiled nature amidst the town. In the generous areas reserved for open spaces we have included eventual reservations for all public services requiring pure air, safety and silence: high schools, colleges, hospitals, playgrounds, cultural and recreational centres, etc.

The study of demographic trends permitted us to establish a limitation of the future built-up area within an outer green belt, intended to prevent costly ribbon developments along traffic roads.

Fig. 4 (left). The heavily industrialized Chaudiere Falls area of the Ottawa River today between Ottawa and Hull. (*R.C.A.F. Photo*)

Philemon Wright's pioneer settlement in the Capital area in 1880 was on the north side of the Chaudiere Falls (top) now the city of Hull. With its water power and the river for transportation and the movement of timber, the area was developed early as one of the main sites of the lumber industry. Pulp and paper mills now at the Chaudiere and along the Hull shore of the Ottawa River are expected to move of their own accord in the future, permitting many desirable improvements.

Fig. 5 (right). Proposed long range improvements to Chaudiere Falls area.

A vertical view of the Chaudiere Falls section of the model of the National Capital of the future, looking north. The proposed new bridge is shown in detail. The islands and shores are landscaped and many recreational facilities are planned, such as the tennis courts right centre. The proposed new hydro-electric power dam is seen left centre.




Fig. 6 (top left). Ottawa today, looking west from the railway yards and industrial area on Nepean Bay, Ottawa River. (*Spartan Air Photo*)

Relocation of the railways and industrial areas of Ottawa and Hull is the key to the National Capital Plan. The plan calls for relocation of the railways in a belt around the south and east edges of the city, and ample space for new industrial areas has been acquired along the new lines. The photo shows the old industrial and commercial area on the Ottawa side of the Chaudiere Falls, with the railway yards, roundhouse, Ottawa West Station on Nepean Bay, and the right of way for the railway running through the residential area, upper centre.

Fig. 7 (top right). Long range proposals for improvements to the Chaudiere Falls Area and the Ottawa and Hull shores of the Ottawa River.

This view of the model is west from the end of Wellington street in downtown Ottawa. Wellington street divides lower left, a curving viaduct sweeping to the right to a new bridge over the Chaudiere falls, while the street itself continues off to the left. The islands at the Chaudiere are developed for park and recreational purposes. A proposed new hydro-electric development is seen on the far side of the main span of the bridge. The shore of Nepean Bay, upper left, is landscaped, with a new Federal District Commission driveway running around it. Ottawa's water filtration plant is seen on Lemieux Island (top centre) with a new bridge, replacing the present railway bridge, as part of a new driveway leading to Gatineau park in the Laurentian Hills north of Hull.

Fig. 8 (lower left). Beauties of Rideau Falls in National Capital to be restored in Capital Plan. (*R.C.A.F. Photo*)

Rideau Falls, where the Rideau River joins the Ottawa on the site of the National Capital, will be restored to their natural attractive appearance when proposals to remove the old lumber mills which now mar the site are carried out. The old buildings at the right are occupied by the National Film Board, the Food and Drug Laboratories of the Department of National Health and Welfare, and the National Research Council. The Bureau of Statistics is housed in the old mill buildings on the island between the falls. The main building of the National Research Council is seen at the left. The view is north across the Ottawa River to the eastern outskirts of Hull, with the Rideau River in the left foreground.

Fig. 9 (lower right, on the opposite page). The restoration of Historical Rideau Falls.

The large building at left centre is the National Research Council and the French Embassy is seen right centre on the cliff above the Ottawa River.

The east end of the city of Hull is seen (top) across the Ottawa River at the mouth of the Brewery Creek, upper right.

Fig. 10 (upper left). Railway yards and industries now occupy shores of Ottawa River west of Parliament Hill. (*Spartan Air Photo*)

The Ontario side of the Ottawa River. Looking east towards Parliament Hill (top right) with Nepean Bay, centre, and the Chaudiere Falls, hidden by industrial development, beyond.

Fig. 11 (upper right). Proposed improvements to Chaudiere Falls and south shore of Ottawa River west of Parliament Hill.

Bathing beaches and parkways replace railways. In the long range planning proposals shown in this photo of the model, the new shoreline is landscaped and reserved for public use. Wellington Street joins Scott Street at the traffic circle and overpass (lower right) to improve the east-west traffic route. The improvements will greatly increase surrounding property values.

Fig. 12 (lower left). Hull, Que., looking south across the Ottawa River to Parliament Hill. (*Spartan Air Photo*)

An industrial city with a population of about 40,000, Hull is largely supported by its long established lumbering and pulp and paper industries. It is the gateway to one of the Capital District's greatest assets, the summer and winter playground of the Gatineau Hills, with their hunting, fishing, camping and other tourist attractions. Extensive, long range improvements are proposed in the National Capital Plan.

Fig. 13 (lower right). New Interprovincial Bridge and Civic Centre for Hull.

The long range plans for the Hull of the future. The present interprovincial road and railway bridge is replaced down river away from Nepean Point in Ottawa, by a new road bridge which extends the Capital's driveway system across the river to a suggested civic centre in Hull (centre of model). Riverfront industrial sites are converted to parks when the industries move of their own accord in the future. The large building for the new Government Printing Bureau is seen lower left centre.

Within such limits the population may easily grow to half a million, or more, in the capital urban area. The gradual development of the urban extension is thus guided and controlled within the limits of a predetermined maximum growth.

If, in the unforeseen future, the urban development should require larger extensions, "new towns" outside of the rural green belt, ten or twelve miles from the central urban group, and planned for independent and self-supporting life, will house the excess of population, far enough away from the large city, to exclude all reasons for future annexations.

Objectives

This short description covers the normal planning of the urban area. Yet, the function of the National Capital remains to be satisfied. To such purpose the civic survey shows the following characteristics:

(a) 30,000 civil servants, the largest class in the active population.

(b) Relatively high percentage of apartments and privately owned dwellings, due to the number of high clerical employees.

(c) Fine residential developments, of low density, occupied by estates of diplomatic agents, high functionaries or heads of corporations.

(d) For Government purposes, large sites, well located and properly decentralized, have to be reserved. Also, public institutions, cultural and recreational centres must have their locations selected in advance.

(e) The hotel capacity has to be improved on adequate grounds.

(f) The park system already has been laid out through the excellent work of the Federal District Commission, and only requires to be augmented in relation to the future extensions of the urban area.

Fig. 14. Proposed site for botanical and zoological gardens and sports centre.

Relocation of the National Museum within the proposed gardens is recommended as a suitable location for the national collections of natural history, paleontology, geology, forestry, etc. Also suggested for the same area is a national sports centre with adequate facilities for national and international meets.

(g) In brief, the National Capital calls for ample facilities for governmental, parliamentary, diplomatic, cultural and social life, for an exceptional appearance of dignity and welcome, for additional measures to protect the natural beauty of its setting within and outside of the urban area.

We have endeavoured to satisfy such requirements in our proposals by a series of progressive projects, divided into three groups: urgent or short range operations, long range operations, and desirable proposals, subject to amendments suitable to their eventual realization. The timing of the execution of the short range and long range operations is organized according to a gradual programme of implementation and financing, with the view of avoiding the waste of double expenditure consequent to interim and temporary solutions. Particularly, the long range remodelling of railroad facilities is achievable by gradual steps without upsetting freight or passenger services.

Among the short range operations, immediate solutions had to be found to accommodate several important governmental administrations now inadequately housed in temporary or obsolete buildings. Such was the Department of Veterans' Affairs, the Printing Bureau, the Bureau of Statistics, the Film Board, the services of National Defence and of the National Research. Almost equally urgent are a City Hall, a National Theater, a National Institute of Arts, a National Library, a large Auditorium and Convention Hall, a Museum of Natural History, a National Stadium, a Zoological Garden.

Traffic Congestion

Traffic congestion on the main east-west cross-town artery, Rideau Street, Confederation Plaza and Wellington Street, is gradually becoming impossible. All classes of traffic, local, shopping, general supplies, Union Station approach, interurban movements, street car lines, converge on this central trunk.

This situation will be largely eliminated when the cross-town parkway is built on the right-of-way of the present cross-town C.N.R. lines, but still a large amount of local traffic will remain on Confederation Plaza, Rideau Street and Sussex Street as a natural link between two commercial centres (Bank-Sparks and Rideau-Dalhousie). The narrow bottleneck now existing between the Union Station and the Chateau Laurier will be eliminated when the improvements proposed in our plans made in 1939 for the Confederation Plaza and its approaches are completed. The first step in this completion is the elimination of the Daly Building and the widening of that part of Rideau Street.

But only when the present Union Station is relocated on a larger site on the future railway belt line, will final and efficient facilities for traffic and parking be made possible in the heart of the City. However, an immediate remedy for the congestion of Wellington Street and Confederation Plaza is the construction of a bridge across the Canal and railroad yards, (for which complete plans have been prepared), which will by-pass Wellington and the Plaza, through the use of Albert and Slater Streets as western approaches, and Waller Street as its eastern approach.

This new structure can be built without disturbing present railway operations, and will, in the future, become the central motive of the final development of the centre of the City. This new traffic improvement will give immediate relief to present bad conditions. In the meantime, various parking places, covered and open, will be provided for in the most congested parts of the City and near the busiest buildings.

Conclusion

To conclude this hasty résumé, it is stressed that the Plan of the Capital Region calls for very careful protection of the remarkable natural setting of the Capital area. This does not involve any expenditure, but only costless restrictions and controls. Aesthetic protection is not a load on, but a great relief to municipal budgets.

The great thought of the Right Honourable Prime Minister Mackenzie King, to dedicate the National Capital Plan to the Heroes of the Second World War, will very happily be materialized in a Memorial Terrace with a simple granite monument on the nearest hill of Gatineau Park, from which a panorama of the Capital Region appears. This was another providential asset, among many other natural beauties, to the National Capital Region of your great country.

Reminder!

The E.I.C. Annual Meeting and the A.S.C.E. Annual Summer Meeting will be held, jointly, at the Royal York Hotel, Toronto, July 12-14, 1950.

Plan NOW to Attend

Powder Metallurgy

by

J. S. Campbell, M.E.I.C.

Professor of Machine Design, Queen's University, Kingston, Ont.

Spectacular powder metallurgy applications have become so common, that many engineers do not realize that the manufacturing technique has similarly advanced. The process is applicable today to mass production of plain simple parts.

The basic process is to powder the component materials, mix them thoroughly, press them into the desired shape in a permanent mould or die, and finally heat treat. The materials can be powdered by grinding in ball mills, by crushing, atomizing, condensing metal vapours, chemically precipitating or depositing electrolytically. Generally the more ragged the particles' or crystals' shape and the finer the powdered size the better.

The press operation is performed with care to eliminate air inclusions. The usual pressure ranges from 20 to 50 tons p.s.i., although for special products it may range as low as one ton and as high as 100 tons p.s.i. The part as it is ejected from the die is generally weak, and requires to be handled with care. The high pressure tends to create a limited amount of mechanical welding between particles.

The heat treatment involves heating the pressed parts in a reducing or neutral atmosphere, and is referred to as sintering. The sintering temperature is usually less than the melting temperature of every constituent metal or alloy present. Sintering changes the physical properties, imparting strength that approaches that of the same alloy produced in the conventional manner.

In cases where the sintering temperature employed is above the temperature of one of the metals present, then this constituent melts and brazes the mass together. Normally the sintered part is used as is, a product complete in every respect, no machining such as turning, drilling, grinding, milling, threading, reaming, etc. being required to meet final specifications.

Occasionally to improve physical properties such as ductility, or to secure even closer tolerances, additional pressing or coining and sintering operations are employed. There are also instances where to facilitate moulding of complex parts, they are produced in several segments and then combined as a final pressed and sintered assembly. Machining can be employed in combination with this process where desirable. Thus the process may be considered quite flexible and has many applications.

Powder metallurgy has been applied in the manufacture of many diversified products, as shown in the following examples:

(a) Tungsten light filaments are swaged and drawn from powder-metallurgy-produced billets. This process avoids the high melting temperatures (melting temperature of tungsten 6,120 deg. F.) and practically eliminates contamination, as well as large crystal growth that is inherent with tungsten castings. Repeated pressing, swaging and heating produces a product so ductile it can be drawn to wire as fine as one thousandth of an inch in diameter.

(b) Self lubricating bearings of bronze, etc. Bearings with very fine voids evenly distributed throughout the bearing, and amounting to as much as 30 per cent by volume, are manufactured by powder metallurgy. Such bearings impregnated with oil will feed the lubricant to the friction surfaces for long periods of time.

(c) Electrical contacts such as silver tungsten are unalloyable in the liquid state. They act much like water and gasoline, and separate out. By powdering and mixing these metals, a product having the desired properties of a good conductor and a resistant to high temperature can be produced, that is applicable for electric contacts.

(d) Friction plates for brakes, friction drives and clutches. Self lubrication, high heat dissipation, uniform coefficient of friction from −65 deg. F. to 200 deg. F. operating temperatures. Little affected by moisture, more compact and wears relatively slow and even. These qualities have introduced powder metallurgy friction plates into use as aircraft brakes, bus and truck clutch and brake applications, etc.

(e) The Germans also used this process to combine metal and ceramics, for the purpose of obtaining the strength and temperature resistance required for turbine blades. Ceramics however do not lend themselves too well to sudden combined shock and temperature change. Although the production of metal and ceramic blades was successful this application is considered hazardous.

(f) Gears of iron, steel and steel alloys, etc., are a natural application for powder metallurgy. Such gears are limited to slightly lesser

Physical Characteristics of Alloys Fabricated by Powder Metallurgy Process*

(one pressing and one sintering only)

Alloy		Ultimate tensile tons/sq. in.	Yield strength tons/sq. in.	Shear strength tons/sq. in.	Elongation	Reduction of Area	Hardness	Density	Notes
F-71 Steel	As Sintered	35.0	30.0	27.5	2%		40–80 Rockwell "B"		
	As Hardened	55.0	no appreciable yield		1%		20–45 Rockwell "C"		Hardness can be maintained as "file hard". Equivalent Rockwell "C" 55-60
SA-471-A Steel	As Sintered	22.5	17.5	17.5	2%		30–70 Rockwell "B"		Strength of steel piece at any point, when insufficient, can be doubled by additional treatment
	As Hardened	32.5	no appreciable yield		1%		10–35 Rockwell "C"		
Presmet Corporation FX-000 Steel	As Sintered	27.5–30.0	22.5–25.0		25%	30%	30–70 Rockwell "B"		
	As Cyanide Hardened 010″ Case	32.5–37.5	30.0–32.5		10%	15%	60–65 "File Hard" Equivalent Rockwell "C"		
	As Carburized 060″ Case Not Hardened	37.5–40.0	30.0		10%	15%	40–80 Rockwell "B"	92% to 97% dense	
F-2 Iron	As Sintered	10.0	5.0	5.0	15%		40–80 Rockwell "F"		Low strength and hardness, but good deformation characteristics
	As Carburized and Hardened	30.0	no appreciable yield		1%		20–45 Rockwell "C"		
FX-000 Steel	As Sintered	27.5–30.0	22.5–25.0		25%	30%	30–70 Rockwell "B"		
	As Cyanide Hardened 010″ Case	32.5–37.5	30.0–32.5		10%	15%	Rc 60–65 "File" Hard" Equivalent		
	As Carburized 060″ Case Not Hardened	37.5–40.0	30.0		10%	15%	40–80 Rockwell "B"		
FX-010 Steel	As Sintered	50.0–62.5	no appreciable yield	approx. 80% of ult. tensile strength	2%	Nil	15–30 Rockwell "C"		
	As Hardened	75.0–87.5			1%	Nil	45–60 Rockwell "C"		
B-35-E Brass 80-20	As Sintered	20.0	15.0		20%		10–50 Rockwell "F" "H" Scale 45–65		

Also available are the following alloys:

- 90 Cu—10 Zn—Brass
- 70 Cu—30 Zn—Brass
- 65 Cu—18 Ni—17 Sn—Nickle Silver
- 80 Cu—10 Pb—10 Sn—Bearing Bronze
- 85 Cu—15 Zn—Brass
- 70 Cu—30 Ni—Cupro Nickle
- 90 Cu—10 Sn—Bronze

All demonstrate extreme ductility, ultimate strengths in the range 10.0 to 20.0 tons/sq. in., fair machinability, and excellent corrosion resistance. By repressing, or coining, the ultimate tensile approaches 150 per cent of that as sintered and the hardness ranges from Rockwell "B" 10-50.

*By the Presmet Corporation, Worcester 4, Mass.

stresses than similar gears when made of the same parent materials. If desired, the same sized gear can be retained by going to a higher grade material. Powder metallurgy gears, probably due to the slight porosity and inherent lubricating property, generally give better wear life. The accuracy of powder metallurgy produced gears can be classified as somewhere between first class commercially cut gears and carefully cut gears. If precision gears are specified, then the above gears can be lapped or ground to obtain even this accuracy. Precision gears normally require one of these operations as the finishing step, to meet specifications in the conventional manufacturing process.

Powder metallurgy may be classified as a mass production process. Major cost savings are made on production of large quantities of parts, and the process should be considered for producing even the most simple parts having requirements of say 20,000 pieces.

Powder metallurgy manufacturing is likely to be most economical as an alternative to:

(a) Castings of iron, brass, etc. that cannot be cast to the desired finished tolerances without resorting to machining.

(b) Forgings that cannot be completed in one or two handlings or that require machining to meet specifications.

(c) Stampings that require reaming turning, grinding, etc.

(d) Screw machine products requiring secondary operations.

It is evident that since powder metallurgy can be competitive with such common manufacturing processes, major cost savings can be realized where the machining operations are complex or expensive. In many instances all machining, milling, drilling, slotting and grinding operations can be eliminated by powder metallurgy production of but one pressing and sintering operation, the part being in every respect complete and up to specifications.

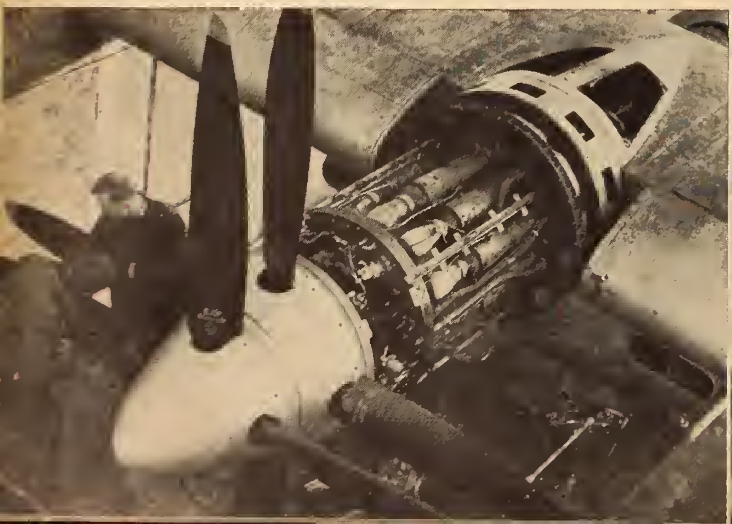
Design for powder metallurgy production is another further step to be considered. Often simple redesign of the end products will lend itself to still further cost savings. A simple example is the incorporation in a gear of the drive key, thus two parts become one and cost of parts and assembly are both reduced.

Propeller Gas Turbines

The propulsive efficiency of a jet engine increases with the flight speed of the aircraft and the advantages inherent in these engines are not fully realized below speeds of 450-500 m.p.h. Some gas turbine engine manufacturers, apparently believing that air speeds above 500 m.p.h. for commercial aircraft are still several years in the future, have been directing development efforts toward the gas turbine-propeller combination. Such engines combine the simplicity and smoothness of the gas turbine with the greater propulsive efficiency of the propeller at speeds below 500 m.p.h.

British engine manufacturers in particular have several propeller-turbine engines under development and in production. The two illustrations on this page show a test bed installation of the Armstrong-Siddeley 4000 hp. "Python" propeller-turbine. The first photo of the uncowled engine shows the somewhat unconventional reverse-flow compressor arrangement. Air enters at the intake ring between the leading edge sections of the wing, moves forward through the multi-stage axial compressor and rearward again through the combustion chambers which can be seen lying longitudinally around the compressor casing. The combustion chambers discharge between the intake ducts to the turbines which utilize most of the energy of the gases to drive the compressor and contra-rotating propellers. Additional jet thrust is obtained from the turbine exhaust.

The second picture emphasizes the clean uninterrupted nacelle design obtainable with the gas turbine which needs no large cooling radiators.



THE INVITATION OF THE WEST

An address presented before the Canadian Institute of Mining and Metallurgy and the Ottawa Branch of the Engineering Institute of Canada, at Ottawa, October 13, 1949.

by

John R. White,

Vice-president, Imperial Oil Ltd., Toronto, Ont.

Calling attention to the broad base of resources on which the West's industrial future rests, the author shows why it is impossible to predict the directions such industrial development will follow. Present energy production from western oil is the equivalent to the output from five Niagaras; instances are given of how this primary production has already brought about the development of many secondary industries.

Pointing to the lack of Canadian "Venture" Capital, he stresses that imagination and initiative are needed to enable the West to make the most of its opportunities.

The opportunity to discuss with you the invitation which western Canada presents today is one which I prize highly. I feel strongly that much in the future will depend on the kind of consideration that groups such as yours give to the problems and opportunities of the west. In essence, there is nothing exceptional about the invitation of the west except its vigor and its promise. Basically, it is an invitation to make the most of what nature has given us. It is the invitation to prove that Sir Wilfrid was right, and that the 20th century really does belong to Canada.

In the west an infant industry has appeared. It is less than three years old. At the moment, it's growing lustily and there are all sorts of ideas as to how it should be brought up. I have used the analogy before, between modern methods of bringing up children and the ways in which we should encourage industrial development. May I use the parallel again, because I think the psychologists have perhaps got a little ahead of the economists in studying the art of healthy development. Today, no intelligent person would try to predetermine the course of a child's life. We would not force him, at the age of three, into any particular trade or profession. Rather, we would try to let the youngster develop along his own lines, find his own vocation and so contribute more to society and himself, than he would if forced into a line entirely unsuited to his capabilities. Moreover, few adults any longer feel they know enough about the future to predict the most suitable career for a youngster.

Broad Base for Secondary Industries

This connection between psychology and economics is nowhere more clear than in Alberta. An "aptitude test" of the province would show that its resources and its people lend themselves to the development of almost every modern form of industrial activity. So diverse are its resources that one is tempted to give up cataloguing the industrial possibilities in favour of a list of the impossibilities!

What is there that cannot be done with 50 billion tons of coal, a billion or so barrels of oil, three trillion cubic feet of natural gas and a quarter of a billion dollars worth of farm produce every year? Add in the salt beds that underlie most of Saskatchewan through Alberta to Athabaska. Include the 15,000 square miles of tar sands, the 150,000 square miles of timber and 106,000 horsepower in Alberta's waterfalls alone. It is hardly necessary to count the rarer materials, such as the potash, bromine and iodine because what few materials Alberta lacks can be brought in from outside, — for example, from the metal mines that surround her on all sides.

Visible in the west are the materials for every type of plastic, for virtually all the major industrial chemicals and electro-chemical products. There is here the material for rayon, for nylon, synthetic rubber, phenolic and cellulose plastics, carborundum, graphite, cyanamide, acetylene and its host of relatives, and many others. And it follows that if the materials for these basic products are present, there is the possibility of erecting over them all the secondary and tertiary industries that have been based upon them in other parts of the world.

Fig. 1. A typical drilling scene in western Canada.

knowledge that a good market existed for oil, and that ways could be found of bringing this oil to market that turned Alberta's petroleum resources into a real economic opportunity. If once we recognize that most new industries start out as a sort of by-product or incidental off-shoot of some earlier development, we stand a considerably better chance of having our long-run hopes fulfilled. That the new industries spring unexpectedly from apparently unrelated developments elsewhere, serves further to emphasize the fact that economic growth is almost entirely unpredictable.

Oil Discovery Will Affect West's Economic Future

Time after time, and in place after place the discovery of new oil fields has led to temporary embarrassment for the industry but left behind it constructive changes in the economic life of the world. A classic example was the great Spindletop gusher of 1901 in east Texas. This well brought in a field so prolific, and developed in so unorderly a fashion, that crude oil dropped to three cents a barrel at

Three Fundamental Needs

This geographical aptitude alone does not constitute a career. Actually, the three essentials for economic growth are opportunity, capital and initiative. And while the presence of natural resources plays a necessary part in the creation of opportunities, it is still only a part. An economic opportunity usually seems to appear as a combination of natural and man-made factors. For example, there was an economic opportunity to grow wheat in western Canada when the Canadian Pacific Railway was first flung across the prairie. In the same way, the oil-bearing strata of Alberta did not of themselves constitute an economic opportunity for the oil seeker. It was only the

Fig. 2. Flaws in drill pipe may lead to breakage during drilling operations which might result in a costly "fishing" job. These men are using a magnetic coil to magnetize a piece of drill pipe. Powdered iron sprinkled on the magnetized pipe will reveal the presence of hidden cracks or other weaknesses.

the field at a time when the drillers had to pay five cents a glass for drinking water! But Spindletop was perhaps the most important single factor in converting much of the world's shipping and the greater part of American railroads to oil burners. Undoubtedly, Spindletop and its successors in east Texas were largely responsible for aiding the rapid growth of the automobile industry which was developing at the opposite side of the United States.

The development of the Alberta oil fields has not been as tempestuous as the early growth along the Gulf coast. From the first, output from the new wells has been governed by conservation practices which will effect the maximum efficient recovery. More recently, a voluntary system of prorationing fostered by the provincial government has kept output from the field in harmony with the available markets. Prices of crude have gone down as output has expanded, but prorationing has prevented the extreme gyrations that were common in the early days of the century.

But the comparatively orderly development of the Alberta fields does not by any means indicate that they will not prove to be just as fruitful a spawning ground of opportunity. If, for example, prices of crude have not collapsed as the field expanded, they have been reduced from the previous level. And as the field expands, the prospect is that the price at the wellhead will be further reduced. This is traditional in the price structure of crude oil, since each growing field must expand its markets by underbidding its competitors.

Prices are thus set by the prevailing competitive level at the fringe of the area served by each field. It is obvious from this, that the farther afield the oil can travel. the greater will be price advantage in the neighbourhood of the oil wells themselves. And simultaneously, the farther afield the oil

Fig. 3. Great columns of smoke and flame roar out of the flare pit at Imperial Schoepp No. 1 during the brief time it took to clear the hole of mud following its kick-in to production.

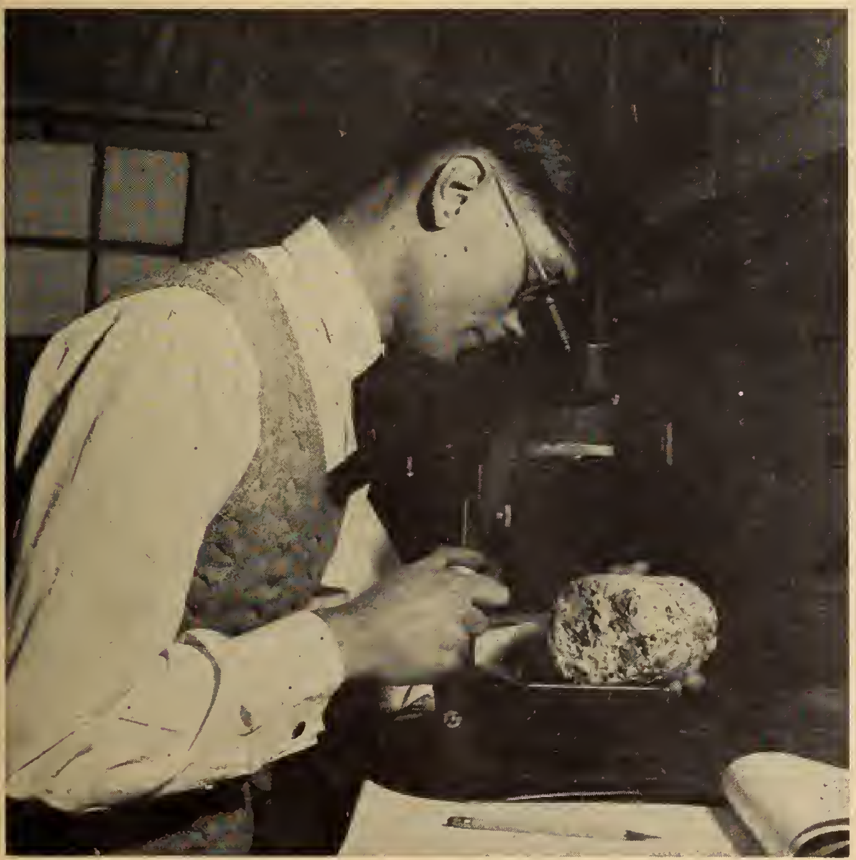


Fig. 4. This sample of rock which was brought up by the core drill at Redwater is being examined by a geologist. His trained eyes look for evidence that will tell the age, sub-surface structure, and angle of dip of the rocks in the area, and if they are favourable to the accumulation of oil.

Fig. 5. Imperial-Leduc development. On this particular pipeline job, workmen are trenching through two feet of river ice and into the bed of the river in order to lay pipeline from the Leduc field gathering system into the new Woodbend area. It is something of a race against time as a quick thaw could leave them stranded on the river with a 14-ton digger and no means of getting it up the bank.

can travel, the larger will be the market for the producers and the greater their incentive to continue their search for petroleum.

Reasons for Pipe Line Through the U.S.

These factors explain the great importance which has been put on the pipe line from Edmonton to the Great Lakes, at Superior, Wisconsin. The difference between the route decided upon and an all-Canadian route would probably mean something up to 10c a barrel to the Alberta producer, and that 10c might shorten the reach of the Alberta producer by several hundred miles, and so reduce his potential market by an amount that we cannot even estimate. Decisions of this nature can have a very great effect on the capacity of the oil industry to breed opportunities in the Canadian west.

The cornerstone of a strong western industrial expansion will be a strong and healthy oil industry. It is, for example, in the interests of both producers and consumers that the pipe line should follow the most efficient and economical route. It is also in the interests of oil production in western Alberta that the recent upward adjustment in crude prices was made. One could hardly expect the oil seeker to come to Alberta if he knew that oil prices in that area were out of line with the world level. Like the prospector for base metals or gold, the oil seeker has the world for his hunting ground, and since he is usually operating with someone else's money he is forced to keep prices and markets in mind when he is selecting his targets. I am not suggesting that the oil industry should get special favours of any sort. The normal play of economic forces, unhampered by secondary considerations, will provide adequate opportunity for the oil industry. And in so doing, we will undoubtedly have the best guarantees that the oil industry will provide opportunities for other industries.

Energy of Five Niagaras

Last year, the average Canadian had his productive power multiplied by the energy of 285 gallons of petroleum. In terms of human energy, it was as though the strength of each Canadian were multiplied twentyfold. This year it looks as though petroleum will increase the invisible servants it places at the disposal of the average Canadian still further, and that the people of the prairies will lead the rest of the country by a wide margin. What this will mean to prairie farming and prairie industry generally would be difficult to estimate. But the mechanization of agriculture which is being stimulated by this new energy will strengthen the entire economic fabric of the prairies. And this basic improvement will be continued as the oil industry grows in the west.

Putting it another way, the energy from 18,400 barrels of petroleum is about equal to the energy that is drawn off from Niagara Falls in a day. The Alberta fields will, it is estimated, be capable of producing 100,000 barrels daily by the end of this year. More than five Niagaras! And, just as waterpower has the problem of disposing of secondary or off-peak power, petroleum also brings marketing problems.

Although a barrel of crude oil can be processed into any desired proportions of gasoline, kerosene and other products, in the final analysis the refiner must use the machinery of free prices to move all his stocks. He must charge different prices for the different products so he can meet his overall costs. This means, of course, that some lines of products are put on the bargain counter in order to keep them moving. And this characteristic of oil refining provides headaches for the oil industry but opportunities for everybody else!

Secondary Industries Stimulated

For 1948 alone, Premier Manning reported the establishment of 32 new industrial enterprises representing a total capital of more than $31 millions and employing more than 1,200 people. Separate tabulations — obviously using a different basis of classification — reported 68 new enterprises for Edmonton and 42 for Calgary. One large group, of course, is made up of the firms which have taken on the job of supplying the oil industry itself. As a rule, the first stage of development is the opening of a supply store and a warehouse.

A logical secondary development is that of doing repair work on the equipment being handled. Quite commonly this leads to fabricating shops and a gradually increasing degree of manufacturing on the spot. One such firm got its start in eastern Canada erecting tankage and has since moved to Edmonton for the construction of new tanks and separators, and the laying of gathering pipe for the producing fields. This firm is completing an expansion programme which will add substantially to its range of manufactured products.

The job of supplying the industry with rock bits will soon move into the manufacturing stage. The same can be said for the supplying of machines which wrap and coat pipe lines. The development of oil has also had a pronounced effect on many existing industries. The needs of the oil drillers have increased the shipments from the cement plant at Exshaw by four or five carloads daily. There has been a vast increase in the demands for chemicals for the treatment of wells, for large quantities of starch to mix with the drilling fluid at Stettler. Another by-product of the drilling and producing operations has been the very substantial growth of the trucking industry.

The enterpriser will combine all these growing possibilities into still further new enterprises we cannot begin to predict, but we do know that there will be a steady growth in the possibilities for industrial development so long as the oil industry itself is growing and thereby providing a fertile soil for secondary developments. A healthy development of the oil industry itself will generate opportunities in other fields. The direction of industrial growth in the west will only be known as the opportunities develop and multiply. To a great extent, they will depend upon the other two essentials of industrial growth, capital and initiative.

Lack of Canadian "Venture" Capital

There is no question of the availability of capital in this country. The nation's savings for 1948 were in the neighbourhood of $3 billions. But certain of its other characteristics are of a sort to arouse serious questioning. To a considerable extent, surplus income is today diverted into channels in which its freedom of movement is severely restricted. The large sums now taken in personal and corporation taxes, amounting to approximately $1.3 billions in 1948, also represent a deduction from the fund of risk-taking venture capital. Regardless of the worthiness of the undertakings on which this money is spent by governments it is quite apparent that it cannot be made available for "industrial wildcatting".

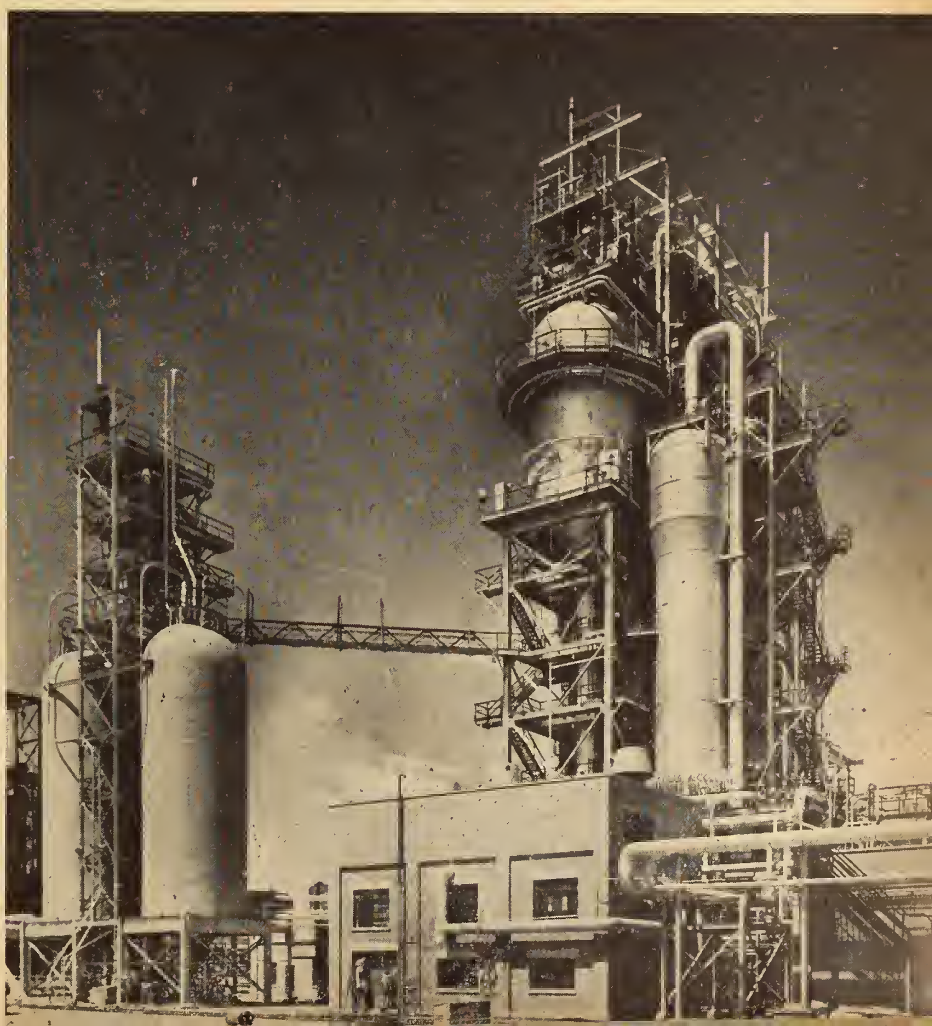
Diversion of a large part of the national income into government or government-controlled channels cannot add to the funds available for untried ventures. It is not usually considered a function of governments to gamble with the money of the taxpayers! Yet history indicates that economic progress starts with a gamble, whether that gamble be undertaken by a company of adventurers trading into Hudson's Bay or a bicycle dealer tinkering on a horseless carriage in a Detroit shed. I do not wish to imply that western Canada is to be regarded as a longshot in the economic race. There is probably nothing more certain than that western Canada will become one of the most prosperous and populous regions in North America.

Imagination, Initiative, Needed Too

But if the west is to fulfill itself *soon*, it must be recognized that imagination and initiative will be required. Its future does not lie in merely imitating the achievements of other parts of Canada and the United States. Its distance from existing markets prevents any exact duplication of the story of oil in the Gulf states. Distances and other factors will probably prevent a duplication of the industrial story of eastern Canada.

There will be similarities between the development of western Canada and those that have taken place previously. But essentially, the two conspicuous features about the invitation of the west are:- the great and growing wealth of opportunity that the discovery of oil has stimulated, and the tremendous part that new ideas, combined with venturesome capital, can play. The invitation of the west has been spelled out by the railroader, the settler and now the oil man. I predict that the industrial pioneer will follow quickly in their steps.

Fig. 6. Canada's first catalytic cracking unit, 15 storeys high, is being built at Imperial Oil's Montreal East refinery to produce improved gasolines for Canada. It is part of the largest construction programme in the company's history, made necessary by an unprecedented demand for petroleum products.



DESIGN DEVELOPMENT OF THE AVRO JETLINER

A paper presented at the Annual General and Professional Meeting of The Engineering Institute of Canada in Quebec City, May 11 to 14, 1949

by

J. C. Floyd,

Project Designer, A. V. Roe Canada Limited. Malton, Ontario

During the latter part of 1945, some interest was shown by the airlines in both Canada and the United Kingdom in the remarkable progress then being made with the use of the turbojet engine in military aircraft. At the end of 1945, the Gloster Meteor was in regular squadron service with the R.A.F. and the U.S. Army Air Forces were also using jet fighters. It was generally agreed that if the advantages of high speed and reduction of noise that the jet engine offered, could be combined with the requisite safety and economy essential in airline operation, there would be a ready market for the high speed jet powered transport.

In the spring of 1946, a detailed analysis was carried out at the newly formed Avro Canada Branch of the Hawker Siddeley Group at Malton, around a provisional specification for a medium range inter-city turbojet transport. The specification was based upon the requirements of the Trans Canada Airlines domestic routes. The results of this analysis were sufficiently favourable to convince both the airlines and the Company that the idea of a medium range jet airliner was not only feasible, it was also basically sound and should be proceeded with immediately. Preliminary design work was started in the summer of 1946 with an extremely small design staff which was gradually increased, and by the early part of 1947, the design was well under way.

Design Policy

In order to reduce the number of untried features to a minimum, which was obviously desirable both from the point of view of safety and rapid development, the aircraft was designed on reasonably conventional lines. It was felt that the incorporation of too many design features which had not been satisfactorily demonstrated on previous aircraft would entail a considerable amount of laboratory testing, and at the same time, the development costs involved would be prohibitive. Nevertheless, enough original and novel design features were incorporated to make the project unusually interesting. As the less conventional features will obviously be of the most interest, these will be covered in greater detail in this paper.

Specification

The general specification around which the aircraft was designed was basically as follows:

(1) The aircraft was to be a turbojet-powered short-to-medium range inter-city transport, with a still air range of at least 1,200 miles.

(2) The payload was to be at least 10,000 lb., with accommodation for not less than 30 passengers.

(3) A cruising speed of over 400 m.p.h. at 30,000 ft. was specified without having to resort to the use of oxygen for the passengers or crew.

(4) The aircraft was to be designed to operate from airports with 4,000-ft. runways under standard atmosphere conditions and to comply with the take-off conditions of the Civil Air Regulations. A decelerated stop length of 5,000 ft. was not to be exceeded under 'hot day' conditions following engine failure.

(5) Controllability at low speeds was not to be sacrificed in any way, despite the high speed range required. The approach and stalling speeds were to be at least comparable with present transport aircraft.

(6) Special attention was to be given to serviceability and maintenance problems, to allow for maximum utilization and operational regularity.

(7) The aerodynamic and structural requirements of the Civil Air Regulations were to be achieved.

(8) The cost of operation was to be comparable with or better than existing transports.

This then was the target. The figures in Table 1 will serve to show that it has not only been achieved, but that the aircraft as now designed is superior in all respects to the original specification.

To achieve these results, there were many difficult and new problems to be faced. As there were no aircraft of this type in service, there was obviously no experience or established data to fall back on for many of these special problems. A summary of some of the major items which had to be considered will serve to show the nature of some of these problems.

On August 10, 1949, the first prototype Avro C-102 civil jet transport was wheeled out of the hangar at Malton to begin its flight trials. As it is the first completely Canadian-designed airliner, and the first jet transport in the world specifically designed for inter-city airline operation, considerable interest in this project has been aroused throughout the industry and airlines on both sides of the Atlantic. It is an adventure in engineering of which Canada in general, and the engineering profession in particular, can justly take pride.

The main purpose of this paper is to give a brief summary of the design and general problems encountered in the development of the first prototype up to the present flight test stage.

Pressurizing Requirements

To obtain the optimum operating conditions with turbojet engines, it is necessary to fly as high as possible. The reduction in engine thrust between sea level and say 30,000 ft. is around 40 per cent, while the drag is reduced to less than 25 per cent. As the thrust from the engine is approximately constant for all speeds, the variation being usually less than 5 per cent between 200 and 500 m.p.h., it can be seen that flying at altitude is far more important than with conventional aircraft. In the interests of economy it is also essential to climb the aircraft to the operating altitude as fast as possible, and to descend as rapidly as possible at the destination.

Most conventional pressurized aircraft have the cabin pressurized to 8,000 ft. conditions at any altitude, 8,000 ft. being accepted as the altitude to which the average person can climb without feeling any discomfort either from lack of oxygen or reduced air pressure. Assuming that this aircraft was pressurized to 8,000 ft. cabin conditions at 30,000 ft., however, it would take 40 minutes for the aircraft to descend at the recommended rate of 200 f.p.m. This is obviously not feasible with a jet aircraft as not only would all the advantage of speed be completely lost, but the fuel consumption of four turbojet engines operating for most of the time at low altitude would be prohibitive.

It was obviously necessary, therefore, to pressurize the cabin to as near sea level conditions as possible right up to the cruising altitude to enable the aircraft to be brought down in the shortest

TABLE I

C-102 Jet Transport

4 Derwent 5 Turbojet engines. Total Static Thrust at Sea Level I.C.A.N. Conditions	14,400 lb.
Gross weight	60,000 lb.
Maximum landing weight	52,500 lb.
Still air range (with short range tanks)	1,400 miles
Cruising speed at 30,000 ft. and 55,000 lb. gross weight	450+m.p.h.
Payload	12,700 lb.
Number of passengers	40–60
Payload for 500 mile range with full A.T.A. allowances at 60,000 lbs. T.O. gross weight	12,000 lb.
4 Engine take-off over 50 ft. obstacle at 60,000 lb. I.C.A.N. conditions sea level	3,100 ft.
3 Engine take-off with above conditions	3,525 ft.
Distance to Accelerate to Critical Engine Failure Speed and Stop (C.A.R. 04b.1221): 60,000 lb. Gross weight at sea level	
I.C.A.N. conditions	3,750
"Hot day"	4,200
Landing	Distance from Height of 50 ft.
Sea level (I.C.A.N.)	2,867 ft.
3,500 ft. (I.C.A.N.)	3,064 ft.
Stalling speed at landing weight of 50,000 lb. with flaps in landing position	87 m.p.h.
Stalling speed at landing weight of 40,000 lb. with flaps in landing position	78 m.p.h.

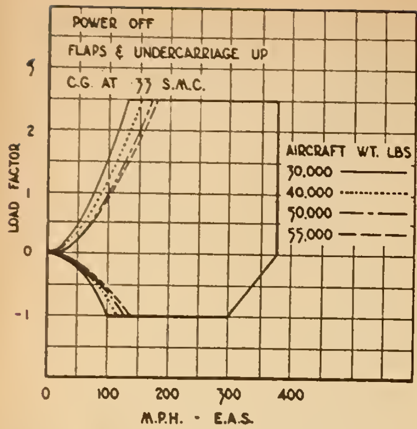


Fig. 1. Manoeuvre load factor vs. equivalent air velocity for various all-up weights.

possible time. The conditions achieved to date are as follows: a sea level cabin up to 21,250 ft., a 2,000-ft. cabin at 25,000 ft., and a 4,000-ft. cabin at 30,000 ft. The pressure differential to achieve this is 8.3 p.s.i., and as a safety factor of 2 is used for pressurizing, the fuselage had to be designed to withstand a pressure of 16.6 p.s.i. The structural problems involved with the use of these high pressures were, to say the least, interesting.

Rapid decompression due to a window blow-out, etc., is always a problem in considering high altitude flying for passenger carrying aircraft. It is comforting to note, however, that in the opinion of the Aviation Medicine experts, the only real physiological discomfort up to 30,000 ft. is the lack of oxygen. Above 40,000 ft. the average individual is unable to obtain sufficient oxygen, even when breathing an atmosphere which consists entirely of oxygen, because of the decrease in total pressure in the lungs. Investigation is, however, going ahead on the basis of an automatic oxygen system, which comes into operation if a blow-out does occur, and which floods the cabin with oxygen vapour.

Choice of Engines

Originally designed as a twin engined transport, the C-102 was designed to take two Rolls-Royce Avon engines. In the fall of 1947 when it was realized that the Avon engines would not be available for the first prototype, it was decided that four Rolls-Royce Derwent

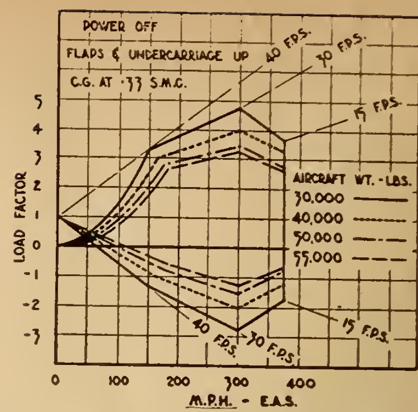


Fig. 2. Gust load factor vs. equivalent air velocity for various all-up weights.

engines would be used on the first aircraft. The decision to do this was not taken lightly, as it involved a complete redesign of the centre section structure which was then somewhere near design completion. The sideways retracting undercarriage scheme had also to be completely scrapped.

As the redesign work progressed, however, it became evident that the use of four engines was not only a very much better and

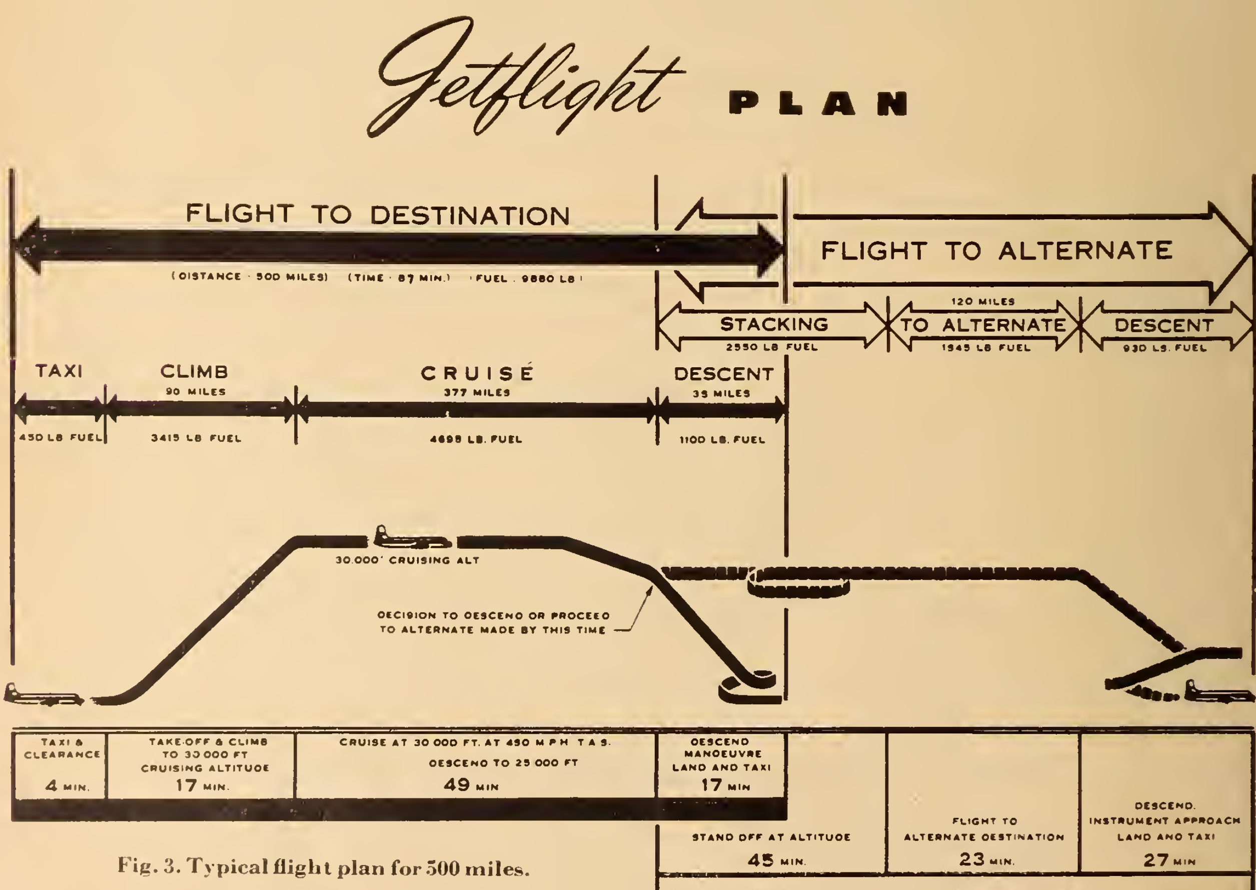


Fig. 3. Typical flight plan for 500 miles.

safer arrangement, but the fact that the undercarriage would now be retracted fore and aft in the nacelles made the undercarriage unit and adjacent structure very much simpler in all respects. Also the use of engines which had been operating in military aircraft for over 100,000 operational hours was a very big point in eliminating one of the big unknowns which would have had to be faced with the use of engines which were only in the development stage.

The use of four engines also made compliance with existing C.A.A. requirements much easier, and the engine failure case less severe on the control surfaces. The decision to use an underslung nacelle, instead of the "through-the-spar" arrangement necessary with the original engines, also simplifies the fitting of newer types of engines as they become available without any major structural alteration.

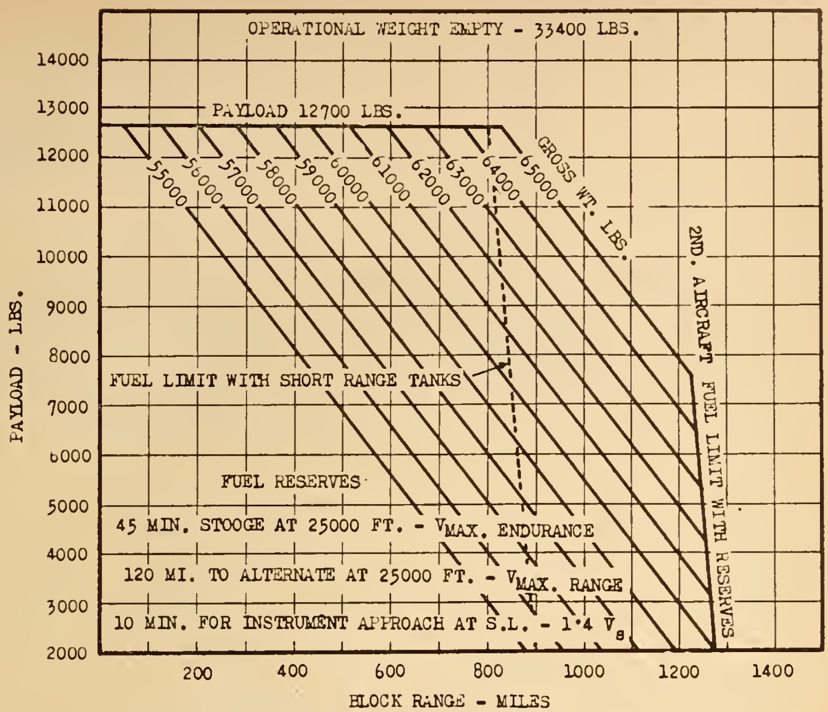


Fig. 4. C-102 payload vs. range.

Structural Requirements

The high speed and relatively low wing loading resulted in the load factors being considerably higher than those at present used for transport aircraft. Refcrence to C.A.A. 04.21411 shows that the gust factors vary directly with the speed and inversely with the wing loading. The relatively large amount of fuel carried in the jet powered transport resulting in a low landing weight, and consequently, a low wing loading, together with the increased speed, all make for a higher gust factor.

The limit load factors for manoeuvring and gust conditions can be seen in Figures 1 and 2 respectively, and these have to be multiplied by a safety factor of 1.5. The highest limit load factor is 4.8 at a weight of 30,000 lb. and a speed of 300 m.p.h. E.A.S. The over-all wing loads were also increased due to the absence of relieving loads from conventional outboard nacelles.

To compensate for the increased structural strength required, the high strength aluminum alloys 75ST and 24ST are used extensively to obtain the maximum strength-to-weight ratio. The outer wings are also designed as fully stressed skin structures with heavy gauge skin and stringers taking the place of the usual concentrated spar booms, and providing a high degree of torsional stiffness. Extra heavy skins are used on the lower portion of the fin to give torsional rigidity and prevent tail flutter.

The windscreen structure is a high strength aluminium alloy casting, and the pressure bulkheads are situated at the front of the windscreen and at the rear of the passenger cabin. The rest of the structure is along conventional lines, and so will not be dealt with in any great detail. The structure weight is approximately 27 per cent of gross at 60,000 lb.

General Aerodynamic Considerations

Drag: The reduction of the parasitic portion of the total drag is most important with turbojet powered aircraft. The ratio of fuel consumption to thrust does not increase very rapidly for speeds between 300 and 500 m.p.h. As the thrust is approximately constant for all speeds, it is apparent that the mileage travelled per unit of fuel is increased in almost direct ratio to the aircraft speed. The aircraft then, has to be aerodynamically clean to cut the parasitic drag to a minimum.

In the design of the C-102, the greatest care has been taken to get a good external finish, and all external riveting is flush. The skins are preformed and stretched to provide the smoothest contour and practically all the radio antennae are flushed into the contour.

Wing Section: It was obviously essential to cut down the drag to a minimum and at the same time to obtain the highest possible $C_{L\ max}$ for take-off and landing performance. The structural problems with high gust factors and the large amount of fuel which had to be carried also influenced the wing design. The section chosen to obtain the best all-round characteristics was a N.A.C.A. 230 series aerofoil, with a thickness at the root of 16.5 per cent and 12 per cent at the tip.

The aircraft will be operating at a Mach number of less than .7 at 30,000 ft. and no compressibility problems are expected with this aerofoil at these speeds. It also has the advantage that the trailing edge angle is low, and the pressure recovery gradient is conservative, which makes the section less sensitive to manufacturing and junction interference.

Wing Plan Shape: A fairly low wing loading was used for better approach characteristics and the plan shape which appeared to give the best compromise was one with an aspect ratio of 8.1 and a taper ratio of .5. As the basic characteristic having the greatest effect on stalling is the taper ratio, this was chosen very carefully.

It was considered that for an aircraft operating at a Mach num-

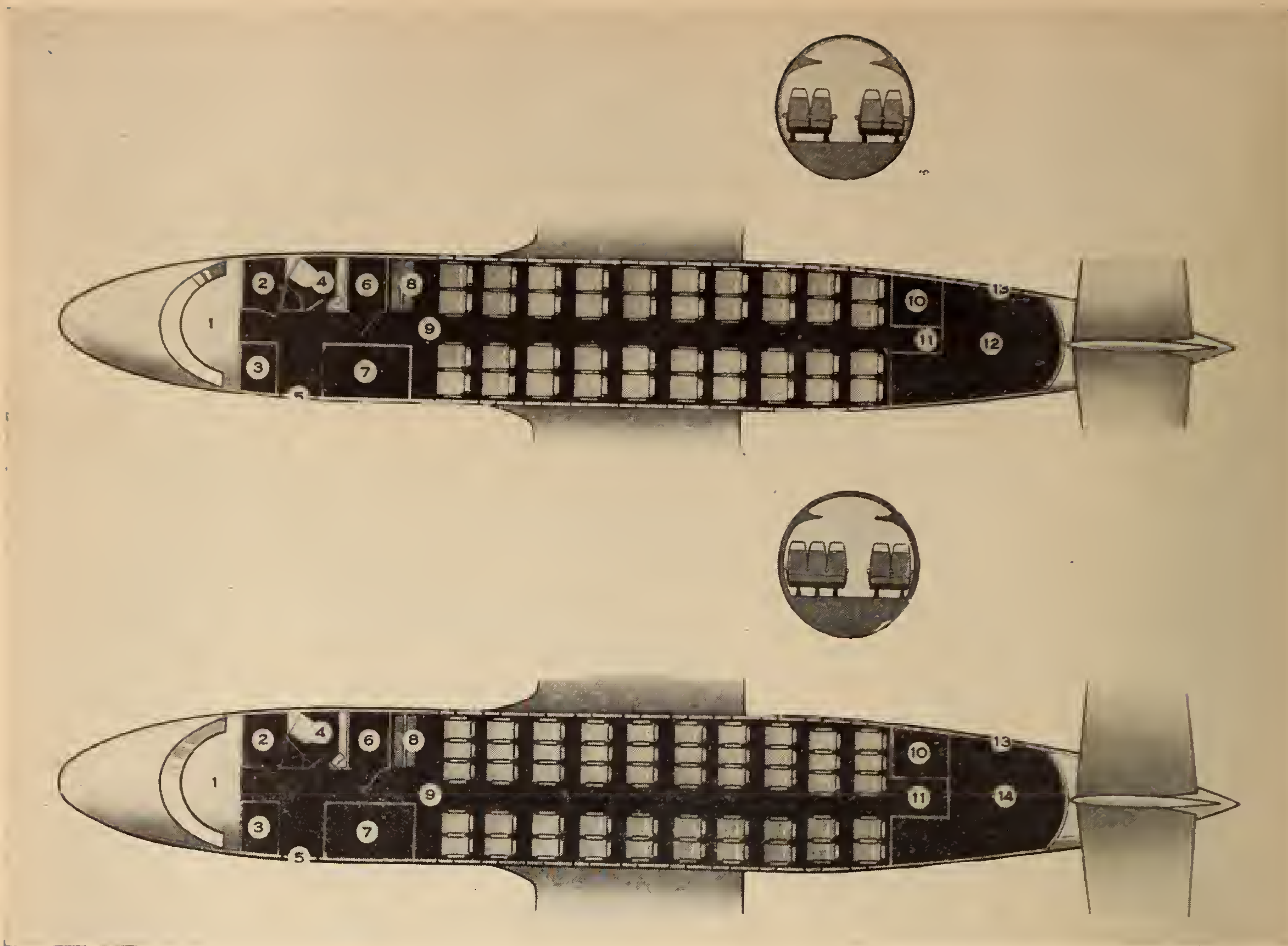


Fig. 5. Forty and fifty passenger versions.

LEGEND: 1—flight deck; 2—accessory compartment; 3—radio compartment; 4—washroom; 5—entrance door; 6—cargo—53.2 cu. ft. net volume; 7—cargo—121 cu. ft. net volume; 8—coat racks; 9—cabin; 10—buffet; 11—stewardess station; 12—cargo—367 cu. ft. net volume; 13—cargo door.

ber less than .7, sweep back would not be worth the extra weight it would involve. The best arrangement appeared to be that having a straight rear spar, which gives a sweep back of approximately 4½ deg. at the quarter chord. Washout was considered, but did not seem to give any great promise. Although it gave slightly better stall characteristics, the effect of the extra induced drag at high speed was less favourable, and the manufacturing difficulties would also be very much greater.

Split-type flaps are fitted on the first set of wings for the first prototype. These will later be changed to the double-slotted type to cut down the landing, and approach speeds to the minimum. The profile drag has been kept to a minimum by the use of thick skins required for wing stiffness, and complete flush riveting. Square tips are used, to give greater aileron effectiveness by carrying the surfaces out as far as possible, and for ease of manufacture of the tips themselves.

The dihedral on the outer plane is 6 deg. and the wing incidence is 2½ deg. throughout the span.

Fuselage Shape: The shape of the fuselage is the usual compromise between getting a profile aerodynamically clean and a structure easy to assemble, coupled with the standardization of interior fittings and structure for as long a length as possible. This has resulted in a parallel section of fuselage for approximately 60 per cent of the total length.

Special care had been taken to get good lines around the nose canopy, and wind tunnel results, showed that the critical Mach number around the canopy is about .73, i.e., higher than that for the wing.

Tail Plane Vertical Position: The tail plane is located high on the fin. If the tail plane was on the centre line of the fuselage, it would be directly in the wake of the jets. While the temperature effects of the jet stream are not too serious by the time they get back to the tail, the velocity effects are more marked. If the tail was just out of the jet stream, but fairly low down on the fin just above the fuselage, there would be a marked interference between the sharply tapered after-body and the tail plane.

Effect of Thrust on Trim: The jet nozzles are inclined at an angle of 7 deg. to bring the line of action of the jets as close to the normal C.G. position as possible, and minimize the effect of change of trim between power-on and power-off.

Jet Stream Effect: The jet stream has a cleaning-up effect around the trailing edge of the centre section wing. When the engines are opened up during a baulked landing, air is drawn into the jet stream over the adjacent wing surfaces due to the greatly increased velocity through the jet nozzles. This has the effect of reducing the stalling speed.

Wing Root Fillet: The unusual design of wing root fillet was incorporated to take care of the upwash from the fuselage. The normal component of the flow around a long nosed fuselage produces an upflow at the wing root, which may cause premature root stalling, and during wind tunnel tests, it was found that a long forward fillet of the right shape corrected this effect.

Flight Plan

Until the various flight plan procedures have been worked out between the airlines, the Civil Air Authorities, and airport control personnel, it is obviously not possible to give a definite flight plan. Figure 3 shows a recommended procedure, which allows for a standard 45 minute stacking and 120 mile flight to an alternative airport, plus allowance for instrument approach, landing and taxiing.

It will be seen that instead of the usual procedure of descending at the destination airport, taking a pass at the airport to check whether the landing is possible, and then proceeding to an alternative airport, the decision to descend or proceed to the alternative is made at some point during descent. This point is shown on the flight plan at an altitude of 25,000 ft. and approximately 33 miles from the airport, and this is considered to be entirely reasonable with present ground aids and radio equipment.

Due to the high cruising speed, it is expected that the weather at the destination will have been reasonably accurately established, and will not have changed during the short flying time. If conditions are considered to be unfavourable for landing at the destination airport, the aircraft proceeds at its best endurance speed at an altitude of 25,000 ft. Any stacking required is carried out at an altitude of 25,000 ft. When the aircraft is given the signal to land, the normal procedure of descent and instrument approach is then made at the alternative.

The flight plan as shown is applicable for all ranges above approximately 200 miles. For ranges under 200 miles, it is debatable whether it is worth while climbing to an altitude of 30,000 ft. for cruise. The fuel used for take-off, climb to 30,000 ft., cruise, descent and approach for a range of 500 miles is approximately 9,210 pounds, while the fuel allowances carried for flight to alternative, stacking, and descent at alternative airport amount to approximately 5,125 pounds, or just over 1/3 of the total fuel.

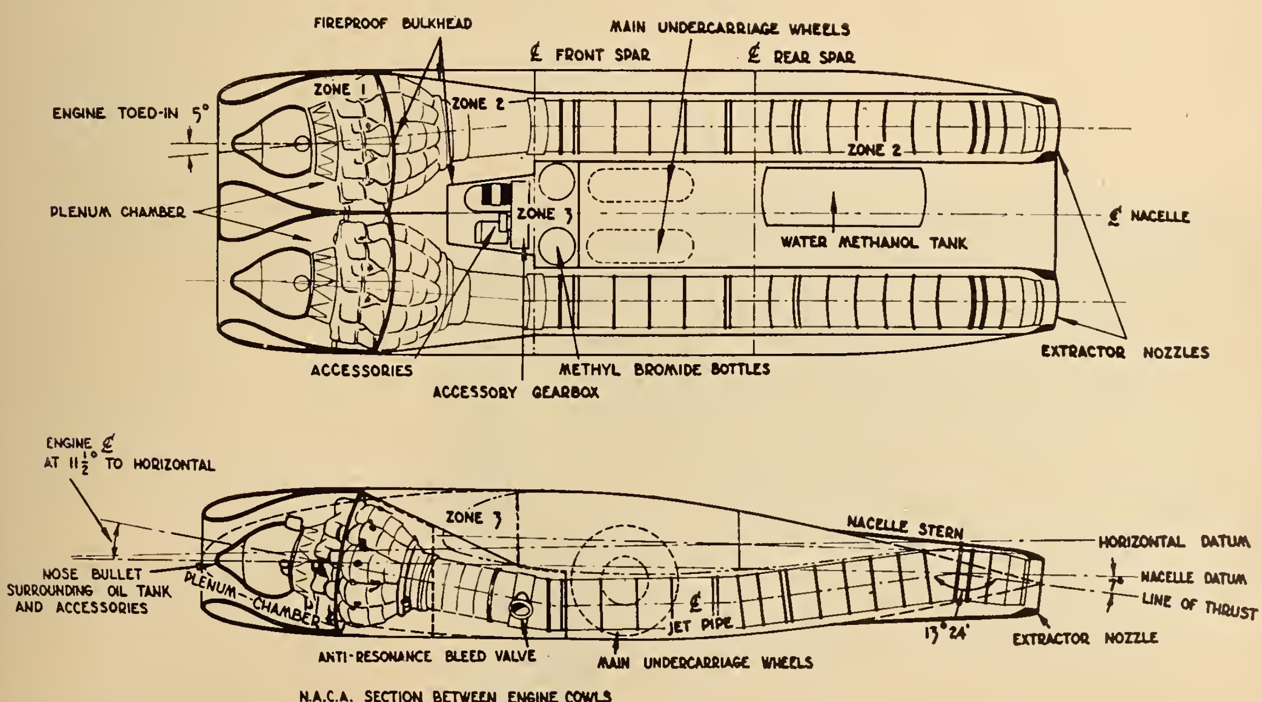
Descent is carried out at a speed of 200 miles an hour E.A.S. with the use of dive brakes to get a high rate of descent. As the accessories, including the hydraulic pumps and electrical equipment for de-icing may be required during the descent, the engines are throttled down to 7,000 r.p.m., at which speed, the accessories are designed to maintain the full output required for any of the services. There is very little penalty on rate of descent incurred by keeping the engines running at this r.p.m. The average fuselage angle during descent is not more than 8 deg., which is considered to be reasonable from a passenger comfort standpoint.

Direct Operating Costs

While it is not the purpose of this paper to join in the merry-go-round of comparisons of the conventional and jet-powered transports on a ton-mile per lb. of fuel basis, nevertheless, the operating costs had to be considered very carefully, and their consideration played an important part in the final design and configuration of the aircraft.

The two important efficiency factors in the cost analysis are the cost per mile and the payload for

Fig. 6. Nacelle data.



a given range. The cost per mile is obviously governed by speed, as many of the direct costs such as, crew salaries, depreciation, insurance, etc., are fixed hourly costs. Neglecting fuel consumption, if the blockspeed is increased from say 250 m.p.h. to 350 m.p.h., the cost per mile would be decreased by approximately 30 per cent. It can and has been shown elsewhere, that this decrease in cost due to speed more than compensates for the increase due to higher fuel consumption.

The effect of blockspeed can possibly be seen more clearly by considering the number of aircraft required for a given scheduling. The equation in its simple form is shown below.

$$N = \frac{D}{U \times V_b \times N_p}$$

where N — Number of aircraft required
D — Traffic density in passenger miles per year
U — Utilization in hours per year
V_b — Blockspeed
N_p — Passenger capacity of aircraft

For a given yearly utilization, traffic density and passenger capacity, it can be seen that if the blockspeed is doubled, the number of aircraft required is halved, and consequently, the earning power of each aircraft is considerably increased. To take advantage of the higher blockspeeds, however, maintenance and turn-around time at the airport has to be cut down to a minimum,

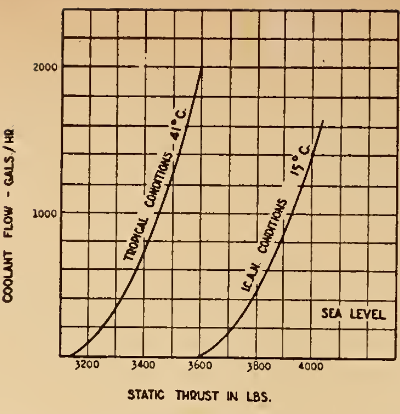


Fig. 7. Variation of static thrust with water-methanol injection at 14,700 r.p.m.

and the optimum climb and descent procedure from operating altitude taken into account.

The high degree of pressurization and the incorporation of dive flaps to allow a rapid descent; the use of special accessories and radio compartments where practically all items that required frequent servicing are housed; and the employment of underwing pressure refueling are only a few of the items which have been incorporated to increase the economic efficiency of the aircraft.

So far as the payload portion of the cost per ton mile efficiency datum goes, the fuselage was laid out to give the best compromise between a full passenger version and combined passengers and cargo. Two typical layouts are the 40 passenger version with an additional 4,100 lb. of freight, making a total payload of 12,500 lb., and the 50 passenger version with a payload of 10,500 lb. Payload vs. range with all allowances is shown on figure 4.

While the final analysis of economy must be left to the individual airline, the results of a detailed analysis show that the direct operating costs compare very favourably with those of present transports, despite the relatively high fuel consumption of present jet engines, and despite the fact that the present allowances for stooge and flight to an alternative airport are very severe on the jet transport. It is obvious that as the specific fuel consumption for the jet engine improves with the use of ceramic blade materials and higher compression ratios, and as the flight procedures are modified to cut down the stooge time, the picture will be even brighter.

Cabin Layout

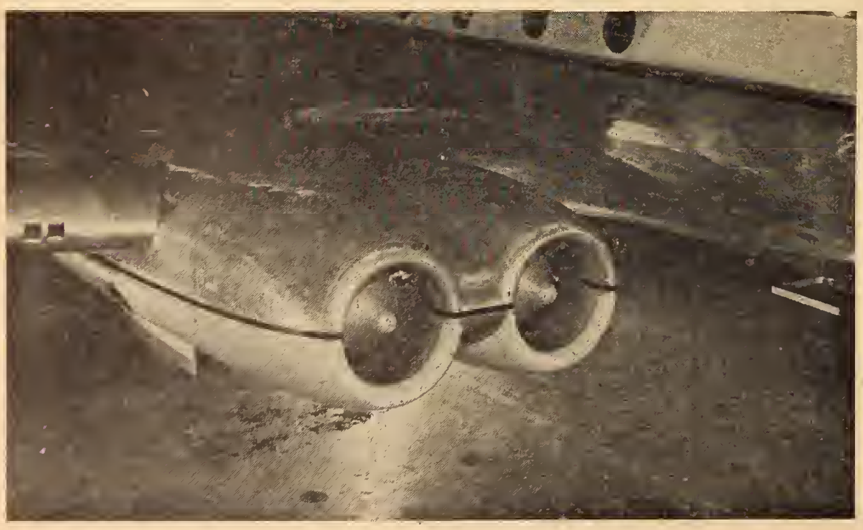
Although the final seating arrangement and cabin layout will depend on the customer's choice, it appears to be fairly definite that the high density passenger version will be the one of greatest interest. Two typical layouts are shown in Figure 5. Accommodation for 40 or 50 passengers is shown with provision for their baggage on the left hand side of the cabin, adjacent to the front entrance door. The 10 ft. diameter fuselage allows for wide seats, and a generous aisle with a head room of 82 inches. Emergency exits are situated in the centre section and rear section above the wing, and a crew emergency exit is fitted in the ceiling of the crew compartment. Noise level in the cabin is considerably reduced by the use of turbojets, and this, coupled by a complete lack of vibration, will add enormously to passenger comfort.

Power Plant

The four Derwent 5 engines are mounted in pairs in two underslung nacelles, each nacelle being made up as a single integrated structure. The engines are toed-in toward the centre line by 5 deg. and set at approximately 11½ deg. to the horizontal in order to take the jet pipes under the main spans without cutting away any of the spar structure.

Tubular engine mounts are used, and these can be removed or replaced separately. The nacelle geometry is shown in figure 6. All nacelle air loads are taken back into the two engine mounts, which

Fig. 8. Three-quarter front view of nacelle.



are attached to the centre section front spar. Engine servicing and maintenance is made particularly easy by the low position of the nacelles. All engine adjustments can be made without the necessity of using service ramps or ladders. Engine removal is carried out by detaching the services and gear drive at the break points, swinging the trunnion locating caps down, and dropping the engine on to the special trolley. The engine is then wheeled away sideways to make way for the replacement engine. With this unique arrangement, a complete engine change can be made in a very short time.

The jet pipes are parallel in plan, and are supported on trunnions and links. Two spherical joints are incorporated to give flexibility to the pipes on expansion, and also for the withdrawal of the jet pipe for engine removal. A 16 inch nozzle is fitted and the jet emerges at 7 deg. to the datum line of the aircraft, to bring the line of action of thrust as close to the C.G. as possible.

The jet pipe runs through a tunnel of stainless steel formed by firewalls attached to the adjacent structure. The jet pipe itself is insulated, and is cooled by a flow of air passing through the firewall tunnel and induced by the extractor nozzle.

Engine Accessories: The main accessories driven by the engines are mounted on an accessory gearbox located between the engines in each nacelle, and attached to the wing front spar. The gearbox contains two completely independent gearing systems, each driven by one engine, and each having independent lubrication. Each inboard engine drives a cabin blower, a vacuum pump, and a tachometer generator, and each outboard engine drives a 50-kw. alternator, a 9-kw. generator, an hydraulic pump, and a tachometer generator.

The gearbox drives are connected with the engines by a system of drive shafts linked by means of flexible couplings. The main gearboxes are handed so that the same accessories are fitted to each, but the mounts are reversed so that each box is a mirror image of the other. The gearbox drive is taken from the engine through a bevel reduction gearbox mounted on the wheel case, which in turn drives an intermediate gearbox having its own lubrication system. Push-pull

Fig. 9. Three-quarter top view showing aft lines of nacelle.

type engine controls are used to eliminate creepage and slackness due to temperature change.

Derwent 5 Modified Engines: The C-102 engines are standard Rolls-Royce Derwent 5 engines, but with a completely redesigned oil tank. The cast oil tank is sited at the front of the engine, underneath the forward gear drive. The engines are handed only by the oil tank filler and the gear take-off. The change from starboard to port engines is made simply by interchanging the filler neck and blanking plate on the oil tank and swinging the gear take-off around in the opposite direction. The oil tank and system are integral parts of the engine.

Engine Suspension: The engine is supported by mounting trunnions at approximately the centre of gravity of the engine, and is steadied at the rear end by a shackle

Fig. 10. Fuel consumed during descent with all engines at half speed.

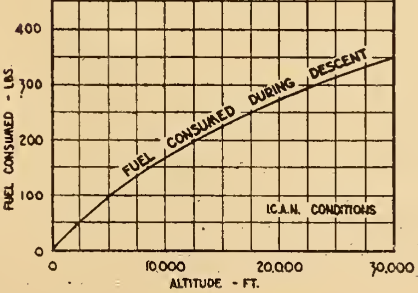


plate bolted to the top of the nozzle box.

Cowling: The upper part of the cowling is developed as a permanent structure provided with small access doors for engine slinging, and a larger door to permit access to the upper part of the accessory gearbox. The lower half of the cowling consists of the two large access doors hinged at the sides, and a smaller door beneath the accessory gearbox swinging aft. All access doors are locked by means of flush-type quick release fasteners, and the two main curved doors can be quickly detached by swinging them out and unhooking the special hinge locators.

Fire Protection: With the engines installed, the nacelle is divided into two compartments on each side, and a third compartment housing the accessory gearbox. This split-up is achieved by means of special firewalls and bulkheads as shown in Figure 6. Each nacelle has a vertical firewall forming a centre keel and isolating the two engines from each other. The engine has an integral intermediate firewall permanently attached and sited around the combustion chambers. This mates up with a permanent portion of firewall on the nacelle, forming a complete firewall between the front and rear portions of the engine.

The front portion, or zone 1, which also forms the plenum chamber contains the engine accessories and oil tank etc., while the rear portion or zone 2, contains all the hot portions of the engine, com-

Fig. 11. Flight deck.

LEGEND: 1—ceiling switch panel; 2—direct-vision window; 3—radio compasses control panel; 4—fuel system panel; 5—flying instruments panel; 6—nose wheel steering handwheel; 7—engine instruments panel; 8—ancillary control panels; 9—control column; 10—rudder pedals; 11—auto-pilot panel; 12—radio controls; 13—gust lock and parking brake; 14—first officer's seat; 15—captain's seat; 16—folding seat for observer.

bustion chambers, turbine casing, and jet pipe. The intermediate firewall is to prevent the high pressure fuel from a burst pipe or joint being sprayed on to the hot side. The rear portion of zone 2, extends in the shape of a tunnel back to the jet nozzle, and is completely lined with stainless steel firewalling and sealed against ingress of fuel or oil. Fire from a burst combustion chamber or perforated jet pipe would be confined within this zone out of reach of electrical and fuel lines or the aircraft structure.

The above system of firewalling also isolates all engine parts from the accessories and gearbox, which are in the space above the conical firewalls, shown on figure 6, as zone 3. Edison resetting type fire-detectors are used, and a methylbromide system of extinguishing is used for zones 1 and 2, while a CO_2 system is provided for the gearbox compartment, zone 3. A two-shot system is used and the warning lights, buttons, and selector switches are mounted on the ceiling fire-protection panel in the cockpit.

Thrust Augmentation: The thrust from a jet engine varies considerably with temperature and airport altitude, and on a hot day with a temperature of 110 deg. F., the reduction in jet thrust can be as much as 16 per cent. As this can be critical for take-off conditions, where a possible engine failure has to be taken into account, some means of thrust augmentation has to be used. Various means of achieving the extra thrust were investigated, and it was finally decided that injection of a water-methanol mixture into the compressor inlet offered the best solution. The predominant effect of this is to increase the mass flow of air to the engine by increasing the air density at the compressor inlet.

The injection system itself is relatively simple, and has few of the disadvantages of other forms of augmentation such as after-burning, where the long sheets of flame coming out of the tailcone are likely to cause alarm to the passengers. The percentage increase in thrust with rate of injection is shown in figure 7.

It can be seen from the graph, that under tropical conditions, to provide the static thrust which would be obtained for take-off under standard I.C.A.N. conditions, it is necessary to inject the mixture at a rate of 2,000 gals. per hour or 33 gals. per minute. A tank is housed in each nacelle holding 66 gals. of water-methanol, which is sufficient to supply each engine with the required quantity for a period of one minute.

Nacelle Shape: The external and internal shape of the nacelles was chosen very carefully, with a view to getting the best possible pressure recovery characteristics externally, and an efficient plenum intake which would give the best compromise between the ideal low and high speed conditions, see figure 6. For take-off conditions where there is very little ram effect, there is a suction in the plenum chamber, and in order to prevent break-away around the intake walls, the wall angle was kept down to less than 10 deg. To achieve this, it was necessary to go to separate intakes for each engine, as with a common elliptical intake, the diffusion angle would have been excessive in a short nacelle and any increase in nacelle length was disadvantageous, due to the destabilizing effects of a long wide nacelle.

The best intake curves were established in conjunction with the engine manufacturer's recommendations. For the outside shape, the lines between the inside lip of the intake radius and a point about 20 per cent of the total nacelle length aft of the intakes was most critical both for drag rise and intake efficiency, see figure 8. Figure 9 shows how little the nacelles interfere with the top surface of the wing.

Engine Data

A civil version of the standard Rolls-Royce Derwent 5 engine is used, and a brief summary of the performance is shown below.

	Engine Speed	*Time Limit*
Take-Off and climb	14.700	15 mins.
Max. Continuous Power	14.100	Unrestricted
Idling on Ground	Approx. 3.500 r.p.m.	

Relighting in the air is possible, and numerous relights have been carried out during flight tests. As the economy of the C-102 has been worked out assuming that all engines are operating, however, relighting would not normally be employed. It can be seen by reference to figure 10, that each engine consumes less than 90 lb. of fuel in descent from 30,000 ft. at half max. cruise r.p.m. and, therefore, the weight saved in closing down two engines during descent was not considered to be worth the risks which may be involved by a hot start on relighting, at least until this technique is more firmly established.

Fuel System

Fuel is housed in four integral wing tanks located in the inboard portion of the outer wings, between the main spars. The total capacity of the tanks is 2,400 Imp. gals., the inboard tanks having 1,375 gals., and the outboard tanks 1,025 gals. The tank capacity can, however, be considerably increased. Immersed booster pumps are used.

A continuous flow transfer system is used and operates as follows: Fuel is transferred from outboard to inboard tanks by means of the outboard booster pumps. The flow to inboard tanks is controlled by a special float type level control valve, which closes when the fuel in the inboard tanks is at a certain level, and shuts off the transfer pump. This system relieves the pilot of the necessity of watching the fuel gauges in order to switch to the full tanks at precisely the right moment, and also allows for all fuel to be used up in the outboard tanks without interfering with the proper functioning of the engines, which is essential with the high rates of flow to the jet engines.

Additional provision is made by means of the electrically operated fuel cocks (C) to supply fuel from outboard tanks direct to the engines if required, by-passing the transfer line and the fuel level control valve. The pilot can then fully control the disposition of his fuel load, and also have an alternative pressure feed line to the engine in the event of failure of an inboard booster pump. A cross-balance pipe is provided so that fuel from any tank is available to all engines in an emergency. The booster pumps deliver fuel at a normal pressure around 6 to 8 p.s.i., and in the event of failure of the booster pumps, the engines are capable of sufficient suction to enable them to operate with the booster pump inoperative.

A signal light system is provided on the fuel system panel to enable the pilot to check instantaneously the condition of the fuel system. If the outboard tank is running dry a flick-type warning light is received, and the pilot can switch off the booster pump.

Both overwing and underwing refueling is installed and the tanks can be refilled at the rate of 200 Imp. gals. per min. through each underwing refueling valve at a nozzle orifice pressure of approximately·5 p.s.i. A refueling manifold is used for each pair of tanks and a special built-in selector valve permits fueling or defueling of each tank individually. A special float valve coupled with the underwing refueling system prevents the tank being damaged, by shutting off the fueling valve when the fuel reached a predetermined level in the tank.

The sealing of the integral tanks was a problem which had to be studied very carefully, since the airlines had been having some trouble with certain types of integral tanks, and a certain amount of prejudice had been built up against them. After much investigation and testing, a system of sealing was derived which has given such excellent results on test that it appears to be a great improvement on the existing methods of sealing.

Thiokol-based sealants are used and combinations of plasticizers and synthetic resins are added, making a permanently plastic seal which has low shrinkage and good adhesion properties. The top and bottom wing skins and the spars are sealed before assembly and the corners are then sealed after the wing is removed from the assembly jig.

Flying Controls

Double aerodynamically-unbalanced control surfaces have been

Fig. 12. Nose undercarriage.

used for both the rudder and elevator controls. The effectiveness of a small chord high aspect ratio control is very much higher than a large chord surface, and it was felt that for all normal control loads a surface chord of 16 per cent was sufficient for the elevator and 14 per cent for the rudder. The intermediate or auxiliary surface on the rudders is used solely to trim out for an engine failure at low speeds. With the use of jet engines, high rudder angles are not normally necessary due to the absence of slip stream, which is the usual cause of swing at take-off. The engines are also close to the fuselage which again reduces the rudder power required.

The effectiveness of the small chord high aspect-ratio elevator allows for a greater range of C.G. limits with a consequent reduction in loading restrictions for passenger and freight distribution; for instance, the manually operated elevator is 75 per cent as effective, as the manual and power-operated surfaces acting together, although the chord of each is identical. With the use of the power elevator, the total permissible C.G. range is from 10 to 33 per cent, or approximately 35 inches of C.G. travel. The surfaces do not need aerodynamic balance, which means that they have a lower drag, less danger of icing, better repeatability and low weight of mass balance.

The narrow chord elevator is also very much better from the point of view of susceptibility to oscillatory instability. The usual cures for this are less aerodynamic balance, and a lower mass moment of inertia. These features are all incorporated in the double surface control. Power operation of the tail surfaces on the first prototype is by a simple switch controlling a small electric motor and limit switches.

An hydraulic assister is used for aileron power boost in the ratio of 5 to 1. This is a pure assist system, and in the event of an hydraulic or unit failure, the booster is thrown out and full manual control is retained with, of course, reduced power. Push-pull type controls are used on all three main control systems, employing light alloy tube to eliminate differential expansion and contraction under extreme temperature changes. The tubes are supported in roller guide bearings using rubber covered ball bearing rollers.

Pressurizing

The air enters through a ram intake in the leading edge of the outer wings, and passes to the cabin superchargers on the gearboxes, which have a capacity of approximately 60 pounds of air per minute at 30,000 ft., against a cabin differential pressure of 8.3 p.s.i.

The air under pressure passes from the blower through an intermediate silencer in the centre section leading edge, across the spill valve, which automatically controls the amount of air bled from the system, as the blower out-put is regulated by engine r.p.m. and altitude. The air then passes through a non-return valve into the main entry duct, passing through a large silencer. The temperature having been raised considerably by the blower compression, the air is then cooled by an air-to-air intercooler.

An automatically controlled valve feeds the air either into the refrigerating turbine or by-passes the turbine, and feeds the air directly into the heater duct. The heater is used as the final controlling unit to provide the required temperature. A water separator and silencer is provided in the line from the refrigerating unit to the heater, and a ground conditioning point is provided to feed ventilating air through the heater, while the aircraft is on the ground.

A secondary air-to-air intercooler is provided between the compressor and expansion turbine of the refrigerating unit. From the heater, the air passes to the various cabin ducts and up through the space between the skin insulation and inside trim of the cabin to provide a warm wall. The air is finally discharged through a grill incorporated in the baggage racks, and is exhausted into the underfloor space through wall grills at floor level. The air finally discharges from the cabin through a special discharge valve in the rear of the fuselage.

Seventy-two hp. is required to provide for the full pressure differential of 8.3 p.s.i. at altitude. When the refrigerating unit is operating, the power required is increased to 116 hp. at sea level. Normally enough heat is generated by the blowers to make the heater unnecessary. The capacity of the refrigerating turbine is approximately 50,000 to 60,000 B.T.U.'s.

Cabin Sealing: The fuselage had to be very carefully sealed to provide a pressure tight cabin and a method of sealing was used which has been well tried on other aircraft. This consisted of applying special sealing compounds between the faying surfaces and skin joints. The remaining riveting such as, riveting stringers and capping strips to the skin were not sealed, as with the use of dimpled riveting, the rivets are tight enough to produce a satisfactory seal. Any leaking rivets are individually sealed by brushing with a special sealant.

Cockpit Layout

Having in mind the usual confusing array and disposition of instruments and controls in the average flight deck, a special attempt was made in the case of the C-102 to achieve a configuration that was both functionally good, and at the same time, gave the best servicing layout (Fig. 11). The main instrument panel is divided into three sections. The centre panel carries all engine and fuel instruments. A small fuel system control panel is attached to the engine panel with the fuel diagram etched on, and this contains the switches and lights for the various booster pumps and cross-feed warning lights. All panels are hinged for easy access.

The engine instrument panel is much simplified by the use of jet engines, as the only engine instruments are the R.P.M. indicators, jet pipe temperature gauges, burner pressure gauges, and oil pressure warning lights. The two main instrument panels carry the normal flight instruments, and have been grouped to conform with the latest requirements for radio navigation and automatic landing aids. In the ceiling, between and within easy reach of each pilot, is the main electrical panel carrying the engine starter switches, fire protection switches and buttons, and the main electrical control switches.

The pressurization control panel is on the left of the captain and the air conditioning, oxygen and de-icing control panels to the right of the first officer. Circuit breaker panels for both electrical and radio equipment are mounted on the aft flight deck bulkhead. A lot of thought was put into the main control pedestal, which on the upper position carries the engine throttles, undercarriage, flap, and automatic pilot controls, the emergency manual low pressure fuel cock levers, and fuel tank selectors. The radio control panels are situated on the lower portion of the pedestal. The pedestal also carries all the manual trimmer controls, the manual autopilot disconnect lever, gust lock and parking brake levers, and the aileron power boost cut-out.

The rudder pedals are fully adjustable and are articulated to provide toe brakes for equal or differential brake application. The above cockpit layout was finalized only after many conferences with airline pilots and technicians and the final mock-up was carefully checked to get the best possible layout.

Landing Gear

The absence of propellers and the consequent short distance between the aircraft structure and the ground coupled with the fact that an under-slung nacelle configuration was used, resulted in an extremely short main landing gear. The actual distance between the undercarriage main pivot and wheel centres is less than 30 inches. This has resulted in the establishment of an extremely robust and simple design, and one which is believed to be lighter as a percentage of the gross weight than any existing transport undercarriage.

Twin wheels are used on both the main and nose units, both retracting forward. The main undercarriage struts consist of a telescopic leg incorporating liquid springing. The nose wheel is self-centering, fully castoring and incorporates shimming damping, see Fig. 12. The hydraulic steering unit incorporating a double piston control acts as a shimming damper when the steering is switched off. The nose wheel is steerable through an arc of 70 deg. each side, and the wheel can castor through 360 deg. for towing. Lever suspension is used on the nose gear.

Undercarriage retraction is electro-hydraulic and hydraulic brakes have been installed, controlled by the rudder pedal toe brakes. All wheels are to the American Tire and Rim Association specifications. The main undercarriage doors are operated by separate hydraulic jacks, and the nose wheel doors are operated mechanically by a trip mechanism fitted to the nose undercarriage.

Accidental ground retraction is prevented by a micro-switch which comes into operation when more than 5 per cent of the aircraft weight is on the wheels. All undercarriage up-locks can be tripped manually in an emergency and extension will then take place by gravity and drag forces.

Accessories and Systems

The position and layout of the various accessory units which have to be serviced regularly on the ground, or which need to be accessible in flight, was given a lot of thought, as this is a point which has aroused much criticism in the past by airline operators.

An accessories compartment was introduced behind the first officer's bulkhead on the starboard side to carry the main aircraft accessories. The heater, refrigerating turbine, main electrical accessories such as, inverters, relays, etc., and the main electrical distribution panel are all housed in this compartment. All radio and electronic units are in a similar separate compartment on the port side behind the pilot's bulkhead.

The main hydraulic units are panelized, the panels being housed in the forward wing root fillet, with easy access at ground height to all ground connections, accumulators, valves, etc. The emergency power pack is also contained on these panels.

Methyl bromide engine fire protection bottles are housed in the nacelles at shoulder height and the engine starter relay panels are also in this vicinity. The extremely low static position of the aircraft insures that practically all external servicing is done without steps or servicing ramps.

Hydraulic System

The main hydraulic system is a high pressure system operating at a normal pressure of 1,800 p.s.i. The cut-out pressure is 2,200 p.s.i. and the relief valve pressure is 2,700 p.s.i.

The normal system power is provided by two constant pressure variable displacement pumps. Either pumps will provide full hydraulic power for the complete system, and the use of two pumps is to provide duplication against failure. The main services operated by the hydraulic system are the main and nose undercarriage gear, nose wheel steering unit, landing and dive flaps, main wheel brakes, main wheel doors, and aileron power booster.

Complete duplication of the normal hydraulic system is provided by a " power pack " consisting of an electrical motor and a pump. A hand pump is provided in the accessories compartment which also can be used in an emergency. On the ground, the system can be operated by ground supply points located on the wing root fillet panels.

Electrical System

The electrical system is basically a single grounded negative system for both d-c and a-c services.

There are in effect six separate systems providing power for the various services. The various systems are listed below:

> 28.5 volts—From two engine driven d-c generators for lighting relay controls, radio and some instrumentation. The d-c generator system is over-voltage protected.
>
> 115 volts — Three-phase 400 cycles from d-c motor generators (inverters), for some flight instruments, engine instruments and some radio equipment.
>
> 26 volts — Three - phase 400 cycles from a transformer, connected across the 115 volt three-phase power supply for general instrumentation.
>
> 208 volts—Three-phase 400 to 700 cycles from two engine driven alternators for wing and empennage de-icing and galley.
>
> 600 volts—Three-phase 400 to 700 cycles, from a transformer connected across the 208 volt three-phase power supply for the " Nesa " de-icing system.

Two 89 ampere hour batteries connected in series to supply 24 volts are used for ground testing and generator stabilization in flight. All wiring is contained in aluminum conduits running between the main control panels and junction boxes. Standard AN wiring is used throughout the aircraft, except for the high temperature region where silicone wiring has been used in the nacelles, and special flame resistant wiring has been used on all the high voltage circuits.

Standard AN connectors are used at all break points for dismantling during major overhauls. The main master terminal board in the accessories compartment is used as the master panel for testing all the services. Special flexible and water proof wiring is used throughout the landing gear system. Circuit protection is provided by circuit breakers on the 28-volt d-c and 208-volt a-c system, and fuses are used on all 400 cycle equipment.

De-icing System

While de-icing will not be fitted for the first flights of the first prototype, an electro-thermal de-icing system will be used for the wings and empennage. De-icing power is provided by two 50-kw., 208-volt three-phase 400-700 cycle alternators situated on the engine driven gearbox. Wind-screen de-icing is provided by special "Nesa" glass wind-screen panels which consist of a vinyl core sandwiched by two thicknesses of semi-tempered glass. On the outside surface of the vinyl between the vinyl and the outside layer of glass is a conductive "Nesa" coating which provides approximately 5-6 watts per sq. in. power input. The wind-screen de-icing is entirely automatic and the temperature is controlled to provide the quantity of heat required for anti-icing, and at the same time keeping the vinyl layer at a temperature which gives it the best resistance to bird impact.

The three forward panes of the aircraft are designed in this manner, and the vinyl centre layer has the additional advantage, that in the event of a wind-screen being shattered by any circumstances, the vinyl will still withstand at least twice the maximum differential pressure in the fuselage by blowing out in the form of a bubble. Engine and intake de-icing is a special problem which at the moment is being investigated fully by the engine manufacturers and Avro Canada.

Radio System

All radio equipment is housed in the radio compartment on the starboard side of the front entrance door, and is completely enclosed by quick removable panels giving complete access to all units. The radio and electronic compartment is ventilated by a separate blower. The basic radio system consists of the following:

1. HF communication transmitter receiver with provisions for 20 channel equipment.
2. VH communication transmitter receiver.
3. 18 channels plus guard channels.
4. Dual automatic radio compasses with radio magnetic indicators.
5. Isolation amplifier chassis including interphone amplifier, and a special loud speaker amplifier for the captain and first officer.

All the radio and navigation instruments are duplicated on the captain's and first officer's panels, and all control panels are located on the flight deck pedestal.

The entire radio pedestal assembly is removable as a unit. Microphone and headphone jacks are provided at the side panels, and separate loud speakers are provided for the captain and first officer. Communication with the cabin attendant is by an interphone system. A sound hand set is connected to an outlet in the wheel wells and external servicing points. All receiver audios are muted during interphone speaking periods with an interlock to prevent muting of either or both communication audios during communication periods.

Provision for Additional Facilities: Full provision is made for the following additional radio navigational equipment.

1. Two VHF navigational receivers providing omni-directional range and localizer, both installations having separate controls and instruments for simultaneous operation. (Magnetic headings for each of the ODR sets derived from separate remote-indicating compass systems.)

2. Two glide-path receivers with channel selection automatically tied in with corresponding localizer receivers.

3. An additional marker beacon receiver to complete the duplication of radio navigational equipment.

Selection of the visual output of either of the two ILS combinations can be available to the captain by means of one switch. The autopilot automatic approach equipment would be paralleled with the captain's ILS indicator.

Conclusion

It has obviously not been possible in this paper to give more than a bare outline of the work that is necessary in the design of a new aircraft. An enormous amount of test work had to be carried out on the structure, and functioning of equipment, even before the aircraft first flew, and rigorous flight testing is now being carried out to assess control, stability and general performance.

There has been much discussion in the past on the relative merits of jet and reciprocating engined aircraft, and most of the criticisms of the jet have been made by people who have never had the experience of either working on a jet project or really getting down to the job of comparing the two types on a rational basis.

It is worthy of note that while these arguments of relative efficiencies were going on, Canada really got down to the job of designing and building an inter-city jet transport, which is the first of its type and which will be competitive on *any* basis with the newest types of aircraft that the rest of the world has to offer.

It will be faster, more comfortable, and at least as economical as any inter-city transport aircraft in service at the present time, and is much more capable of development as jet engine fuel consumption is reduced, and scheduling is improved. In short, the successful demonstration of the C-102 in flight, is an achievement of which the Canadian Engineering fraternity should feel justly proud.

FEES

Members' accounts for 1950 have been mailed. The bylaws state that fees are due and payable on the first day of January.

Time and money spent in collecting overdue accounts are direct losses to the common effort, and Journal subscriptions unpaid after three months cannot be reported in the audit of paid circulation.

Please help by remitting now

Notes on Management

Sales Budgets

Whenever we start planning for a tour, one of the first prerequisites that comes to mind is the necessity for a road map. It helps guide us to our destination. If we can use such terms as "tours" and "road maps" as symbols of business practice, then we would quite naturally think of budgets. For budgets are those things which guide us in our business effort. They indicate where to go and how to get there, and if, during the course of the tour, or in this case the business year, there have been some deviations from the main road, which is generally to be expected, they show how far we have strayed off the course.

Importance of Budgets

There are different types of budgets to serve different purposes, but none are more important than the sales budget or, in terms preferred by some, the sales forecast. Sales are the main theme of most business effort, and it is from the consideration of expected future volume that most of the other plans are derived.

One of the more interesting ways to say a few words about the sales budget, or sales forecast, is to describe briefly an actual case history.

Budget Committees

In the company we shall consider there is a Sales Budget Committee composed of three members: the vice-president for sales, who assumes responsibility for selling the quantities estimated; the vice-president for production, who assumes responsibility for producing the products to be sold and for their availability when wanted by sales; and the financial vice-president, who co-ordinates sales and production planning in accordance with financial limitations and desirability. This Committee meets each quarter to establish the sales budget for the following three months and for the three subsequent calendar quarters in order that the company may at all times be projecting its activities one year in advance.

The Committee develops the sales forecast by considering one product at a time and establishes the target having in mind the current inventory position, previous sales experience, future demand, seasonal fluctuations, profitability and future product availability.

Committee Decisions

In order to achieve realization of these estimates, the Committee decides on sales promotional activities, makes recommendations concerning advertising emphasis, and considers price revisions. With a view to improving the company's over-all economic position, it considers the elimination of undesirable or unprofitable lines, liquidation of overly large inventories, and frequently approves write-down of values of inventories of products which fail to meet sales expectations.

Transposition of Recommendations

The estimates, of units to be sold, when completed for a product class, go to the accounting department in order that estimated quantities may be transposed into dollar sales, costs, and gross profits. The Committee is then supplied with this dollar information on its estimates, and this data enables it to evaluate, revising if necessary, the dollar forecasts established in relation to actual dollar results for similar previous periods and gross profits applicable thereto.

Reviewing Results

The estimates are then given to the tabulating department of the company to be recorded on punched cards. Subsequently, daily reports as to actual dollar sales in relation to budget are published before 4.30 p.m. each day, showing the sales variances for that day and the cumulative variances for the month.

Each month the Sales Budget Committee reviews the results, considering any price changes and month-end inventories, and takes any corrective steps that are necessary to adjust the situation satisfactorily. Thus the sales trends are quickly noted and they find their immediate policy reflection throughout the other departments of the company.

Operating Expense Limits

Prior to the first of each year, based on forecasts of sales dollars for the following year, operating expense limits are established. An overall dollar budget for the year is fixed for administrative expense, and for selling, research, and advertising expenses. These expense limitations are established at a figure which, when deducted from anticipated gross profit, will provide a net profit that is adequate, after taxes, to pay dividends, provide needed capital equipment, and add the proper amount to surplus. No changes are made to these other budgets unless important variations in sales occur which make such changes necessary or desirable. The important feature is that when these variations do occur, it is possible to make adjustments throughout the organization that permit it to maintain a relative profit on sales, be they up or down.

Budgets—Financial Statements of Policies

That is the paramount importance of budgeting — from company-wide budgets to departmental budgets—they represent the complete financial statement of the policies of a company and guide the management of that company towards the realization of the goals they have set for themselves.

TRANSPORTATION PROBLEM

(SEE COVER)

Fig. 1

Canadian Vickers Ltd. and the Desrosiers Cartage Co. Inc. of Montreal co-operated recently in an unique marine-motor truck moving operation.

When the Shell Oil Co. of Canada Ltd. and the Arthur G. McKee Company, Inc., of Cleveland, asked Vickers to build a catalyst regenerator 65 ft. long, 27 ft. maximum diameter, and weighing 105 tons, the advantages of assembling it in Vickers' own shops rather than in the field, were sufficient to warrant a full investigation of the possibility of transporting the finished unit from Vickers' Maisonneuve plant on the Montreal water-front to Shell's Montreal East Refinery. Officials of Vickers' traffic department joined with representatives of the Quebec Hydro, the Bell Telephone Co., and the cartage contractor, to survey possible routes and confirm that the regenerator could be moved by water to a pier near the refinery and by special truck-trailer equipment to its destination. The mayor of Montreal East, M. Napoleon Courtemanche, the councillors and municipal authorities offered every possible assistance.

Floating Dock Used

The regenerator was built in one of Vickers' shipbuilding berths (Fig. 1) and was " launched " on November 25th. The cartage company's 60-ton float and a special 40-ton trailer had been previously positioned on a platform built on a section of Vickers' floating dry-dock. The dry-dock section carrying the trailers was submerged, the regenerator was floated into position, and the dock raised (with the load on the trailer as shown in figure 2).

Four tugs then towed the dock down-river to the Marien Avenue pier where it was moored in the unloading position without mishap — in spite of particularly adverse weather and current conditions. The dock was then submerged sufficiently to permit attachment of the float to its prime mover.

Obstructions Removed

To lower the centre of gravity of the load the regenerator carried 20 tons of sand which, together with bracing and vehicle weight, added up to 168 tons on 42 wheels. The road trip was 4 miles and required nearly two working days. It was completed without incident but was slowed by the necessity of removing or raising some 193 overhead wires, 2 poles, and 11 lamp-brackets (Fig. 3). Planks and steel plates were laid on parts of the road to prevent damage and a bulldozer was constantly available to anchor and prevent the load from tipping. The bulldozer and a second prime mover supplied additional power on grades.

Special Precautions

The Canadian Vickers' transport crew carried, for use in emergency, a welding machine, an air compressor, four 50-ton jacks, 25 planks, and 8 tons of plate. Ten loads of stone dust were used for filling and levelling the road. Outriggers in the form of 12-in.-by-12-in. timbers (see cover picture) were used as an extra precaution against tipping. The load was 29 ft. wide and 31 ft. 8 in. high. The actual moving time, excluding delays for wire operations, etc., including the movement of the floating dock, was ten hours and forty minutes.

Fig. 2

Fig. 3

From Month To Month

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

Good News

It is a matter of great satisfaction and gratification that General A. G. L. McNaughton, M.E.I.C., has been appointed to the International Joint Commission.

For a long time the Institute and other engineering organizations have been urging upon the Government that an engineer should be appointed. The Institute had received several assurances that a satisfactory appointment was under way, but so much time had elapsed that everyone was beginning to feel discouraged.

The Government is to be congratulated on the excellence of its selection. General McNaughton has all the qualifications necessary to this difficult task. Not only is he a distinguished engineer but he is widely experienced in international and administrative affairs. Engineers everywhere will rejoice at the news of his appointment, and doubtless too, the citizens in general will be equally pleased.

Congratulations to General McNaughton—and to the Government for its wisdom and acumen.

"Swallowing a Camel"

Ever since the summer of 1946 the Institute has been endeavouring to have the tariff restored on engineering plans entering Canada from foreign countries. As part of the endeavour there have been telegrams, letters and even delegations sent to Ottawa to impress the authorities with the seriousness of the situation. Other organizations as well, such as the provincial professional associations, the Canadian Construction Association and the National Construction Council have made appeals but up to the moment there is not the slightest indication that the government is going to do anything about it.

There have been no written documents (so far as we know) to describe the government's reasons for removing the tariff in 1946 or for not restoring it, but by word of mouth, grape-vine and rumour, the main defences seem to be:

(a) The government desires to remove as many obstacles as possible to the establishment or enlargement of United States' subsidiary plants and other industry in Canada.

(b) The tariff removal has not resulted in injury to Canadian engineers or manufacturers because by means of embargo regulations, plans are admitted freely only when they are for work which Canadian engineers cannot do and for plant and equipment which Canadian industry cannot manufacture.

Unfortunately the facts as disclosed to the Institute and to other bodies do not bear out these claims. There are numerous examples which prove the contrary. In general Canadian engineers, because of their education, their experience, and their native talents are the equal of engineers any place in the world. Only in a few new highly specialized and narrow fields are they not competent to design, build, and operate all plant or equipment and even in these they will become quickly the equal of others if given a chance.

The Institute has a file of cases which seems to prove that the customs authorities are lax in applying the embargo restrictions. Drawings representing millions of dollars of plant and equipment, the design and construction of which are well within Canadian competence, are crossing the border constantly. Since when have the designs of garages, hydro-electric power plants, pulp and paper plants, sewage disposal systems, bathing pools, industrial buildings and so on been beyond the competence of Canadian engineers? These are fields in which the Canadians lead or equal the world—and yet plans for such structures in great numbers are being made in the United States and brought into Canada largely duty free.

Principal offenders seem to be government itself at the federal, provincial, and municipal levels. At the federal level the offense is not restricted to any one department. The Institute hears of hotel and office buildings, railway terminals, ice breakers, mechanical equipment of many kinds designed and in some cases built in the United States, to the order of some one of the departments or government agencies. At the same time a great hue and cry is raised by the government about the need to conserve United States' dollars.

All these materials and services must be paid for in United States' dollars or at rates that compensate for the depreciation of the Canadian dollar. The ordinary citizen is informed that for his personal use he may have only a hundred and fifty dollars a year in U.S. funds, but for the importation of engineers' plans and mechanical equipment there seems to be very little restriction. It is the latter field in which the greatest expenditures are made. Verily it seems as if the government were " straining at a gnat and swallowing a camel ".

The engagement of United States' consulting engineers leads to the engagement of United States' contractors and manufacturers. Naturally the United States' engineer specifies United States' materials because they are what he is used to. He is influential in getting United States' contractors and sub-contractors on the job because he knows them and has confidence in them. In some instances he has a financial interest in them as well.

There are examples of United States' engineers using in their designs, structural steel shapes which are not manufactured in Canada, and materials which are not obtainable here, even though such materials are not essential to the design. There are examples of building designs which are not suitable to our temperatures whereby such things as tanks and other types of vessels are placed outdoors where in our Canadian winter they would freeze. One case is reported where the plans had to be almost entirely redesigned in Canada by a firm of Canadian engineers — and this for a plant costing about seven million dollars.

It is interesting to note that the United States still imposes a substantial tariff on Canadian-made plans entering that country. Just why do we seem so willing to accept these unbalanced and unfair arrangements? Have we no confidence in ourselves? Have we an inferiority complex? Are we overawed by our great neighbour so that we give him all and are satisfied in return with the " crumbs from the rich man's table "?

No criticism is being offered of this splendid nation to the south. They are a great people, big in heart, broad in outlook, progressive and aggressive. We are the luckiest people in the world to have them as our neighbours, but we do not need to, nor do they expect us to hand them our heritage on a silver platter.

Canadians must be given every opportunity to develop themselves culturally and economically. Surely the government should lead in such matters instead of cutting the very ground from under our feet by encouraging the people in other countries to do the work we should be doing for ourselves.

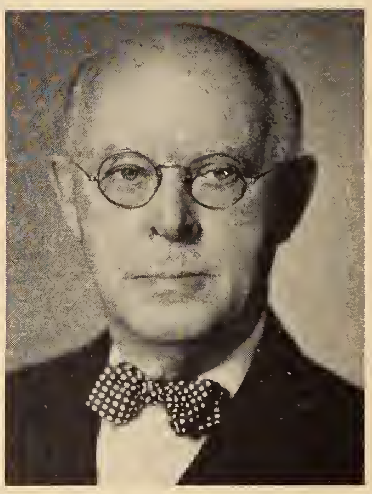
Probably the tariff is not the most important matter in this unfortunate condition of affairs. At its best it was not high, and if restored would not go far towards correcting the condition. It is with the people themselves that the fault lies. Their ignorance of what Canadians can do and their habit of looking to the United States for almost everything they want, spells retarded development for Canada. If the Canadian Customs and the Foreign Exchange Control Board would be more rigid in the enforcement of their embargo powers, and if the government itself would set a better example, much of what goes on to-day would come to an end.

What can be done to impress Canadian users of engineering services with the competence of Canadian engineers? What can the Institute do? What can other organizations do? What can you do?

C.I.M. Appointment

E. J. Carlyle, M.E.I.C., M.C.I.M., retired on October 1, 1949, from the positions of executive director and secretary of the Canadian Institute of Mining and Metallurgy.

In sixteen years as secretary-treasurer and since 1947, as executive director and secretary, Mr. Carlyle has rendered a great service to the Institute and the mining industry. His extensive experience in mining and metallurgical operations in many parts of the world was undoubtedly a factor in the success with which he met, and disposed of, issues which have concerned his Institute. His energy and organizing abilities are attested by its growth during his incumbency.



E. J. Carlyle, M.E.I.C.

Carlyle Gerow, M.E.I.C.

The Council of C.I.M. is to be congratulated on his appointment as secretary emeritus. The Engineering Institute of Canada joins with his friends and the members of his Institute in wishing him good health and continued mutually beneficial association with the affairs of C.I.M.

The Institute extends congratulations to Carlyle Gerow, M.E.I.C., M.C.I.M., who has succeeded Mr. Carlyle as secretary-treasurer of C.I.M.

Mr. Gerow's record includes distinguished service to his country in both World Wars and a long association with the field of steam plant engineering and fuels. He has been managing secretary of the Canadian Coal Operators' Association and has represented the Maritimes on the Council of the Mining Institute. He is a member of the Mining Society of Nova Scotia, the Engineering Institute of Canada, the Toronto Board of Trade, and the Engineers' Club of that city.

His demonstrated capacities and the esteem in which he is held by friends and associates in all parts of Canada, augur an association beneficial to the Mining Institute and satisfying to Mr. Gerow personally. The Engineering Institute wishes him every success.

U.S. — Canadian Co-operation

Significant of the increasing co-operation between the Institute and the major American engineering societies was the election of Past-President L. F. Grant of Kingston as vice-chairman of the Engineers' Council for Professional Development. His election took place at the annual meeting of E.C.P.D. in Chicago, October 28-29, 1949, at which Dr. H. S. Rogers, president of Brooklyn Polytechnic Institute was elected E.C.P.D. chairman.

Besides Colonel Grant, the Institute was represented at the meeting by Vice-President J. A. Vance; Geo. B. Moxon of the Aluminum Co. of Canada, Montreal; and Professor W. S. Wilson of the University of Toronto. A full report of the meeting will be included in E.C.P.D.'s annual report which will be reviewed in a future issue of the *Journal*.

Employment Outlook for 1950

Recently the Department of Labour at Ottawa has been discussing the prospect for next year's engineering graduates. On the whole the picture appears to be favourable.

For years a certain number of people in looking at the large graduating classes have prophesied serious unemployment but each year the graduates were absorbed without too much trouble. The chances are the same thing will occur again next Spring.

The Minister of Labour reports that the prospective employment survey made by his department in 1946 has been rechecked recently. Results though as yet incomplete show the prospective needs for 1950-1951 to be about 10 per cent greater than indicated in the original survey. The original survey indicated that 2,000 graduates would be required each year for the following five years. Actually, the total demand in 1947 and 1948 was for about 4,200 engineers, whereas there were only 2,900 graduated. This backlog was helpful to the 1950 class which numbered 3,200.

The experience at the Engineering Institute is that right now there are more job openings than there are engineers. Also, it is evident in many places, that smaller employers who previously never employed an engineer are now doing so or are considering it. This is an expanding field which under favourable circumstances will go far to maintain a demand for engineers. Even if this tendency results in the employment of only one engineer per company, it will mean jobs for several hundreds.

The 1950 class will number about 3,500. This will be a new record. Succeeding years will show figures but little higher than in pre-war years. While the Institute believes there will be employment for the graduates, it is likely more seeking will have to be done than was required in recent years. It is well for today's seniors to be prepared to go hunting for their jobs in the Spring, but they should approach the task optimistically.

Incidentally if any employers who are interested in these new engineers will inform the Institute's service of their needs, every effort will be made to find precisely what is required—but do it as early as possible. After all " It's the early bird that gets the . . ." No that won't do, better " First come, first served ".

Report of the Committee on Atmospheric Pollution in Canada

The appointment of this Committee resulted from the action taken by Council on a letter from Mr. G. N. Martin, M.E.I.C., of the Dominion Bridge Company, in which it was suggested that the Engineering Institute of Canada should take the initiative in forming a committee to handle matters relating to the subject of smoke abatement. Subsequently it was considered that this Committee should be composed of representatives from various national organizations, so that as many as possible of the technical groups concerned would become actively interested in the project.

Accordingly, a preliminary meeting was held in Toronto on April 20, 1949, at which the desirability and possibility of the formation of such a committee was discussed. It was then agreed, tentatively, that the whole question of atmospheric pollution should be surveyed, and the title agreed upon, and subsequently confirmed, was the " Committee on Atmospheric Pollution in Canada ". The matter was then referred back to the constituent bodies for the appointment of official representatives, and these were later named by them as follows:

The Engineering Institute of Canada, Professor E. A. Allcut; Canadian Steam Boiler Institute, Mr. John G. Hall; American Society of Mechanical Engineers, Mr. F. D. M. Williams; Canadian Manufacturers' Association, Col. E. D. Davis; Institute of Power Engineers, Mr. W. J. Longeway; American Society of Heating and Ventilating Engineers, Mr. George

P. Cooper; Stoker Institute of Canada, Mr. Robert Broad.

At a later date was added: Dominion of Canada Department of Mines and Resources, Mr. C. E. Baltzer. Professor Allcut was elected chairman and Mr. Longeway secretary of the Committee.

The first meeting of the newly constituted Committee was held on October 12, at which it was agreed that the purpose of this Committee was "to draw up a model by-law for the purpose of assisting any community in the reduction or elimination of atmospheric pollution". In this regard it was considered advisable that liaison should be maintained with the A.S.M.E. Committee which is actively interested in this matter in the United States, and accordingly Mr. John G. Hall, M.E.I.C., was appointed to represent the Committee on that body.

It was also agreed that, as a first approach to the subject, the study should be made under the following headings:

(1) The nature of pollution.
(2) Its source and the organization required for its determination.
(3) Methods of measurement.
(4) Methods of conveying information.
(5) Methods of administration.
(6) Methods of enforcement and/or the penalties.

It was also agreed that, as the new Toronto By-Law is the latest of its kind, it should be used as a starting point for a comprehensive study of the problem.

E. A. Allcut, M.E.I.C.,
Chairman

Institute Honours

Six eminent engineers were honoured by motion of the December meeting of Council, after scrutineers reported favourable ballots from all councillors. Honorary memberships were conferred on Dr. Lillian Gilbreth, Sir Frank Whittle, J. B. Challies, and C. R. Young. J. A. McCrory and G. A. Gaherty were each awarded the Julian C. Smith medal "for achievement in the development of Canada".

Lillian M. Gilbreth

An account of the career of Lillian M. Gilbreth presents a remarkable story of achievement. Born Lillian Moller in 1878 she commenced a succession of degrees, honours and awards with the degree of B.Litt., from the University of California, in 1900. She has earned two more, the M.Litt. and the Ph.D., and has been awarded six more. She holds memberships or honorary memberships in some twelve professional societies both American and foreign.

She is the mother of twelve children, the author of ten books, was a partner with her husband in, and is now the president of, the consulting industrial engineering firm of Gilbreth Inc., Montclair, N.J. With her husband she pioneered the field of efficiency engineering and management and the principles and techniques of motion study.

As a professor Dr. Gilbreth has lectured regularly on the staffs of Perdue, Bryn Mawr, and the Newark College of Engineering, and has given series of lectures at M.I.T., Yale, Ohio State, Michigan, Harvard Business College, Smith College, Teachers' College, and in various European centres. She is licensed as a professional engineer in New Jersey and Indiana.

Lillian M. Gilbreth, Hon.M.E.I.C.

Sir Frank Whittle

Air Commodore Sir Frank Whittle is technical adviser on engine design and production to the British Ministry of Supply and British Overseas Airways Corpn. In 1930 he applied for the patent covering "the propulsion of aircraft solely by the expulsion of gases" which was to bring about a revolution in air transportation. In 1936 the firm of Power Jets Ltd. was formed to promote the manufacture of the original gas turbine aero engine. In the interval he had taken his degree in mechanical sciences with first-class honours at Cambridge.

Sir Frank Whittle, Hon.M.E.I.C.

When the lifting of security restrictions permitted the world to realize the contribution Whittle had made to the allied war effort, honours came to him from every quarter. He was knighted in 1948 as a recognition by the British Government of his unselfish contribution to the war effort. He had given his patent, his incorporated company, and his services to the nation with no thought of personal gain, and had declined to place any claim before a committee set up to appraise such contributions.

J. B. Challies

John Bow Challies is vice-president and executive engineer of Shawinigan Water & Power Co., Montreal; vice-president, director, and secretary of St. Maurice Power Corpn.; director of the Brown Co., Berlin, N.H.; Brown Corpn., Quebec City; Canadian Light & Power Co.; Shawinigan Engineering Co. Ltd.; Quebec Power Co., and Saguenay Power Co. Ltd.

After graduation from the University of Toronto in 1903 he entered the civil service in Ottawa and, during the succeeding twenty years, directed much of the work of the federal government in the field of hydro-electric development. In 1924 he resigned from the government service to become a departmental manager of the Shawinigan organization in Montreal. He was appointed to his present position in 1941.

Dr. Challies has served the Institute well. He joined in 1907 and has been secretary of the Ottawa branch, chairman of the Committee on Policy (1922), member of Council (1920-21), vice-president (1924), chairman of the Committee on International Co-operation, chairman of the Committee on Engineering Education and Degrees, chairman of the Ontario Provincial Division, treasurer (1935), member of the Consolidation Committee (1935-37), and president 1938.

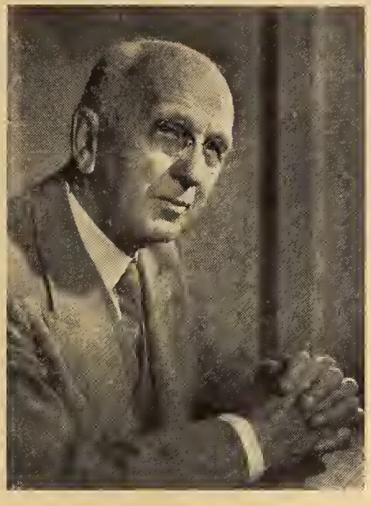
J. B. Challies, Hon.M.E.I.C.

He is licensed to practise in Ontario and Quebec, and holds memberships in several of the American engineering societies. In addition he is chairman of the Board of Governors of the United Theological College, Montreal, and has been active in the affairs of the Canadian Chamber of Commerce.

C. R. Young

Clarence Richard Young graduated from the University of Toronto in 1905 and obtained his early engineering experience with the Dominion Bridge Co., Toronto and York Radial Railways, Canada Foundry Co., and Smith Kerry & Chace, consulting engineers, Toronto. He joined the faculty of the University of Toronto in 1907 and was appointed dean of applied science and engineering in 1941.

Dean Young is a past councillor of the Institute and has served as chairman of the Toronto Branch. He was chairman of the Institute's Committee on International Relations and has represented the Institute on the Committee for Professional Training of the Engineers Council for Professional Development. He has been active also in the affairs of the American Society for Engineering Education, the American Society of Civil Engineers, and the Canadian Standards Association. He has written engineering text-books, technical papers, and a host of non-technical works related to engineering education and professional development, in which latter subject he has had a particular interest. Dean Young was president of the Institute in 1942.



C. R. Young, Hon.M.E.I.C.

G. A. Gaherty

Geoffrey A. Gaherty is president and director of Montreal Engineering Co., Calgary Power Ltd., Ottawa Valley Power Co., Calgary Water Power Co. Ltd., Calgary Investments Ltd., Maritime Electric Co. Ltd., and director of the Demerara Electric Co. Ltd.

He received his engineering degree from Dalhousie University in 1909 and after a short period of engineering experience he joined the Canadian Garrison Artillery and later went to France. He was demobilized with the rank of captain and joined Montreal Engineering Co. Ltd. in 1920. In 1922 he became chief engineer and was appointed to his present position in 1933.

Mr. Gaherty joined the Institute in 1921 as an associate member and became a member in 1934. He has served on the Finance Committee, and for a number of years has been chairman of the Committee on Prairie Water Problems. He is undoubtedly one of Canada's most informed and capable electric utility engineers, and has contributed in large measure to the development of a number of hydro-electric utilities in Canada, notably Calgary Power Ltd. The prairie water problems committee has been, and is, one of the most effective committees of the Institute and under his chairmanship has made a real contribution to the progress of western Canada in the fields of irrigation and power development.

G. A. Gaherty, M.E.I.C.

James A. McCrory

James A. McCrory is president of the Shawinigan Engineering Co. Ltd. of Montreal. He received the degree of bachelor of science at Pennsylvania State College in 1907 and after a period as draughtsman for Crucible Steel Co. of America he came to Canada in 1910 and in 1916 joined the staff of the Shawinigan Water & Power Co. as an assistant engineer. He became vice-president and chief engineer of the company in 1935, and was appointed president in 1947. His contribution to the development of the great power resources of the St. Maurice River has been a significant factor in the industrial expansion of the Province of Quebec.

Mr. McCrory has been an active

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

member of the Institute having joined as associate member in 1921. He was chairman of the Montreal Branch in 1929 and a member of Council during the years 1930-35. In 1937-38 he served as vice-president and chairman of the Finance Committee.

Mr. McCrory holds or has held memberships in the Canadian Electrical Association, American Concrete Institute, American Society for Testing Materials, and Canadian Standards Association. He was president of the Corporation of Professional Engineers of Quebec in 1942.

E.C.P.D. at Chicago

To one who has attended every annual meeting of Engineers' Council for Professional Development, who has watched its growth and recorded its activities, the recent meeting at Chicago was a gratifying experience. More than at any other time one recognized an adherence to objectives, a sense of direction of purpose, and a substantial record of achievement. As James W. Parker, who retired as chairman after three years of service, said at the dinner, E.C.P.D. may not have acquired great velocity, but it certainly possesses much momentum.

One wishes that Calvin W. Rice, whose years of service as secretary of A.S.M.E. were largely devoted to enhancement of the prestige of the engineer and to fostering the co-operation of engineering societies in programmes relating to their mutual interests and the national welfare, could have been present to take satisfaction in this demonstration E.C.P.D. affords of the practicability of the principles he urged upon the profession.

One wishes that W. E. Wickenden, from whose studies of engineering education the concept of E.C.P.D. sprang, could have been present to listen to the words of high praise of his recently published " Professional Guide for Junior Engineers " and to realize that the seeds of professional service which he planted with his popular " Second Mile " have sprouted, flourished, and borne fruit in the organization to which he brought so much and which he served so faithfully.

One wishes that Conrad N. Lauer, under whose forward-looking leadership of the A.S.M.E. Committee on the Economic Status of the Engineer a nucleus was provided around which the desire of engineers for greater unity in their profession crystallized in the formation of E.C.P.D., could have been present to assess the extent to which this desire has been advanced.

One wishes that C. F. Hirshfeld, first chairman of E.C.P.D., could have been present to see how the original plan of a programme of activities that would embrace the life of an engineer from the time he first considers his choice of a career, through the undergraduate years at college and the post-college years on the job, into the full maturity of his professional life when he is recognized by membership in an engineering society and by registration as a professional engineer, has come ever closer to fulfilment.

One wishes that Gen. Robert I. Rees, who made such a brilliant and fundamental start with a practical programme of self-help and self-appraisal by engineering

Fish and Dimes

(Contributed)

Once in a while the engineer gets caught off balance, so far as maintaining his usual professional dignity is concerned. Sometimes his imbalance is due to the innate cussedness of things, sometimes his serious efforts lead to results which make this writer chuckle.

A good example of the latter is the discovery, mentioned at the recent annual meeting of the A.I. Ch.E. by Dr. Charles E. Brown, professor of sanitary engineering at Johns Hopkins University, that fish may be trained to act as G-men in the detection of some kinds of water pollution. Apparently, there are no civil service hurdles to be overcome, any poor fish will do. Nor does Dr. Brown express a preference for either sex. Judging from human experience, we might suggest that perhaps lady fish might be the more efficient, since it might be argued from her care in choosing "Indiscrét" instead of "Daring", and from her inclination to order only the finer and more expensive champagnes, that the human female is endowed with far keener senses of smell and taste than her male counterpart, and it may be supposed that these senses play an important part in the fish's ability to detect pollution.

Dr. Brown says, too, that fish exhibit different and distinguishable reactions to different contaminants, and that they can be trained to accept in some measure various kinds of pollution. Perhaps we shall eventually have breeds especially sensitive to dioctyldimethylammonium bromide, and perhaps further training may be made to yield quantitative results. For example, one of our trained dioctyldimethylammonium-bromide detectors might give us two fin flips per second for a concentration of one part per million, increasing logarithmically to twenty flips per second for fifty p.p.m. Then the investigator, equipped with a tankful of assorted trained fish, each accompanied by its own rating curve, would be all set for any pollution investigations.

The idea intrigues me. We have pushed many of our domestic animals out of the picture by mechanization; perhaps now they may make a comeback. And dog and cat lovers may find that there is useful work their otherwise ornamental pets can be trained to do.

Another speaker at the same meeting notes that a visitor to the museum of Atomic Energy at Oak Ridge, could have a dime activated there as a souvenir of his visit. Uncle Sam provides not only the atomic energy, but also seals the coin in a small special container before delivery.

I am all for this idea. I want a pile in which I can activate all my coins. Then with a Geiger Counter, I can confound the wife of my bosom who helps herself to small change from my pocket, and can discover which of my grandchildren is responsible for the disappearance of the quarter I know I left on my desk last night. Also, I wonder if an activated nickel would be any luckier in the local one-armed bandits than the conventional kind.

Gee! Ain't science wonderful!

R. D. F.

graduates caught in the stagnation of the "postcollege slump," could have listened to the plans outlined by Mr. Monteith that are to be put into effect at the community level.

One wishes that Prof. C. F. Scott, whose vision always outran the progress of new ideas, who preached ceaselessly the need for unity of the profession, could have been present to vote with the Council its approval of a report on uniform grades of membership.

One wishes that Dean R. L. Sackett could have been present to learn what progress has been made in guidance work with high-school-boys and about the plans of Mr. Deutsch's committee who will spread their work into ever-widening areas at the community level.

One wishes that these and a host of other worthies, now departed, could have taken comfort that their tasks have been assumed by other men and the enthusiasm and zeal for a great cause are burning more brilliantly than ever.

There was a time when these pages carried the warning that the success of E.C.P.D. would depend upon its ability to arouse the active interest and participation of an ever-increasing number of men in ever-expanding areas of the engineering profession. It was evident at Chicago that a drying up of the source of active men with new ideas and new enthusiasm has not occurred. Instead, the "new blood" has been found, the ideals and objectives have been maintained, and progress, if slower than some could wish, has been sure and soundly based.

There was a time when it seemed as though the only concrete accomplishment of E.C.P.D. would be the accreditation of curricula in the engineering schools and that even this achievement might become a useful mechanism rather than a living and expanding force for the greater benefit of the engineering profession. Yet recent years have seen the expansion of the accreditation programme into the field of programmes of the technical-institute type. And at Chicago a statement in respect to the "differentiating characteristics of an engineering curriculum" (to be published in an early issue of the Journal) demonstrated that long association with the task of improvement of engineering education has brought keenness of insight to those who have laboured at it and a penetrating sense of analysis to the perplexing question as to the manner in which the approach of the engineering school to the teaching of disciplines that are common of many other curricula is unique. Here indeed is evidence of the virility of the philosophy of those who direct this great work.

There was a time, too, when some persons feared that the spirit of E.C.P.D., in spite of good intentions and wide publicity, might remain within an academic and professional hierarchy and never seep down into the grass roots of the engineering profession where its benefits were intended to be effective. But even this fear was further dissipated at Chicago as, indeed, it had to be at Montreal and at Detroit. The holding of annual meetings of E.C.P.D. in different areas of engineering concentration has served to broaden the base of understanding and interest. The warm reception of Canadian engineers at Montreal, the attempt to interest industrialists and engineering-school deans at Detroit, and the emphasis on activities at the community level, evident at Chicago, have done their part in letting an ever-growing circle of engineers and educators witness E.C.P.D. at work.

James W. Parker has set a standard of leadership and wise counsel as chairman of E.C.P.D. that will be difficult to maintain. One who has witnessed his devotion to a task that requires time and intelligence, who has sensed the direction and depth of his planning, who has admired his meticulous pains to see that every point of view is permitted expression and every decision is taken with a full understanding of its significance, can find abundant reasons for the progress made during the three years of his administration. Now that the chairmanship has passed from the industrial to the academic area of the engineering profession, it is indeed fortunate that Mr. Parker's successor should be Harry S. Rogers, an administrator with a philosophical habit of mind and a reputation of being astutely practical. Under his wise leadership E.C.P.D. should continue its forward progress.

But E.C.P.D. is largely a counseling and co-ordinating agency which must make its work effective through the engineering societies, and the societies, in turn, can do little, except at the national and administrative level, without the personal services of their members working at the community level. The degree of success with which E.C.P.D. can stimulate action by individual engineers and local groups of engineers in attaining its objectives and in benefiting engineers of all ages and the nation which sorely needs their services, depends on how effectively and how generously these engineers and groups will respond to the stimulus and carry forward the programmes that committees of E.C.P.D. are preparing for them. There is a vast amount of practical work to be done, and in the variety of that work lies opportunity for the exercise of the particular talents of every engineer.

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Reprinted from *Mechanical Engineering*, December issue, 1949.

Correspondence

Mechanical Logging

C. D. Schultz & Company Limited

December 2, 1949

To the Editor:

I was extremely interested in Mr. J. O'Halloran's paper on Eastern Canadian logging, published in the September issue of *The Engineering Journal*. You may be interested in the fact that a course similar to that advocated therein has been in operation at the University of British Columbia since 1923.

The course is given in applied science, and is a parallel to the mining engineering curriculum, with logging and forestry replacing mining and geology subjects. It is the only course of its kind in the world, as far as I know, and many of the graduates occupy prominent places in the forest industry of British Columbia.

Yours very truly,

C. D. Schultz, m.e.i.c.

Hydraulic Research

November 20, 1949.

To the Editor:

On Friday, October 7th, the Garfield Thomas Water Tunnel was dedicated at The Pennsylvania State College. Sir Charles Wright presented a bottle of water from the towing basin at Haslar, England, which will mingle with the water in the tunnel. This symbol of the co-operation between British and American scientists is a small indication of the importance of the water tunnel in hydraulic research.

The tunnel, which is being built under contract from the United States Navy Bureau of Ordnance at a cost of some two million dollars, will be used in a research programme on torpedo propellers. Dr. J. M. Robertson will direct the operation of the tunnel.

The dimensions of the tunnel are given in Figure 1, while Figure 2 is a photograph of the tunnel during erection. A steel and brick laboratory was later built around the tunnel. Figure 1 is taken from "Hydrodynamic Design of the 48-Inch Water Tunnel at The Pennsylvania State College" by Donald Ross, J. M. Robertson, and R. B. Powers, a paper presented at the Spring Meeting, 1948, of The Society of Naval Architects and Marine Engineers, New York. This paper discusses the many details involved in the design of the tunnel, as well as reviewing the designs of some of the other water tunnels throughout the world. Undoubtedly the future will see many more articles concerning the tunnel and the results of the research conducted in it.

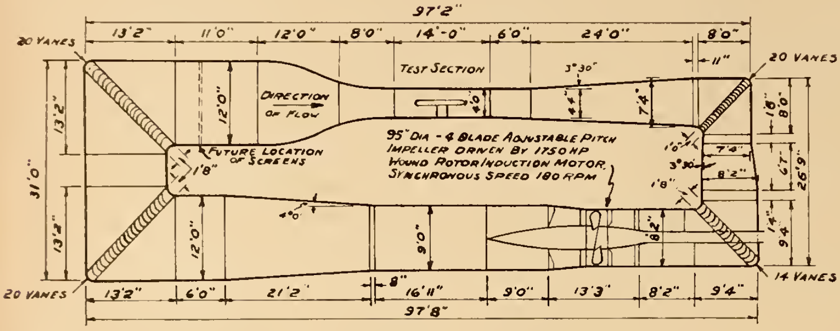

Fig. 1

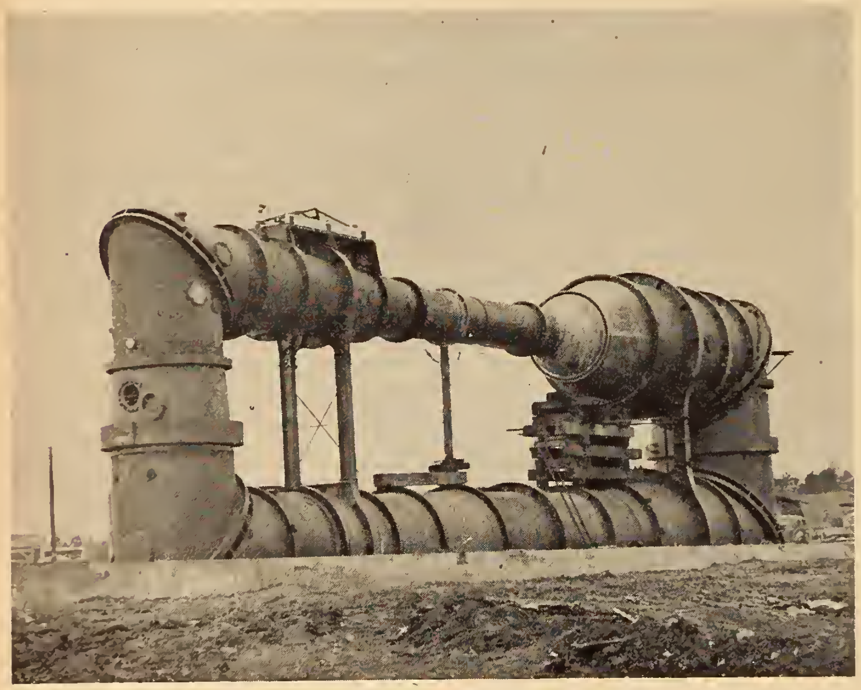

Fig. 2

Yours sincerely,

Vernon L. Dutton, M.E.I.C.,
Pennsylvania State College.

Meetings of Council

Secretary's Notes

The December meeting took place in Montreal on Saturday, December 10th, with the president J. E. Armstrong in the chair. Twenty-one councillors were present representing the following branches: Kingston, Hamilton, Toronto, London, Kitchener, Niagara Peninsula, Ottawa, Montreal, St. Maurice Valley, Quebec.

The president noted that this was the first meeting to be held in Montreal since June and that in the interval regional meetings had been held in Sydney, N.S., Kitchener, Ont., and Vancouver, B.C.

A resolution was passed expressing Council's regret and sorrow at the loss of the field secretary, C. E. Sisson and also sending sympathy to Mrs. Sisson.

Engineers' Council for Professional Development

A report of the Engineers' Council for Professional Development recommending three standard grades of membership namely student, associate member, and member was discussed; also the minimum definitions of the qualifications for these classifications. It was agreed that as the Institute standards were already higher than the minimum specified it was not necessary for the Institute to adopt the proposal.

Employment of Engineers from Outside of Canada

There was a long discussion on the employment of engineers from outside of Canada to do Canadian work. Certain proposals were made as to methods which might lead to some amelioration of these conditions. Finally the president appointed a committee of three to examine the subject further and report back for the next meeting.

International Joint Commission

The general secretary presented several letters received from members of Parliament in response to the Institute's resolution regarding the appointment of an engineer to the International Joint Commission.

Department of Labour Guidance Booklet

There was considerable discussion with regard to a booklet issued recently by the Department of Labour at Ottawa called

"Careers in Natural Science and Engineering". Attention was called to several sections which it is believed did not describe actual conditions. It was agreed that many portions would be misleading to high school students for whom the book was designed. The suggestion was made that the Institute should continue with the publication of its own guidance booklet "The Profession of Engineering in Canada" as it was felt that it more nearly met the requirements of this type of counselling service. Final action was postponed until certain additional information could be secured and presented to the next meeting.

Employment Services for Engineers

A proposal was made that the Institute give consideration to assisting in the establishment of a co-operative employment system. It was felt that in view of the decreasing activity of the Bureau of Technical Personnel some better service was required for professional technical persons.

The proposal was that the Institute might discuss the subject with certain other organizations to see if some agreement could be reached and also on the methods of implementing it. The matter is to be studied further and considered at the next meeting of Council.

Removals

Members who were in arrears of fees for 1948 and 1949 were removed from the membership list as follows: Members, 46; Juniors, 78; Students, 30; Affiliates, 2.

New Branch at Sudbury

Authorization for a charter for a new branch at Sudbury, Ont., was granted in response to a petition received.

Amendments to By-laws

Approval was given to several proposals to amend the by-laws which will be submitted to the membership at the annual meeting at Toronto after which if approved they will be submitted by ballot to the entire membership.

Principally the changes had to do with simplified methods for handling applications but in addition there was a proposal to eliminate the one dollar discount for prompt payment of annual fees and also an increase in the price of *The Engineering Journal* to non-members. (The specific changes in full detail have been sent to every corporate member.)

Membership Committee

The Membership Committee submitted a proposal for a method by which branches could establish and maintain a steady interest in the development of new members. It was reported that the Toronto Branch proposed to try out the method after which if it proved satisfactory it would be recommended to other branches.

A.S.M.E.-E.I.C. Joint Committee

A report was made on the recent meeting of the joint committee between the American Society of Mechanical Engineers and the Engineering Institute which was held in New York on November 29th.

Admissions and Transfers

Approval was given to placing on the life membership list the names of thirty-six members who had met the requirements of the by-laws.

The names of seven hundred and fifty student members were submitted for automatic transfer to the class of junior as of January 1, 1950. This is in accordance with the by-laws which require a student to transfer (without paying a transfer fee) to the classification of junior on the second January after graduation.

Twenty-seven applications for member were approved, also five for junior and three hundred and sixty-one for students.—L. A. W.

News of Other Societies

The **Canadian Section of the American Water Works Association** plans the next convention to take place at Niagara Falls, Ont. Convention headquarters will be at the General Brock Hotel.

The **Engineers' Alumni Association of the University of Manitoba** (Central Ontario Branch, 367 Balliol Street, Toronto) announces that the annual dinner meeting (stag) of the Branch is planned for February 25, 1950, at the Royal York Hotel, Toronto.

The convention on electric railway traction was announced recently by the **Institution of Electrical Engineers** (Savoy Place, Victoria Embankment, London W.C. 2). It will take place March 20 to 23, in The Institution Building in London.

The spring meeting of the **American Society of Civil Engineers,** (33 West Thirty-ninth Street, New York 18, N.Y.) will be in Los Angeles, Calif., April 19-21.

The **American Concrete Institute** (18263 W. McNichols Road, Detroit 19, Michigan) has available information about the 46th annual convention to be held at Edgewater Beach Hotel, Chicago, Ill., February 20 to 22.

At the 42nd annual meeting of the **American Institute of Electrical Engineers** (120 East 41st Street, New York 17, N.Y.), in December 1949, Warren L. McCabe, vice-president and director of research of the Flintkote Company, was elected president of A.I.E.E.

The 18th annual meeting of the **Institute of the Aeronautical Sciences** (2 East 64th Street, New York 21, N.Y.) is in session at the Hotel Astor, New York City, January 23-26, 1950.

The I.A.S. also announces the fifth annual flight propulsion meeting at the Hotel Carter, Cleveland, Ohio, March 24, 1950.

The 1950 annual meeting of the **American Institute of Mining and Metallurgical Engineers** (29 West 39th Street, New York 18) will be at the Statler (Pennsylvania) Hotel, New York City, February 12-16.

The **American Society of Mechanical Engineers** (29 West 39th Street, New York 18, N.Y.) announces 1950 meetings as follows: the spring meeting, Hotel Statler, Washington, D.C., the week of April 10; the semi-annual meeting, Hotel Statler, St. Louis, Mo., June 19-23; and the annual meeting, Hotel Statler, New York City, November 26 to December 1.

Personals

Notes of the Personal Activities of Members of the Institute

Dr. T. H. Hogg, M.E.I.C., of Toronto, Ontario, has been elected a director of Canadian Dredge & Dock Co. Limited. Dr. Hogg retired from the chairmanship of the Hydro-Electro Power Commission of Ontario in 1947 and since then has been actively engaged in private practice as consultant on many projects of national importance. In addition to service on the boards of several companies, he has been on the Senate of the University of Toronto for many years.

Dr. Hogg was awarded the Sir John Kennedy Medal of the Engineering Institute for the year 1948. He is a past president of the Institute.

Air Vice-Marshal Alan Ferrier, M.E.I.C., has been appointed assistant secretary general for air navigation of the International Civil Aviation Organization. He assumed his duties at the beginning of the new year.

Air Vice-Marshal Ferrier is a member of the Canadian Air Transport Board which is charged with economic regulation of all commercial air services operating in or over Canada. He is chairman of the associate committee on aeronautical research of the National Research Council of Canada.

Prior to this recent appointment, he was a member of the Royal Canadian Air Force's Air Council, responsible for specification, development, inspection and maintenance of all air force technical equipment.

R. Ewart Stavert, M.E.I.C., of Montreal, president of The Consolidated Mining and Smelting Company of Canada, Limited, has been elected a director of the International Nickel Company of Canada, Limited.

Mr. Stavert's directorships, aside from The Consolidated Mining and Smelting Company of Canada, Limited, include the Bank of Montreal; the Sun Life Assurance Company of Canada; Dominion Bridge Company, Limited; Dominion Engineering Works, Limited; Canada Starch Company, Limited; Amalgamated Metal Corporation Limited; Henry Gardner & Co., Limited and other companies.

Mr. Stavert joined the C.M. & S. Company in 1934 as assistant to the president. He was appointed vice-president at Montreal in 1939 and elected vice-president of the Company in 1941. Mr. Stavert has been president of the Company since April, 1945.

E. V. Buchanan, M.E.I.C., of London, Ont., was elected president of the Ontario Association of Professional Engineers, at the recent annual meeting of the Association.

Mr. Buchanan is general manager of the London Public Utilities Commission, and general manager of the London and Port Stanley Railway. He has been active in the Engineering Institute, serving as vice president for Ontario in 1938. He has also been actively associated with the Canadian Section of the American Waterworks Association, and was its chairman in 1937-38. He received the George Warren Fuller Memorial Award of that Association in 1948.

Carlyle Gerow, M.E.I.C., assumed office in October last as secretary-treasurer of the Canadian Institute of Mining and Metallurgy, whose offices are in Montreal.

Mr. Gerow, then the acting managing-secretary of the Canadian Coal Operators Association, Ottawa, was appointed to his new post in April last by the council of C.I.M.M.

He had directed the Coal Operators Association for 3 years, and during this time he visited the mining areas of Great Britain, France and Germany. After service in the First World War, Mr. Gerow attended Queen's University, graduating in 1922 in chemical and metallurgical engineering. He worked in steam plant engineering and combustion for ten years, before joining the Dominion Steel & Coal Corporation Limited in 1931. He remained with the Company, working at Montreal and later at Toronto as district manager of coal sales for Ontario.

During the recent war he spent the winter of 1940-41 at Saint John, N.B., supervising the bunkering of coal burning convoy ships. Early the following year he was loaned by Dominion Steel & Coal to the Department of National Defence for Air as advisor on heating fuel. In this position for nearly five years, he directed the supply of all heating fuel, coal, oil, gas and wood for all R.C.A.F. and R.A.F. training schools in Canada. In recognition of his services he was made a Member of the Order of the British Empire in 1943. He also acted as liaison between the Department of National Defence and the coal and oil controller's offices.

G. R. Doull, M.E.I.C., has been appointed principal assistant engineer, Atlantic Region, Canadian National Railways, with headquarters at Moncton, N.B.

Mr. Doull joined the railway service as a draughtsman at the Halifax Ocean Terminals in 1914.

Air Commodore M M. Hendrick, R.C.A.F., M.E.I.C., of Toronto, whose promotion from the rank of group captain was announced in November last, was named air member of the Canadian Joint Staff and air attache at Washington, D.C., to take over his new post early in 1950.

Air Commodore Hendrick has been senior air staff officer at North West Air Command headquarters, Edmonton, and previously was commanding officer of the R.C.A.F. station at Edmonton.

Gordon Hulme, M.E.I.C., manager of the public relations and advertising department of the Shawinigan Water and Power Company, Montreal, has become a member of the board of directors of the Public Relations Society of America.

He is Canadian vice-president of the Society. He is also the immediate past-president of the Canadian Public Relations Society.

A graduate of McGill University, class of 1931, Mr. Hulme has been with the Shawinigan Company since that time He was appointed to his present position in 1945.

J. A. Ouimet, M.E.I.C., has been appointed chief engineer of the Canadian Broadcasting Corporation. Mr. Ouimet has been assistant chief engineer of C.B.C. since 1941.

He was research engineer with Canadian Television Ltd., before joining C.B.C.'s forerunner in 1934 in a similar capacity. His work included designing of special radio and electronic instruments, and also special duties in the television field. From 1937 to 1941 he was successively operations engineer and general supervising engineer, and was responsible for engineering and technical administration of the Royal Tour broadcasts in 1939. Mr. Ouimet studied at College Ste-Marie and obtained his B.A. degree from the Universite de Montreal in 1928. He received his engineering training at McGill University where he graduated in electrical engineering with the highest honours in 1932.

R. Ewart Stavert, M.E.I.C.

He received the Ross Medal of the Engineering Institute in 1948 for his paper "Certain Aspects of Frequency Modulation and Television Broadcasting in Canada". He is an associate member of the Society of Motion Picture Engineers, and a member of the Comite Internationale de la Television.

Lt.-Col. J. Blair, M.E.I.C., of the Royal Canadian Engineers, who was stationed at Ottawa, Ont., has been transferred to the Fort Osborne Barracks, at Winnipeg, Man., as command engineer. Lt.-Col. Blair had been director of engineering development at Army Headquarters at Ottawa.

William N. Kelly, M.E.I.C., of Vancouver, B.C., has received the renewal of his appointment, by certificate, as non-exclusive surveyor to the American Bureau of Shipping for the Port of Vancouver.

Mr. Kelly is the councillor of the Engineering Institute representing the Vancouver Branch.

M. A Montgomery, M.E.I.C., the chairman of the recently inaugurated Kitchener Branch of the Institute, is a sales engineer for Canadian Blower and Forge Co. Ltd., of that city.

Mr. Montgomery, a mechanical engineering graduate of University of Saskatchewan, class of 1934, is from Wapella, Sask. He worked on a geological survey of Northern Ontario in 1935. He was a sales engineer for Sarco Canada Ltd., Toronto, from 1935 to 1937. He joined Canadian Blower and Forge Company in 1937, but was absent from the Company from 1942 to 1945 when he served in the R.C.N.V.R. directorate of naval construction.

Robert Donald Livingstone, M.E.I.C., was elected, some time ago, the chairman of the Lethbridge Branch of the Institute. He is a mining engineer for Lethbridge Collieries Ltd.

He was born at Lethbridge, and studied engineering at University of Alberta, graduating in 1939.

He worked for Lethbridge Collieries from 1939 to 1941, after which he spent four years as field engineer and adjutant of the 4th Canadian Armoured Division Engineers, R.C.E. He returned to his Company in 1945.

George Ernest Martin, M.E.I.C., superintending engineer at Headquarters is on retiring leave from the Department of Public Works of Canada.

Mr. Martin began work with the Department as an assistant engineer at Chatham, N.B., in 1908. He was promoted to senior assistant engineer in 1921. In 1923 he was transferred to the Saint John, N.B., district office, and two years later he was transferred to the London District Office. In 1936, Mr. Martin was promoted to Engineer Grade 1 and transferred to Headquarters in Ottawa. In 1936, he was promoted to Engineer Grade 2, and in 1939 he became a superintending engineer at Headquarters, which position he has held until October, 1949, when he started his retirement leave.

He graduated from McGill University in 1908 with a degree of B.Sc.

G. H. Burbidge, M.E.I.C., district engineer at Fort William, Ont., was granted six months' retiring leave from the Department of Public Works of Canada in August last.

Mr. Burbidge commenced work with the Department as an assistant engineer in the Winnipeg district office in 1912. In 1917 he was promoted to district engineer of the Winnipeg district. In 1919 the district office at Prince Albert, Saskatchewan, was closed and that province was added to the Winnipeg District. In 1921 there was a re-organization of the several districts throughout Canada and as a result Mr. Burbidge was transferred to Fort William as the senior assistant engineer for that district. In 1930 he became the acting district engineer. In 1945, he was promoted to district engineer Grade 2 in charge of the Fort William-Port Arthur district, which position he held until March, 1949, when the position was changed to that of district engineer Grade 5. Mr. Burbidge will commence his retirement from the public service in February, 1950.

He graduated from the University of Toronto in 1905 with the degree of B.A., and from McGill University in 1909 with the degree of B.Sc.

J. B. Petrie, M.E.I.C., who was mechanical superintendent of the Dominion Steel & Coal Corporation's iron ore mines at Bell Island, Newfoundland, retired in the summer of 1949.

He had been some thirty-nine years in that location, and upon retirement returned to his home at Victoria Mines in Cape Breton, N.S.

Mr. Petrie attained Life Membership in the Engineering Institute this month.

Allan G. Smith, M.E.I.C., has been appointed engineer in charge of the Northern Electric Company's new industrial heating test centre in Toronto.

A graduate of McGill University in electrical engineering, he joined the Northern Electric Company in 1937 as assistant to the supply manager in the general sales division and three years later transferred to Toronto as a salesman in the illumination department. In 1941 he was appointed specialist in illumination and industrial heating, a position he held until 1947 when he was named industrial heating engineer. His most recent appointment is that of engineer in charge of the industrial heating test centre.

C. H. Hopper, M.E.I.C., is at Kirkland Lake, Ont., where he has a practice as a consulting mining engineer.

He was previously with the Shawinigan Engineering Company, working at La Trenche, Que. He received the degree of B.A.Sc. from University of Toronto in 1929 and received the professional degree as a mining engineer from the same university in 1943 after considerable work in mining. He was a prospector-engineer for Dominion Explorers Limited, and in 1930-1932 worked for the Department of Highways of Ontario. He was then a field engineer and geologist for Ventures Limited, Toronto, for 3 years; and chief engineer and geologist for Matachewan Consolidated Mines, Limited, for 4 years. He joined Boyles Bros. Drilling Co. Limited, Vancouver, in 1942, remaining until 1949.

G. W. Painter, M.E.I.C., has recently been appointed by Canadian General Electric Company as their liaison in Montreal Locomotive Works for the diesel electric locomotive production programme there. He is responsible for integrating with M.L.W., the engineering and scheduling of C.G.E.'s Peterborough Works, where a large-scale production of the electrical components for the programme is under way.

Mr. Painter graduated from McGill University in 1933 with a degree in electrical engineering, and subsequently received C.G.E.'s test course training. Following a period as an engineer in the Railway & Traction Division at the Company's head office, he received a highly specialized training in transportation equipment in one of the largest plants in the United States, and returned to head the Division until his enlistment in the Army in 1941.

During the war he served with distinction in North-West Europe, was awarded the M.B.E. and held the rank of lieutenant colonel at the time of his discharge.

Lt.-Col. William S. Hunt, M.E.I.C., commanding officer of the R.C.E.M.E. school at Barriefield, Ont., will hand over his command to **Lt.-Col. J. R. Dunlop,** M.E.I.C. He has been given a staff appointment at Ottawa.

Col. Hunt has been in command at Barriefield since July, 1947. He received his B.Sc. degree from Acadia University in 1934 and that of B.Eng. (chemical) from McGill University in 1936. Col. Hunt served overseas in the recent war and on his return to Canada with the rank of major in 1945 he was appointed to the Canadian staff college at R.M.C., Kingston, Ont.

Col. Dunlop, who is taking over the command, graduated with the degree of B.Eng. (mechanical) from McGill University in 1935. He was overseas in the recent war and on his return was stationed at the Department of National Defence Headquarters at Ottawa. He was appointed assistant director of mechanical engineering in 1946. He has been at the Army Staff College in Kingston since early in 1949.

R. C. Peck, M.E.I.C., is attending the Centre d'Etudes Industrielles in Geneva, Switzerland. He expects to be there until next fall and will then again enter the Aluminum Ltd., group of companies. He has spent the last three years with the Demerara Bauxite Company of MacKenzie, British Guiana. He graduated in civil engineering from the University of Alberta in 1940.

J. Maurice Mace, M.E.I.C., has been appointed manager of rural electrification and power company sales for the eastern sales district of the Northern Electric Company Limited.

He was formerly manager of the Company's branch house in Quebec City. He has had considerable experience in the rural electrification and power apparatus fields. Mr. Mace joined Northern Electric in 1936 in the power apparatus sales department, and during the war was made a sales engineer for marine power and degaussing equipment. In 1946 he was transferred to the rural electrification department, and was made manager at Quebec City in the following year.

Mr. Mace graduated from McGill University in electrical engineering in 1935.

Otto Olsen, M.E.I.C., is now employed in Denmark. He was with the West Kootenay Power & Light Company at South Slocan, and at Trail, B.C., in 1948. He graduated from the University of Denmark in 1940 with a degree of M.Sc. in civil and structural engineering.

P. B. McCaffary, M.E.I.C., is now employed in the capacity of sales engineer by the Commonwealth Electric Corporation Ltd., in Montreal. Previously he was with the Canada Paper Company, Windsor Mills, Quebec, as assistant electrical superintendent. He graduated from Notre Dame University in 1933 with a degree of B.Sc. in electrical engineering.

J. M. Michaud, M.E.I.C., is now with Canadian Industries Limited in Montreal. He was with the Aluminum Co. of Canada Limited in Montreal prior to this recent change. He graduated from McGill in 1940 with a degree of B.Eng. (mining).

Alexander Brown, M.E.I.C., recently joined the Federal Department of Mines and Resources at Ottawa. He has been a field engineer of the Dominion Coal Co. Ltd., Sydney, N.S., for several years. Mr. Brown graduated from Nova Scotia Technical College in 1937 with a B.Eng. (mining), and has worked in mining projects in the Maritimes since that time.

Charles A. Auclair, M.E.I.C., has joined the staff of F. H. McGraw & Company Canada Limited, Montreal. Mr. Auclair, a graduate of Ecole Polytechnique, Montreal, goes to his new work from the Department of Transport, Quebec Canals Division in Montreal.

Howard George Ambrose, M.E.I.C., is with Gore and Storrie, Toronto consulting engineers. He was previously instrumentman for the C.N.R. He graduated in 1942 in mining engineering from the University of Toronto.

Thomas Aitken, JR.E.I.C., is with the Abitibi Power & Paper Company, Sault Ste. Marie, Ont. He is a graduate of the University of British Columbia in chemical engineering, class of 1946.

Wm. J. Staples, JR.E.I.C., has joined the staff of the Ford Motor Company of Canada Limited, Windsor, Ontario. He had been assistant mechanical superintendent for Demerara Bauxite Co. of Mackenzie, British Guiana, and was associated with the Aluminum Company of Canada Limited at Arvida, Que., and Long Branch, Ont., before going to South America. He graduated from the University of Toronto in 1942, with a degree of B.A.Sc., in mechanical engineering.

G. R. Minty, JR.E.I.C., who was with R.C.A. Victor Co. Ltd., Montreal, has joined the staff of Canadian General Electric Company in Montreal. He graduated from the University of Saskatchewan in the class of 1941.

A. A. Lewis, JR.E.I.C., is employed by the Canadian General Electrical Company Limited in Montreal. Prior to this change he was assistant engineer in the electrical department at the Welland Canal for the Department of Transport. Mr. Lewis is a graduate in electrical engineering from the University of N.B., class of 1945.

Rex Ford, JR.E.I.C., has joined the Canada Cement Company, in Montreal.

Mr. Ford is a graduate in civil engineering from McGill University, class of 1944. He was previously with the Shawinigan Chemicals Co. Ltd., Shawinigan Falls, Que. He has been active in the St. Maurice Valley Branch of the Institute, and was chairman of the Junior Section in 1948.

J. A. Paget, JR.E.I.C., has severed his connection with the Gutta Percha Rubber Company, Toronto, and has joined the Viceroy Manufacturing Co. Ltd., Toronto, as chief draughtsman. Mr. Paget is secretary-treasurer of the Junior Section of the Toronto Branch of the Institute.

Lewis W. Caldwell, JR.E.I.C., has been appointed sales engineer in the Supply Division of Canadian General Electric Company at Calgary, Alta.

Mr. Caldwell graduated in 1947 from the University of Alberta with a degree of B.Sc. in electrical engineering. He has held a number of appointments in C.G.E.'s head office.

William Alexander, S.E.I.C., an engineering student at the University of Manitoba, was one of the first nine Canadian students to receive the $125.00 scholarship from Association of Military Engineers fund. He enlisted as a private in the R.C.E.M.E. in 1943, and served overseas. In 1945, he returned to Canada, and upon discharge completed his grade 12 and entered the University of Manitoba, where he enlisted in the C.O.T.C., training at Montreal, Kingston, and Camp Borden. He received word in October last that he had been granted a commission as lieutenant in the active forces.

J. F. Graham, S.E.I.C., who graduated this year from the University of New Brunswick with a degree of B.Sc. in electrical engineering has joined the staff of the New Brunswick Electric Power Commission, and is at Fredericton.

Norman L. Williams, S.E.I.C., and **Neil A. Macdougall,** S.E.I.C., of University of British Columbia, Vancouver, were among six third year engineering students who received prizes awarded by the Association of Professional Engineers of B.C., for special summer work on technical subjects.

The prizes were awarded at the convention of the Association in November.

Visitors To Headquarters

Brian H. Colquhoun, and **A. U. Shiach,** London, England, on November 30, 1949.

E. P. Muntz, M.E.I.C., Hamilton, Ont., December 2, 1949.

R. M. Hardy, M.E.I.C., Edmonton, Alta., December 9, 1949.

J. A. Van den Broek, M.E.I.C., Ann Arbor, Michigan, December 29.

Obituaries

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

Richard C. F. Alexander, M.E.I.C., died suddenly in hospital in Ottawa, Ont., on November 29, 1949.

Born in 1875 at Guelph, Ontario, he graduated in 1896 from Royal Military College, Kingston, Ontario. He was employed as draughtsman for the St. Lawrence and Adirondack Railway, during the construction of the line from Beauharnois to Adirondack Junction in 1896 He entered the chief engineer's office of the Canadian Pacific Railway in 1897 and was employed as a draughtsman on maintenance and location work till 1903 That year he received an appointment as resident engineer for District No. 2 of the eastern division Canadian Pacific Railway, which comprised the Montreal Terminals and Smith Falls. He remained with the C.P.R. until 1913. The next year he joined the Department of Railways and Canals. In 1928 he was made senior office engineer for the Department of Transport at Ottawa. He retired in 1940 from the Department and resided at Ottawa.

Mr. Alexander joined the Institute in 1897 as Student, transferring to Associate Member in 1904 and to Member in 1940 He attained life membership in the Institute in 1942.

A. W. K. Billings, M.E.I.C., passed away on November 3, 1949, at La Jolla, California.

Mr. Billings was born at Omaha, Nebraska, in 1876. He studied at Harvard University, receiving an A.B. degree in 1895, and an A.M. degree in 1896. He spent one additional year at Harvard University as graduate student and assistant in physics and in engineering mechanics. Later he received the honorary degree of electrical engineer from Tufts College.

His first work was on the construction of electric street railways and steam-electric power plants in Pittsburgh. Then, in 1899, he went to Cuba as engineer in charge of similar work for the Havana Electric Railway Co. From 1902 to 1906, he was chief engineer for the Havana Central Railroad Co. on heavy electric railroad construction in and near Havana, and from 1906 to 1909 he maintained a consulting practice in that city.

Returning to the United States in 1909, Mr. Billings spent the next two years as engineering manager for J. G. White & Co., a New York firm of engineers and contractors. From 1912 to 1916 he was in Barcelona, Spain — successively, as manager of construction vice-president, and managing director of the Barcelona Traction, Light & Power Co., Ltd.

In 1917 and 1918, Mr. Billings was in the Navy — first as works superintendent at the New York Navy Yard in charge of mechanical and electrical work, and later as officer in charge of the construction of naval aviation stations in Europe, with the rank of commander. For his service he received the U.S. Distinguished Service Cross and the French Legion of Honour.

At the end of the war he returned to Barcelona as consulting engineer for the Barcelona Traction, Light & Power Co., on the design and construction of hydroelectric plants and Camarasa Dam. From 1921 to 1924, Mr. Billings served as construction manager for the same company, the Mexican Light & Power Co., and the Brazilian Traction, Light & Power Co., on the planning and building of hydroelectric plants near Mexico City and Rio de Janeiro.

For the next 20 years he was vice-president of Canada's largest external industrial undertaking, the Brazilian Traction, Light & Power Co., and of its several subsidiaries in Brazil, and for two years before his retirement in 1947 he served as president of the company.

Mr. Billings was a Member of the Engineering Institute from 1930. He was associated also with the American Society of Civil Engineers, which body conferred upon him honourary membership in 1947. He held membership also in the A.S.M.E., the A.I.E.E., and the Institution of Civil Engineers of London, England.

R. B. Kenrick, M.E.I.C., retired civil engineer, died in Montreal on December 1st, 1949.

Born in Bruges, Belgium, in 1864, Mr. Kenrick was educated in England. He came to Canada in 1879, and completed his studies at Upper Canada College.

He served a five-year apprenticeship in the engineering department of the old Northern and Northwestern Railways and was employed on general railway and maintenance work. On completion of his apprenticeship he was engaged in survey and construction work on the Irondale Bancroft and Ottawa Railway in North Ontario and on the Temiscouata Railway in New Brunswick.

In 1887 he entered the employ of the Dominion Bridge Company in Montreal as structural draughtsman. He remained with the Company for the next twenty-seven years, working successively as draughtsman, chief draughtsman, construction engineer and assistant manager and participating in all the large engineering works carried out by the Company.

In 1914 he resigned owing to ill health and retired to the country, where for the next thirteen years he indulged in his hobbies of gardening and chicken raising. He retired in Montreal in 1929.

Mr. Kenrick was active in church and charity work and in welfare work for returned soldiers after the First Great War. He was a life governor of the Lachine General Hospital and for the last thirty years of the Protestant House of Industry and Refuge.

Mr. Kenrick joined the Engineering Institute in 1888 as an Associate Member, transferring in 1898 to Member. He attained Life Membership in 1934. He was also a member of the American Society of Civil Engineers, and of the Association of Professional Engineers of Quebec.

News of the Branches

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

Cornwall

L. H. Snelgrove, Jr.E.I.C.
Secretary-Treasurer

T. B. Webster, Jr.E.I.C.
Branch News Editor

Approximately 130 Montreal Branch members of the Institute travelled to Cornwall on Saturday, November 19 to tour the new staple fibre plant of Courtaulds (Canada) Limited. The tour started around 3.30 after the visitors had arrived by bus and automobile.

The engineers, in groups of ten, were conducted to the new central viscose plant where wood pulp is steeped in 18 per cent caustic soda, shredded and treated with carbon bisulphide to form cellulose xanthate, which is treated with 4 per cent caustic soda to form viscose. In this process exact time and temperature control is maintained by intricate control equipment to ensure a uniformly high-quality product. The filtered and aged viscose is extruded through spinnerets into an acid bath, then fibro-spun, washed, dried and baled in the new plant. The visitors were shown as well the new switchroom and compressor room where are located air compressors, vacuum pumps and refrigerating units. The engineers were impressed by the spacious layout of equipment, the labour-saving devices, cleanliness and brightness of the working areas and the automatic control of the processes.

Upon completion of the tour, the Montreal members were joined by some 40 Cornwall branch members for a joint dinner meeting at the Cornwallis Hotel. Chairman R. H. Wallace presided and introduced the head table guests and other prominent visitors. Mr. Tait, chairman of Montreal branch, thanked Drummond Giles, vice-president of Courtaulds, for making the plant tour possible.

W. J. W. Reid, vice-president of the Institute, and president of the Ontario Association of Professional Engineers spoke of the relations between the two bodies and Dr. Austin Wright told of his recent trip across Canada.

Other distinguished guests were Col. L. F. Grant, past president; C. E. Sisson, field secretary; Professor H. Gaudefroy, vice-chairman, Montreal branch; Mr. McBride, programme committee, Montreal; Mr. McMurtry, Brown Corporation, Berlin, New Hampshire; Sqdn./Ldr. Barnard of the Institution of Elec-

Montreal Branch members at Cornwall.

AT THE CORNWALL JOINT MEETING

Upper left—Behind the table, J. Morris, H. Schmelzer and C. B. McRitchie. In the foreground, J. M. Elliott, P. H. Nasmyth and J. Vinet.

Upper right—Around the table, from the left, are: Henri Gaudefroy, Leon Fraikin, R. F. Shaw, R. M. Armstrong, W. P. Nesbitt, Bert T. Yates, Roy Bingley, J. G. McAllister, Y. Kato and R. N. Coke.

Lower left—Clockwise around the table are: R. A. Vincent, J. H. Bema, T. E. Chalmer, F. R. Leggett, T. B. Webster, Robert Marshall, Howard Campbell, Eric A. Springer, J. Reid Clark, H. A. Mullins, R. H. Hobner, R. B. Wotherspoon.

Lower right—From extreme left, around the table: Ivan C. MacFarlane, Colin W. Kerry, Vincent O'Boyle, J. D. Wray, T. C. Powell, Peter Tansey, Henry M. Hadley, Clayton G. Thompson, Per Hall.

trical Engineers of Great Britain; R. C. Flitton, past councillor, Montreal; and Mr. Anderson of Australia.

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The annual banquet meeting was held in the Cornwallis Hotel on December 10th following a plant tour of Courtaulds Limited by some 30 branch members. Arrangements for the tour were made by G. G. M. Eastwood, assisted by L. H. Snelgrove, P. H. Nasymth and D. B. Munro.

Branch Chairman R. H. Wallace presided over the banquet and in his retiring address reviewed the activities of the branch for the past year and spoke of the role of the engineer in the future.

Nominating committee chairman W. P. Nesbitt announced the results of the recent elections. G. G. M. Eastwood is the branch chairman for 1950 and new members of executive are A. A. B. McMath, P. H. Nasmyth, and F. E. Trewartha. Other executive members are H. W. Nickerson, F. R. Warner, and L. P. Stidwill.

Mr. F. R. Warner, chairman of the membership committee, reported a membership of 57, a decrease of six in the past year.

Two coloured films were shown; one describing blue fin tuna fishing off the Nova Scotia coast, and the other picturing Canada's Arctic Eskimos.

Edmonton

E. K. Cummings, M.E.I.C.
Secretary-Treasurer

O. G. Kelly, M.E.I.C.
Branch News Editor

The second annual ball of the Edmonton Branch of the E.I.C. and the Military Engineers was held in the main banquet hall of the Macdonald Hotel on October 27, 1949. The ball was arranged in honour of President John Armstrong and to coincide with his annual visit.

The Branch was fortunate in having as guests at the banquet and ball the president and secretary of the C.I.M & M. At the head table the following guests and members were seated: Mr Armstrong, president of E.I.C., and Mrs Armstrong; Mr. Siebert of Winnipeg president of the C.I.M. & M., and Mrs Siebert; Dr. Austin Wright, general secretary of E.I.C.; Mr. Gerow, secretary of C.I.M. & M.; The Honourable Mr Gerhart representing the Alberta Provincial Government, and Mrs. Gerhart; Major-General Penhold representing the Army, and Mrs. Penhold; Group Captain Coleman representing the Air Force; Dean Hardy of the Faculty of Engineering at University of Alberta and president of the Professional Engineers of Alberta, and Mrs. Hardy; Col. Debney, chairman of the Edmonton Branch of the Military Engineers, and Mrs. Debney; Mr. Tye, past chairman of the Edmonton Branch, and Mrs. Tye; Mr. Cranswick, councillor for the Edmonton Branch, and Mrs. Cranswick; Mr. T. Dalkin, chairman of the Edmonton Branch and master of ceremonies, and Mr. Barford, secretary to Mr. Armstrong.

Immediately after the banquet Mrs. Armstrong presented, on behalf of the Branch, a silver stein to Mr. F. E. Burfield for his outstanding work and leadership in the affairs of the Branch and the Institute.

Dean Hardy introduced President Armstrong who is chief engineer of the C.P.R. The president's address was enlightening and interesting to all Engineers and guests present.

Some 400 members, ladies and guests attended the banquet and ball. According to all reports a good time was had by all. It is hoped the annual ball may be continued for years to come.

The president and general secretary met with the executive at a luncheon in the Edmonton Club at noon of the 27th. An informal discussion was held on Institute affairs.

In the afternoon of Friday the 28th the president and the general secretary, guests and wives along with members of the Executive and their wives were guests of the Imperial Oil and taken on a tour of the Leduc-Calmar Oil field, pipe line, field laboratory at Devon and absorption gas conservation plant now under construction at Devon.

After the tour refreshments were served by the field officials of the Imperial Oil in the Devon Community hall At 6 p.m. the party of 25, including guests, sat down to a delicious steak dinner at the Club Pagoda at Devon. That same evening the president and general secretary addressed the Engineering students assembled in the Convocation Hall of the University of Alberta. After the meeting President Armstrong and Gen Secretary Dr. Wright made a courtesy call on Dean Hardy and Mrs. Hardy from where they repaired to their train and left for Calgary.

The executive wishes to thank Mr Addison and Mr. Hunter of Imperial Oi Company, Mr. Coultis of Imperial Pipe Line and their staffs for making the oil field tour possible.

Regrets were expressed that Mrs Wright had to return East before reaching Edmonton owing to her son's illness Sincere wishes for his early recovery were further expressed.

President Armstrong and Mrs. Armstrong and Dr. Austin Wright, general secretary, left the impression that while in Edmonton they had accomplished their mission, had a good reception and an enjoyable time. This was the aim of the Executive and members of the Edmonton Branch and they hope their efforts were not in vain.

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The regular dinner meeting of the Edmonton Branch of the Institute was held in the Macdonald Hotel on November 23, and some 70 members and guests attended. A paper was presented by E. L. Smith, filtration plant superintendent for the City of Edmonton Water Department and one of the members of the branch executive. The speaker was introduced by D. B. Menzies, City of Edmonton commissioner.

Mr. Smith's paper was similar to the paper he presented to a Western Canada water and sewage conference held in Regina recently. In his opening remarks, he dealt with the economic features of water softening, drawing to the attention of the meeting the effects that the new developments in the use of detergents may have on the future installation of water softening plants.

Then with the use of slides he went on to outline the chemical reactions that take place in the conventional lime, soda-ash method of softening. From reports of analyses of raw and finished water as received and delivered at Edmonton from the North Saskatchewan River, the results achieved at the City of Edmonton municipally owned plant were illustrated.

Costs of softening during winter high hardness periods were compared with those for the summer low cost periods; and a comparison of figures of the years 1941 and 1948 gave a picture of the increasing consumption by the City during that time.

With the help of coloured slides the operation of equipment installed at the new 15-m.g.d. plant was described. Feeders, slacker, flocculators, clarifiers, chlorinators and rapid sand filters were illustrated.

J. E. Cranswick moved a hearty vote of thanks after a short question period.

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On December 8th members and guests of the Edmonton Branch gathered at the Macdonald Hotel for a dinner and meeting to hear Mr. Noel Dant, recently appointed town planner for the City of Edmonton. Members of the Edmonton Chapter of the Alberta Association of Architects were invited to attend this meeting. Some 100 members and guests were present.

At the head table the following guests were seated: Alderman Hanna, City of Edmonton; J. Holloway, provincial town planner for Alberta; Noel Dant; Wm. Butchart, president of Edmonton Chapter of Architects; Professor Burgess, long active in town planning for the City of Edmonton; T. Dalkin, the branch chairman who was in charge of the dinner and meeting.

Alderman Hanna introduced the speaker, paying tribute to the early town planners of the City for their foresight and to the work of Mr. Dant.

Mr. Dant, being a relatively new comer to the City, confined his speech to basic principles and general regional planning. He stressed the point that industrial areas should be located in the greater regional zones and connected to the city centre by main arterial highways. There are some 200 factors to consider when planning an industrial zone. These were not elaborated on except in a general way.

After the paper was presented a question period was held. Some interesting points were brought up, such as railroads through centre of the city, the municipal airport, river crossings and bilateral arterial highways to by-pass the city centre and to travel from one outer industrial zone to another.

A vote of thanks was expressed by Mr. T. Main and an invitation was extended to Mr. Dant to again appear at one of our meetings. Mr. Dant gladly accepted this invitation.

Halifax

W. E. Jefferson, m.e.i.c.
Secretary-Treasurer

A. R. Harrington, m.e.i.c.
Branch News Editor

The November meeting of the Halifax Branch consisted of two parts: one, an inspection trip to the wellpoint drainage installation at the Joint Services Magazine near Halifax; and a very interesting dinner meeting which was addressed by Mr. Byron Prugh of New York, on the subject of **Wellpointing.**

Mr. Prugh outlined the system, termed "wellpointing", which was recently installed at the Bedford Magazine to overcome a ground water problem there. It is the first time that such a system has been installed east of Montreal.

The method calls for the sinking of pipes, or wellpoints, into the ground between the course of the ground water and the object to be protected. The pipes catch the water, carry it to the surface, where it is carried away.

Wellpointing is largely used in the United States where excavations are being made in damp ground. The system lowers the water table below the site of excavation, so that the work can be done in dry ground.

It has also been used successfully for a water supply system, he told the meeting. The system becomes economically feasible when a flow of 200 gallons per minute is possible. Mr. Prugh pointed out that the water would be filtered through large quantities of sand, and that this would filter out the bacteria and foreign particles.

He also outlined another application of the system in fighting forest fires, which has been used in several parts of the continent with success. The fire trucks carry wellpoints, with pumps and lengths of hose attached to the site of the fire. The pipes are sunk into the ground and a steady stream of water is available at the fire front. A number of wellpoints strung out along the advancing front would enable fire fighters to throw a steady stream of water on the blaze.

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The December meeting of the Halifax Branch was the annual meeting of the Branch for the election of officers and discussion of branch business.

A big time is planned for January 26, on the occasion of the annual combined banquet of the Halifax Branch E.I.C. and the Association of Professional Engineers of Nova Scotia. This function has become a highlight in the winter activities of Maritime engineers and all are looking forward to it with anticipation.

Kingston

D. L. Rigsby, m.e.i.c.
Secretary-Treasurer

The Journey of a Word was the title of an address delivered by R. H. Hall, superintendent of carrier development and production in the Montreal headquarters of the Bell Telephone Company. He was guest speaker at La Salle Hotel, Kingston, on December 7, during a joint dinner held by the Kingston Junior Chamber of Commerce, the Chemical Institute of Canada (Kingston section), and the Engineering Institute of Canada (Kingston branch).

The speaker traced the evolution of communication from the arm-waving and signal drums of primitive man to the present system whereby man's voice is able to span a continent by wire in one-twelfth of a second.

"One of the greatest problems facing the pioneers of the telephone industry was that of maintaining the initial energy of the human voice in order to carry it clearly over vast distances," said Mr. Hall.

"The advent of copper wire extended the range to about 400 miles, while introduction of the copper coil increased it to about 1,000 miles.

"When the vacuum tube was developed, energy of the voice was sufficiently renewed that conversation could be carried across a continent—and even across an ocean."

"Today, of course," reminded the speaker, "you can call 85 countries by telephone."

Using the out-size equipment ranged about him on the banquet hall stage, Mr. Hall demonstrated the hidden mechanics set in motion when a person decides to ring a neighbor down the street. Of particular interest was the explanation of why it is that " just one more telephone" cannot be squeezed into service in a community.

Question period at the conclusion of Mr. Hall's address unearthed the major cause of interference on Kingston radios —and to a lesser degree on telephones: the presence in the area of large underground deposits of lodestone.

Introducing the guest speaker, G. M. Coleman, manager of the local branch of Bell Telephone, revealed that Mr. Hall was engaged in experimental work with radar and the proximity fuse during the past war. At the present time he is doing research in trans-Atlantic communication and automobile telephones.

The speaker was thanked by Prof. J. C. Brooks, chairman of the Kingston EIC, and Frank Bishop, chairman for the evening.

During the dinner John Taylor of the Bank of Montreal provided an excellent piano programme of modern and classical music including selections from Tchaikowski's "Nutcracker Suite."

London

Geo. E. Humphries, M.E.I.C.
Secretary-Treasurer

Robert G. Code, M.E.I.C
Branch News Editor

The November meeting was held on the fifteenth of the month at the Wolseley Barracks Reserve Officers' Mess, and was attended jointly by members of the London Branch of the Military Engineers' Association of Canada.

The guest speaker was Colonel H. W. Love, O.B.E. (R.C.E.), chief engineer in the Branch of the General Staff, Army Headquarters, Ottawa, who gave an address on **The North-West Highway and the Royal Canadian Engineers.**

Colonel Love commenced by discussing generally the activities of the Corps of Signals and Electrical and Mechanical Engineers, and more particularly those of the Royal Canadian Engineers, outlining briefly their roles in the present Canadian Army. He stated that the main project in which the Active Force engineers were engaged was the construction and maintenance of the North-West Highway, and various feeder routes to airfields and emergency landing fields.

Before entering his discussion on the Highway, Colonel Love drew very interesting comparisons on the projects in which Engineers were engaged in the First and Second Great Wars and cited examples of how complex the organization of the present Corps of Engineers is.

Colonel Love stressed emphatically the importance of liaison between army and civilian engineers. He stated that co-operation from civilian engineers in the last conflict was excellent and that any lack of personnel was certainly not for the reason of lack of that co-operation between civilian engineers. Studies that civilian engineers might divert their attention to in specialized fields are those concerning the removal of obstables, the effects of jet and heavy aircraft on airport runways, and methods of bridging.

Concerning airfield construction, the civilian engineer might study means and methods of laying runways at great speed to withstand intensive heat directed in take-off by jet and jet assisted aircraft.

In World War II, at one period in hostilities as many as six airfields were under construction at one time, and all of them had to be finished within seven days in order to keep the Air Force in close support. It might be expected that improved methods of construction will have to be developed in the event of future conflict.

Dispersion of activities will of necessity be a trend in warfare methods in the event of another conflict. Bridges far greater than the seventy-ton maximum load for rapid bridging will have to be supplied in much greater number, to carry out dispersed activities and the question of "how" can be studied by civilian engineers also.

Colonel Love's talk on the North-West Highway included a description and history of the road and an outline of the Army's present job. Construction and maintenance, correcting alignment, and improving or replacing bridges constitute the main works programme. The Engineers are supported by the R.C.E. M.E., Signals and Service Corps.

Pictures of the Highway were shown, and Colonel Love added to their interest by relating various incidents connected with them. Perma-frost layers and ground water flow present the greater problems. Bridging operations form a very large part of the work when unpredictable washouts occur. The maximum period allowed to hold up traffic is forty-eight hours.

Colonel Love's address was extremely interesting and was well received by the group. Colonel W. K. Clawson, M.E.I.C., officer commanding 1st Field Engineers Regiment introduced the speaker; and Major S. G. Chipman, M.E.I.C., thanked him for a very excellent talk. Brigadier A. W. Bennett, C.B.E., recently appointed area commander, attended the meeting and extended a cordial welcome to the members of the Engineering Institute and the Military Engineers' Association.

A tour was conducted through the quarters and training areas of the local Engineer Regiment which was followed with refreshments served at the Reserve Mess.

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An interesting talk on **Shore Line Erosion** was presented by Dr. G. B. Langford, head of the Department of Geological Science of the University of Toronto, at the meeting on December 6th.

Dr. Langford's text was based on his recent studies and research in the erosion problem on the Great Lakes. Although it was confined more specifically to Lake Ontario, it was nevertheless of great interest to London engineers confronted with similar situations on Lakes Erie and Huron.

The speaker urged emphatically that engineers throughout the country should study and become conversant with the problems of erosion and conservation. Being fundamentally engineering problems, they are ones which the members of the engineering profession must learn in order to relate them and their significance to the public in general.

Dr. Langford was introduced by E. V. Buchanan, M.E.I.C., the recently elected president of the Ontario Association of Professional Engineers, and thanked by George N. Scroggie, M.E.I.C.

Ottawa

J. C. Elliott, M.E.I.C.
Secretary-Treasurer

Major-General F. F. Worthington, C.B., M.C., M.M., addressed the Ottawa Branch E.I.C. at a luncheon meeting on November 10, 1949, on the subject of **Civil Defence.** The speaker stressed that there is no "black magic" about civil defence, but in essence it consists of sensible measures taken to minimize the effect of disaster upon civilian population. To do this successfully requires, particularly in time of hostilities, complete organization at all levels of Government, so that essential services may be kept functioning and general morale maintained. All elements of national life must work to make such a programme successful. This is particularly applicable to engineers.

The problem of civil defence falls in two phases; the first preparation, plans, organization and training; the second remedial i.e. the action which takes place after an attack.

It was pointed out that engineers are concerned with the first phase, particularly in planning and organization. Buildings of a permanent nature should be designed in such a way as to provide fireproof bomb shelters in basements. Where possible development should be carried out with the aim of providing fire breaks, dispersal areas, etc. Planning is particularly important in laying out utilities so that a complete community would not be paralyzed by damage in any one location. Particular emphasis was laid on fire precautions, in the first instance on the use of materials, and secondly on providing simple and effective fire fighting services. Standardization of equipment, particularly hose sizes, is important.

Planning must always have in mind the continuance of water, sewage, and electrical services. The breakdown of any of these can cause complete breakdown in a community.

The second phase, remedial action, while in normal times not so urgent as the first phase, must however be given careful consideration by engineers. The immediate restoration of facilities, clearing of debris, and facilities for treatment of casualties, must be carefully planned.

The speaker quoted examples of planning along the above lines in Europe, particularly in Sweden. He was very impressed by the work which he saw there during a recent tour.

The conclusion drawn from Major-General Worthington's remarks was that civil defence is largely common sense application of sound engineering principles.

Head table guests were: A. K. Hay, who introduced the guest speaker; A. A. Swinnerton, chairman of the Ottawa Branch E.I.C.; Major-General F. F. Worthington, who is civil defence coordinator for Canada; Major-General N. E. Rodger, Canadian Army, who thanked the speaker; Chief Constable D. MacDonnell, Chief of Police, Ottawa; Chief C. G. Burnett, Fire Department, Ottawa, and Captain D. L. Burgess, Department of Agriculture.

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A regular luncheon meeting was held at the Chateau Laurier on December 1, 1949.

The speaker Dr. George B. Langford, professor of mining geology, University of Toronto, was ably introduced by Mr. W. H. Munro, director and general manager of the Ottawa Light, Heat, and Power Company.

Dr. Langford's services during part of the late war were devoted to conservation work for the Dominion Government. His activities in this direction were not entirely confined to this period as he makes a hobby of this work and is also at present retained as a consultant of the Ontario Department of Planning and Development on a special study of shore erosion on Lakes Erie and Ontario.

The importance of conservation was stressed by Dr. Langford, considering both the economic viewpoint and the effect which the preservation of our natural recreational resources have on the balanced way of living of population. This latter is particularly important with the present trend of five day working weeks. Easily accessible facilities must be preserved to occupy people during their free time.

The speaker cited the Tennessee Valley in the United States as a very good example of planned conservation work.

Until recently agencies doing conservation work have been doing so in an advisory capacity; however, the problem of conservation is now being taken up by the Dominion and Provincial governing bodies.

The Ontario Provincial Government has established legislation whereby any community or area may set up a district and direct how conservation of its natural resources will be carried out. Surveys to facilitate planning have been carried out by the Dominion Government.

The United States government has been very co-operative in supplying information gained from their experience, and have loaned personnel and trained Canadian personnel in conservation work.

In conclusion the speaker stressed the thought that the engineer has a very important work to perform in planning and carrying out conservation of our resources. Laurier was quoted as saying that "the twentieth century belongs to Canada". This is very true but let us not forget future generations!

Mr. D. Kemp Edwards, Conservation Committee, Ottawa Board of Trade, expressed to Dr. Langford the thanks of the Ottawa Branch..

Head table guests were: Dr. G. Langford, A. A. Swinnerton, chairman of the Branch; D. Kemp Edwards; W. H. Munro, director and general manager, The Ottawa Light, Heat and Power Company; T. A. McElhanney, superintendent of forest products, Department of Mines & Resources; Omas Armstrong, president, Ottawa Board of Trade; George Ferguson, former chairman of the Ottawa Branch.

Engineers' Wives Association

The Engineers Wives Association of Ottawa held its second annual dance in the Assembly Hall, Lansdowne Park, on November 4, 1949. At this very successful event some 250 guests enjoyed dancing in the flower decked hall to an excellent orchestra, and refreshments were served during the evening.

In charge of arrangements were the executive: president, Mrs. H. E. Treble; past-president, Mrs. L. M. Christmas; vice-president, Mrs. C. S. Parsons; social convener, Mrs. A. Ignatieff; secretary, Mrs. G. E. Smith; treasurer, Mrs. L. H. Wickwire; membership convener, Mrs. J. E. Lyon; press representative, Mrs. T. L. Hughson; and the councillors, Mrs. G. J. Desbarats and Mrs. R. R. Rogers.

The Engineers' Wives Association of Ottawa was founded in 1947 by Mrs. K. M. Cameron who was the first president, and has enjoyed an increasing popularity. It has now a listed membership of 150 wives of engineers. Meetings are held monthly at which varied programmes of interest are presented, the popularity of which is attested to by an average attendance of 80 members at each meeting. The organization is rapidly growing and some very interesting events are planned for the future.

Saint John

W. M. Brenan, M.E.I.C.
Secretary-Treasurer

A. R. Bonnell, M.E.I.C.
Branch News Editor

The October meeting of the Saint John Branch was held Friday evening October 21 in the Ball Room of the Lord Beaverbrook Hotel in Fredericton with the Chairman, H. P. Lingley, presiding.

Over 100 members and students were present at the meeting. This meeting was the first of two regular branch meetings a year to be held in Fredericton, although branch meetings have been held in this city before.

A. G. Watt spoke to the students, telling of the advantages of the E.I.C. to the engineer.

Mr. Gander, president of the University of New Brunswick Engineering Society spoke on behalf of the student engineers present. Mr. Gander also led in a sing song and rendered a solo, accompanied on the piano by a young lady student engineer.

H. P Lingley introduced the speaker, John Flood.

John Flood described his recent trip to Rome as a delegate to the International Labour Organization. Mr. Flood's talk was illustrated by colour slides, and was very interesting to the gathering.

Mr. Flood was thanked by Dr. E. O. Turner.

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The November dinner meeting of the Saint John Branch was held Thursday evening, November 24, at the Admiral Beatty Hotel with 40 members present.

Chairman H. P. Lingley presided at the meeting.

H. C. Evans, representative of Canadian Ingersol Rand presented two films in colour, one on the construction of the Adams Tunnel and one on mining in the tri-state area.

The film on the Adams Tunnel was probably of more interest to the engineers present as there was only one mining engineer in the group.

The films, Mr. Evans explained, required so much light for the underground colour photography that it was necessary to shut down construction operations to obtain enough power.

The 13-mile Adams Tunnel is the longest tunnel in America. It was built to carry water from Grand Lake on the Western side of the Rocky Mountain divide to the Eastern side. This water provided 2,000 h.p. and irrigated 600,000 acres. It was explained that this water which normally drained to the Pacific now drains to the Atlantic.

The film showed the most modern methods of drilling and removing material with pneumatic equipment and was of particular interest to the excavating engineers.

Mr. Evans was thanked by C. D. MacAllister and the meeting adjourned.

The annual meeting of the Saint John Branch was held the evening of December 13 with dinner in the Royal Hotel. The Chairman, H. P. Lingley, presided.

After reports of the secretary-treasurer and various committees, the reports of the scrutineers were read.

The following officers were elected for the coming year: chairman, D. O. Turnbull; vice-chairman, W. R. Godfrey; secretary-treasurer, W. M. Brenan (re-elected). New members of the executive are C. G. Clark and A. G. Watt.

The retiring chairman, H. P. Lingley, spoke briefly, stressing that the younger engineers should take a more active part in branch affairs and benefit from the experience of older engineers.

Saguenay

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

Mr. Jean-Paul Drolet, chief of technical information, Department of Mines of the Province of Quebec, spoke to the Saguenay Branch of the Institute on November 29. His talk was entitled **The Economic Mineral Resources of the Province of Quebec, with Special Reference to the New Developments of Ungava and Allard Lake.**

The speaker was introduced by the chairman of the Saguenay Branch, Mr. W. F. Campbell. Mr. Drolet illustrated his talk with slides and movie film. Ore samples were shown and descriptive literature was distributed to those interested in more details. Impressive figures of iron ore grades, tonnages, and markets give favourable prospects for the iron ore developments in Ungava. Details of the iron, titanium ores at Allard Lake and the proposed smelting at Sorel were described. The provision of rail and water transportation for both the above ores was discussed. Appreciation and thanks on behalf of the audience was expressed by Mr. Laurent Simard, M.E.I.C.

Peterborough

M. M. Uloth, M.E.I.C.
Secretary-Treasurer

J. C. Allan, M.E.I.C.
Branch News Editor

On November 17 Mr. J. Partridge of the Electronics Section of the Canadian General Electric Company presented a paper on **The Ontario Provincial Police F.M. Radio Network** to the Peterborough Branch.

Mr. Partridge opened his paper by describing the part played by the Provincial Police Radio system in several recent news items, and he remarked that radio communication facilities are a vital necessity in the operation of a modern provincial or state police system. The operating cost of a modern 2-way system is more than offset by the increased efficiency of the force and the more efficient use of personnel and equipment.

One of the principal uses of radio is to maintain 2-way communication between central control stations and patrol cars. This function can be performed no other way.

Another principal use is for point-to-point communication. Statistics show that about half the traffic is directed to mobile units and the remainder to fixed stations.

Since radio channels are not strictly private, unless expensive scrambling devices are used, messages of a secret character are not normally dispatched. Thus radio does not replace other forms of communication such as the mail, telephone, telegraph and teletype.

Eleven fixed stations form the basic network in old Ontario. These operate in the 4-2-44 MC band, and have transmitters rated at 250 watts output, and employ 2 receivers, one for car talk-back and the other for point-to-point communication. These stations are all in open country outside towns on sites chosen for favourable geographical position, height, and freedom from interference.

In addition, there are thirty fixed 60 watt stations forming a secondary network.

The equipment installed in the cars is such as to make possible car-to-car communication over a maximum range of 5 to 25 miles. This can become very important at certain times, during a pursuit, etc.

Mr. Partridge discussed the radio propagation principles involved in and their application to, the Ontario system.

Slides were used to illustrate and explain the equipment and its function.

Following the lecture the members were taken on a tour of inspection of the Provincial Police Headquarters at Peterborough, and their radio station outside the city. All of the members were given the opportunity of riding in police cruise cars so that they could observe the operation of the radio system in the mobile units as well as at headquarters.

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Frequency Conversion was the subject of a paper delivered to the Peterborough Branch by Mr. W. R. Harmer of the Hydro Electric Power Commission of Ontario, on December 8th.

The speaker introduced the subject with a brief history of the growth and development of the H.E.P.C. and an explanation of the 25 cycle island which is the Niagara System. The annual load growth since 1939 of 115,000 hp. is greater than the initial installation of 100,000 hp. in 1910.

In 1946 Hydro engineers were requested to report on the advisability of adopting a uniform 60 cycle system. An interim report was prepared and presented.

Studies were continued and the firm of Stone & Webster was consulted on the engineering features. Clarkson & Gordon, chartered accountants, submitted a report on the financial aspects of the project. These reports were presented to a point Convention of the O.M.E.A. and the A.M.E.U. in 1948 and endorsed by June of that year.

To carry out the project, Hydro in August 1948, started to organize the "Frequency Conversion Division", which undertook an extensive study of the many complex factors related to such a vast undertaking.

Standardization at 60 cycles offers many such advantages as:—

Flickerless lighting; Lower cost of new equipment; Wider selection of types, makes of appliances, and devices; Complete interconnection of all 60 cycle areas of Ontario; A standard frequency throughout the Province which will facilitate the interchange of frequency sensitive equipment; Elimination of local power shortages in time; The possibility that any provincial surplus could be exported to neighbouring Provinces or adjoining portions of the U.S.; Advantages of new development in other 60 cycle areas; The factor of National Defence.

Mr. Harmer described the organization set up by the H.E.P.C. and their contractors to handle the project which should be completed by 1960, and projected a chart to show the progress of conversion month by month and by areas from 1949 to 1959.

Since "Frequency Conversion" affects all classes of consumer apparatus, the cost involved is impressive. Besides the estimated gross cost of $58,256,500.00 for conversion of H.E.P.C. and municipal systems some $132,700,000.00 will be spent on conversion of consumer equipment of all types and sizes. In motors alone conversion will involve some 1,800,000 units ranging from motors of thousands of hp. to fractional hp. ratings. The installation and adjustment of this equipment on the consumer's premises will be carried out by the Hydro's Frequency Conversion Contractors .

It will be appreciated that this is in fact the largest undertaking of its kind in the world, demanding painstaking planning, skilled engineering, exact timing, and the best brains and "Know-How" Canada has to offer.

The speaker described many special features of the conversion programme and some details of the operation to date. Slides were used to illustrate the lecture and a lively question period followed it.

Winnipeg

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

On Saturday, October 8, 1949, the Winnipeg Branch of the Institute and the Association of Professional Engineers of Manitoba sponsored a trip to Pine Falls to inspect the mill of the Manitoba Paper Company and also the power site being developed by the Manitoba Government. The journey was made by special C.N.R. train.

Several pictures of the event appear on this page of the Journal.

Winnipeg Branch visits Pine Falls

Employment Service

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

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

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

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER required for the engineering department of an industrial firm in Central Ontario. Salary open. Apply to File No. 1333-V.

CHEMICAL ENGINEER required to take charge of process development group. Applicant should have at least five years development and production experience in chemical industry. Position in Ontario. Salary open. Apply to File No. 1335-V.

CHEMICAL ENGINEER, recent graduate, is needed for production work by chemical manufacturing firm situated in the Province of Quebec. Some experience in chemical production or synthetic resin manufacture would be advantageous. Salary open. Apply to File No. 1336-V.

ELECTRICAL

ELECTRICAL ENGINEER required by Montreal firm to take full charge of survey and installation. This position involves both engineering and administrative duties. Salary $300.00 to $350.00. Apply to File No. 1341-V.

MECHANICAL

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for ordinary collier plants screening equipment. Hoists, simple steel structures, etc. Salary open. Apply to File No. 1332-V.

MECHANICAL ENGINEER with experience mainly on hydraulic pumping equipment is required for test work in the field. Applicants should have a reasonably wide experience in handling different types. The work will involve travelling throughout southern Ontario. Please apply in writing, stating all relevant particulars. Salary open. Apply to File No. 1337-V.

MECHANICAL ENGINEER with experience in woodworking or plywood industry. Experience in machine and fixture design would also be useful. Position is one of responsibility in a large growing concern. Work would be varied including everything from product design through manufacturing to sales. Age under thirty. Salary $225.00 to $275.00. Apply to File No. 1338-V.

MECHANICAL ENGINEER required by well established firm in Montreal to act as sales engineer. Age early 30's. Salary about $4,000. Apply to File No. 1340-V.

MECHANICAL ENGINEER required to act as field representative for large rubber firm establishing their main offices in Toronto. Preferably Montreal resident, bilingual, owning a car, age 28 to 35 years. Territory includes, Quebec, Maritimes and Newfoundland. Salary open. Apply to File No. 1343-V.

MISCELLANEOUS

GRADUATE ENGINEER required as sales representative for a manufacturer of industrial conveyors. Location Montreal and area. Age 30 to 40 years. Salary $500.00 per month including expenses. Apply to File No. 1329-V.

CHEMICAL OR MECHANICAL ENGINEER required for food industry located in Western Canada. 30 to 35 years of age. Some experience in labour relations and production methods required. Position offers excellent future. Salary open. Apply to File No. 1330-V.

DESIGN ENGINEERS AND DRAUGHTSMEN required in Ontario. Positions of both junior and senior nature. Experience in one or more of the following groups desired: foundry, construction and maintenance, mechanics, electrical, piping, architectural and tool engineering. Salaries open. Apply to File No. 1331-V.

DESIGN ENGINEER with mechanical background required in Ontario for manufacturer of small power tools. Some experience required in the mechanical design of small units. Salary open. Apply to File No. 1339-V.

CONSTRUCTION ENGINEER required by a large firm in Montreal, with 2 to 3 years experience in various pilings. Job to last approximately 1½ years, stationed in Montreal. Salary open. Apply to File No. 1342-V.

GRADUATE ENGINEER required by large firm in Montreal as bridge inspector. Although located in Montreal this position would involve some travelling. Salary $3,100 to $3,200. Apply to File No. 1344-V.

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

CHEMICAL

CHEMICAL SALES ENGINEER required to work out of Montreal on sales and service principally in power plants. Business is well established and offers excellent opportunity for right man. Salary depends on experience. Bilingual desired but not essential. Apply to File No. 1301-V.

CIVIL

CIVIL ENGINEER with at least 2 years practical experience required by a large inter-municipal corporation in Western Canada. Under supervision and direction applicant must be able to assist and perform technical engineering work, prepare plans, perform field duties in connection with the construction and maintenance of simple structures, to install equipment and supervise and direct small groups of men. Salary $235.00 up. Apply to File No. 1144-V.

CIVIL ENGINEER with experience in detailing and designing structural steel and reinforced concrete for manufacturers is required for a steel fabricating company in Manitoba. Salary open. Apply to File No. 1285-V.

ELECTRICAL

ENGINEER, electronics field, with considerable experience on inspection methods and organization. Salary $3,480 to $4,080 depending on qualifications. Position in Ottawa. Apply to File No. 1204-V.

GRADUATE ELECTRICAL ENGINEER. Immediate opening in Montreal with Canadian General Electric for graduate electrical engineer. Sales experience desirable but the essentials are some years experience in application of motor, control switchgear, etc., a definite liking for sales work and a desire to make this a long term arrangement. Reply stating background. Apply to File No. 1299-V.

ELECTRICAL ENGINEER with at least three years of post graduate professional experience in the field of radio engineering in very high frequencies telecommunication and/or radar. Location Montreal. Salary open. Apply to File No. 1314-V.

ELECTRICAL DRAUGHTSMAN experienced in the design of electrical installations principally lighting and power layouts in industrial plants. Location Montreal. Salary open. Apply to File No. 1320-V.

MECHANICAL

MECHANICAL ENGINEER preferably bilingual, about 35 years of age, for position of assistant to plant engineer in large industrial plant near Montreal. Position requires some knowledge of construction practices and ability to plan and supervise maintenance of industrial equipment. Good opportunity for advancement. Accommodation available. Apply to File No. 1288-V.

JUNIOR MECHANICAL ENGINEER required by an electrical manufacturing plant in Ontario to be in charge of their suggestion system plan. Applicant must have initiative and be capable of working with people. Salary open. Apply to File No. 1316-V.

MECHANICAL ENGINEER with sales ability and experience in markets and product development work required by a manufacturer located outside of Montreal. Preferably bilingual. Good opportunity for advancement to the position of sales manager. Salary open. Apply to File No. 1319-V.

RECENT GRADUATE in mechanical engineering required by a paper company in the Province of Quebec. Preferably bilingual. Salary open. Apply to File No. 1322-V.

METALLURGICAL

METALLURGICAL ENGINEER required for research laboratory in Montreal. Applicant must have some experience in steel industry with knowledge of gas and arc welding. Salary open. Apply to File No. 1326-V.

Electrical Sales Engineer

Well known manufacturer of heavy electrical power products requires experienced electrical engineer with successful sales record. Salary $7,000-$9,000 depending on qualifications.

Apply to File No. 1323-V.

MISCELLANEOUS

GRADUATE ENGINEER required by National Research Council to act as representative of the Technical Information Service, with headquarters in Toronto. Work involves personal interviews and plant inspection with officers of industrial firms. Excellent experience for those interested in technical sales work. Salary up to $4,300 per annum, depending upon training and experience. Apply to File No. 1289-V.

COMBUSTION ENGINEER required for industrial concern near Montreal to take full charge of large boiler house and steam turbo generators. Technical knowledge, extensive operating, experience and practical mechanical ability required. Permanent position and attractive salary. Apply to File No. 1290-V.

GRADUATE ENGINEER with considerable experience in mechanical equipment for buildings is wanted for work on heating, ventilating and air-conditioning by a firm of consulting engineers in Montreal. Salary open. Apply to File No. 1291-V.

GRADUATE ENGINEER wanted for Montreal suburb. Applicant will be required to supervise outside work and should have construction and municipal experience. Salary $300.00 to $350.00. Apply to File No. 1292-V.

TWO SALES ENGINEERS required in Eastern Canada by an old established firm. Construction or industrial sales experience along general civil lines desirable but not essential for experienced applicants. Must be willing to travel from headquarters in Toronto or Montreal. Starting salary $200.00 to $300.00 per month depending on experience. All expenses paid. Bilingual ability desirable for Montreal position. Good prospects for early advancement. Apply to File No. 1302-V.

GRADUATE ENGINEER required by mining and industrial machinery manufacturer in Ontario. Applicant must be experienced in the design of tools, jigs, fixtures, dies, molds, etc., also capable of making own drawings and supervising draughtsmen in detailing work. Salary open. Apply to File No. 1306-V.

GRADUATE ENGINEERS AND DRAUGHTSMEN required by a large inter-municipal corporation in Western Canada proceeding very shortly with the enlargement of their sewage disposal plant. Salaries open. Apply to File No. 1307-V.

GRADUATE ENGINEER primarily electrical background required for sale of electrical and allied machinery and to open branch office in Calgary. Must have at least two years selling experience. Salary open. Apply to File No. 1308-V.

ASSISTANT SUPERINTENDENT required in Windsor, N.S. Applicants must be graduate electrical engineers with wide experience in the operation and maintenance of hydro-electric generating stations, substations, transmission and overhead distribution. Opportunity for promotion to superintendent after satisfactory service. Salary $425.00 per month. Apply to File No. 1309-V.

TECHNICAL ASSISTANT required in Halifax, N.S. Applicants must be graduate engineers with wide mechanical and electrical experience in the construction operation and maintenance of modern steam generating stations. Applications should be forwarded not later than Dec. 15, 1949. Salary $475.00 per month. Apply to File No. 1309-V.

TOOL AND DIE DESIGNER, wanted by well established Ontario Range Manufacturer, to head tool engineering division. Must have practical experience in operations and tools and materials used in stove and furnace manufacture and the ability to establish modern methods of operational procedures. Apply to File No. 1311-V.

CIVIL OR MECHANICAL ENGINEER required for position of assistant to general manager of a steel company in the Maritimes. Salary open. Company operates a steel foundry, structural and machine shops and employs approximately 300 men. Intelligence and the ability to learn quickly are essential. Apply to File No. 1313-V.

SALES ENGINEER, preferably civil background, required in Montreal. Salary open. Apply to File No. 1317-V.

ARCHITECTURAL DRAUGHTSMAN required for industrial concern doing mill buildings and extensions. Applicant should be familiar to a limited extent with structural design of reinforced concrete structures, steel structures and similar work. Salary open. Apply to File No. 1320-V.

ASSISTANT CITY ENGINEER required by City of Prince Albert, Sask. Duties will be general municipal engineering. Starting salary will be $225.00 to $275.00 per month. Apply to File No. 1321-V.

RECENT GRADUATE required by manufacturer in Winnipeg. Applicant must be interested in production planning, time and motion study, etc. Work will be in connection with the setting up of a modern production programme. Training period. Salary open. Apply to File No. 1324-V.

PHYSICIST OR MECHANICAL ENGINEER wanted to act as head of Nuclear Engineering Branch by National Research Council. Applicant will be required to direct a group of Physicist and Engineers in applied research and engineering development related to design of atomic energy plants and plant equipment. Salary $5,000 to $6,300. Apply to File No. 1325-V.

Situations Wanted

EXECUTIVE AVAILABLE, M.E.I.C., University graduate Engineering and Administration. Middle forties. Wide experience Administration, planning, manufacturing, sales, engineering, and comptroller functions. Presently senior officer large Canadian company. Apply to File No. 185-W.

GRADUATE, Institution of Mech. Engineers, Ex-Captain R.E.M.E., B.Sc. Tech. (Manchester) two years works experience, 26, arriving Canada end of November, desires suitable employment on production side. Apply to File No. 189-W.

GRADUATE CIVIL ENGINEER, University of Sask., 1949, S.E.I.C., age 25, veteran. Desires employment in hydraulic or structural engineering field. Experience in concrete construction, hydraulic development and general survey work during successive summers. Apply to File No. 203-W.

GRADUATE CIVIL ENGINEER, S.E.I.C., Queen's, 1948, age 23, single. One summer of railroad surveying. One summer on government topographical survey. Presently employed as transitman on highway location survey in Yukon. Desire work in hydraulic engineering, with pulp and paper company or in general construction, in Ontario or Quebec. Apply to File No. 204-W.

ELECTRICAL ENGINEERING ASSISTANT A.M.I.B.E., English, 31 years of age, married, one child, proposes to emigrate Ontario Spring 1950. At present employed by the Air Ministry at London Airport in drawing office. 6 years Royal Air Force, 2 years working on construction of diesel power station. Would prefer position with airfield construction contractors or with public utility company in town or country. Apply to File No. 206-W.

MECHANICAL ENGINEERING GRADUATE, B.E., S.E.I.C., University of Saskatchewan, 1949. Age 23. Single. Desires junior engineering or supervisory position in farm implement field. Diversified experience in operating and maintenance. Interested in development, sales or design. Energetic, reliable, with desire for an opportunity to train for responsible position rather than salary. Ability to make friends and get things done. Available in near future. Foreign or domestic. Apply to File No. 240-W.

GRADUATE of Engineering and Business, S.E.I.C., Toronto, 1949. B.A.Sc. (Honours). Age 24. Some experience in both kraft and fine paper mills. Prefers a position within the paper industry, but will consider any branch of engineering. Available immediately. Apply to File No. 242-W.

CHEMICAL ENGINEER, Jr.E.I.C., P.Eng., B.Sc., M.Sc., 1947. Age 26, single, free to travel. Three years varied industrial experience in inorganic and organic chemical manufacture. Have development, production, and pilot plant experience. Co-operative, resourceful and adaptable to all phases of the chemical industry. Desires permanent position, requiring initiative, with good future prospects. Apply to File No. 249-W.

GRADUATE CIVIL AND SANITARY ENGINEER, S.E.I.C., Recorded P.Eng., B.Sc. Queen's, 1948; M.A.Sc., Toronto, 1949; age 25, single; have held the following positions; instrumentman on highway construction; assistant engineer on hydrographic survey; at present, assistant town engineer with experience in design of sewers and watermains, laying of concrete sidewalks, and also in design of reinforced concrete box culverts; seeking employment in a larger centre, preferably with a consulting engineer. Apply to File No. 250-W.

CIVIL ENGINEER AND ARCHITECT, B.Eng., 1943, at McGill. Graduating in architecture at McGill, May of 1950. Junior member E.I.C. Age 28. Married. Ex-R.C.A.F. officer aircrew. Main interest is town planning and municipal work. Would like to discuss a future. Apply to File No. 252-W.

MINING ENGINEER, M.E.I.C., P.Eng., McGill, 1940. Married. Age 32, bilingual, with past experience covering engineering in layout, designing, estimating, planning and operating of underground and open pit mines desires suitable change with greater responsibility. Apply to File No. 256-W.

CIVIL ENGINEERING, S.E.I.C., B.Sc. (Alberta, '48), P.Eng. (Ontario). Age 23, married, veteran, desires position of responsibility with consulting firm or municipal corporation in town planning, municipal engineering, or hydraulic engineering. Design or construction supervision. Prefer location in Western Canada. Presently employed as Chief Draughtsman and staff engineer including design of all municipal projects, etc. One year as reinforced concrete and structural steel designer. Apply to File No. 283-W.

CIVIL ENGINEERING GRADUATE, Jr.E.I.C., P.Eng., professional engineer and estimator with large Montreal construction company seeks sparetime work. Cost or quantity estimates, structural steel or reinforced concrete design, surveying problems, etc. Special opportunity for firms with no estimating department or firms with the occasional overloaded staff. Apply to File No. 286-W.

STRUCTURAL ENGINEER, M.E.I.C., R.P.E., presently employed as Chief Draughtsman, Designer and Estimator with company fabricating 4,000 tons of structural steel per year desires position of responsibility and authority with larger or more progressive company. Location no object. Apply to File No 293-W.

CHEMICAL ENGINEERING GRADUATE, S.E.I.C., S.C.I.C., B.Sc. (Acadia, '41). B.E. Chemical (N.S. Tech., '49), age 35, married, family. Experience: 3 years business (hardware machinery), 1½ years chemist in control of laboratory (explosives), 2½ years Naval. Ordnance (inspection), 4 months pilot plant installation, 4 months asphalt inspection in oil refinery, one month food processing. Available immediately. Will consider any reasonable offer. Preferable location Eastern Canada (except Quebec) or U.S. Apply to File No. 297-W.

MECHANICAL ENGINEER, M.E.I.C., P. Eng. Established in Vancouver as Consultant and Mechanical designer of wide experience desires work on plant layout, machinery design, quantity surveying, preparation of complete industrial plans, reports, etc. Apply to File No. 304-W.

CIVIL AND MINING ENGINEERING GRADUATE, S.E.I.C., age 27, desires a part time position in Montreal with a consultant of reinforced concrete and structural steel or of mining engineering. Also interested in city engineering in town planning and in building construction. Will be available evenings, week-ends and some afternoons. Apply to File No. 309-W.

CIVIL ENGINEER, M.E.I.C., B.Sc., P.Eng., age 44, married. Wide experience in municipal engineering, both with contractors and consultants, mainly on water supply and sewerage, also roads and buildings. Now employed by contractor as Chief Engineer of sewer and water department. Available on reasonable notice. Apply to File No. 312-W.

CIVIL ENGINEER, GRADUATE, M.E.I.C., with a wide municipal experience, engineering, administrative, financial. Now employed but desires suitable change. Available on reasonable notice. Apply to File No. 317-W.

MECHANICAL ENGINEER, '48. Age 28. Desires part time work in Montreal, evenings and week-ends. Some experience in electrical and mechanical maintenance. Presently employed in heavy machinery design. Apply to File No 345-W.

GRADUATE ENGINEER, S.E.I.C. Presently employed, is seeking employment on a part time basis. Has experience in survey and mining, field and office work and also in structural (steel and reinforced concrete) design. Also has a good knowledge of foundation soil mechanics. Apply to File No. 351-W.

MECHANICAL ENGINEER, S.E.I.C., graduating from University of British Columbia, May, 1950, desires permanent employment. Two years experience on bench work and machine tools. Practical knowledge of operation and maintenance of internal combustion engines. Summer jobs, estimating and inspection work with a construction company, and capital equipment inventory for a process industry. Apply to File No. 373-W.

GRADUATE CIVIL AND MECHANICAL ENGINEER, S.E.I.C., B.Sc. (Eng.), Hons., 1949, University of London. Veteran, age 28, seeks interesting work with progressive firm in Montreal. Design, stress analysis, research, etc., preferred. Field work and design experience. Available on fortnight's notice. Apply to File No. 383-W.

ELECTRICAL ENGINEER, M.E.I.C., aged 35, English graduate, B.Sc. (Eng.), 1st class honours, A.M.I.E.E., apprenticeship and three years construction experience with large electrical manufacturing company, 8 years experience in charge of the electrical departments of large industrial companies. Desires change, preferably in Ontario or B.C. Apply to File No. 391-W.

BILINGUAL MECHANICAL ENGINEER, graduate 1949, B.Sc. (Arts and Science), McGill, 1947, age 24. Summer work includes 6 months in machine shops, and ten months as fitter's helper, mechanic and mechanic's helper. Business and selling experience. Would like engineering work where initiative and application will bring advancement. Apply to File No. 512-W.

ELECTRICAL ENGINEER, Jr.E.I.C., B. Eng., 1945, age 26, single. Four years varied experience switchgear, distribution systems, maintenance, inspection, costs, etc. Desire position in Montreal area but willing to travel. Apply to File No. 658-W.

GRADUATE ENGINEER, M.E.I.C., 10 years experience, design, construction and maintenance in petroleum industry. Desires permanent position offering scope, hard work and variety. Would prefer a smaller company, a consulting engineer or contractor, or to act as sales and service engineer for an equipment manufacturer. Location Western Canada or Ontario. Apply to File No. 1909-W.

EXECUTIVE AVAILABLE, University graduate, M.E.I.C., Professional Engineer. Wide experience in management, production, organization, purchasing, materials handling, expense control, construction, etc. Diplomatic and ability to get things done. Can be available on reasonably short notice. Apply to File No. 2216-W.

MECHANICAL ENGINEER, M.E.I.C. Age 31, married. 8 years engineer officer R.C.N., including cruiser operation, overseeing new construction, instructing engineering graduates. Assistant superintendent in shipyard. Operation diesel generator stations. Interested in practical construction, operation, maintenance, manufacturing methods. Prefer B.C. or Alberta areas. Apply to File No. 2589-W.

MECHANICAL ENGINEER, M.E.I.C. (20 years experience), visiting Britain, now has time free to act in consultive capacity. Apply to File No. 2642-W.

MECHANICAL ENGINEER, Jr.E.I.C., McGill, 1946, P.E.Q., Jr.A.S.M.E., single, 25, presently employed. Past experience includes 18 months machine shop practice, in addition to time spent at tool proving, estimating, processing, and tool design. Desires position with a concern where these qualifications can be used to good advantage. Available on short notice. Apply to File No. 2707-W.

MECHANICAL AND CIVIL ENGINEER, M.E.I.C., Prof. Eng. of Quebec. Polytechnique, U. of Montreal, 1941. Age 33, married, 2 children. Fluently bilingual. Experience includes maintenance and repairs of machinery and buildings as Plant Engineer in Pulp and Paper industry. Supervision of heavy concrete construction, plant layout, organization and production control, cost analysis, time and motion study, boiler house operation, electrical construction, maintenance, production and distribution. Interested in leading position in the industry located preferably in or near province of Quebec. Available in one month's notice. Apply to File No. 2823-W.

CIVIL ENGINEER, M.E.I.C., McGill, '44, P.E.Q., veteran R.C.E., single, 32, car available, reasonably bilingual. Four years experience in woodlands engineering work, for two large paper companies, including two years surveying and two years general work in connection with location design and estimation of roads, bridges, dams, conveyors, depot buildings, etc. Past six months spent as resident engineer on job opening a new district, including construction of flume, wharf, houses, small powerhouse, roads and bridges, etc. Also have one year's experience in paper mill, three years in design and draughting of small tools, and two summers in a granite works. Will be available February 1st, 1950. Apply to File No. 2897-W.

EXECUTIVE ASSISTANT ENGINEER, M.E.I.C., P. Eng., age 31, married, engineering and business administration degrees, nine years experience in the electrical industry holding responsible positions in manufacturing engineering, sales management, and marketing research. A greater opportunity is desired to earn advancement in an aggressive organization. Apply to File No. 2946-W.

MECHANICAL ENGINEER, graduate 1944, Jr.E.I.C., P. Eng., Ont., experienced in production and material control, industrial engineering design and plant engineering. Past experience in building products, basic steel and foundry and implement manufacturing. Employed, age 29, married. Desires position in progressive organization. Apply to File No. 2955-W.

MECHANICAL GRADUATE, age 24, Jr. E.I.C., P.Eng., Q., Queen's, 1947. Two years experience as a maintenance engineer with large Montreal industrial firm. Engaged in general plant and machinery maintenance work, including co-ordination of the work of draughtsmen, machinist and other trades. Evening student in commerce and sociology courses. Navy veteran. Desires maintenance or sales work with another Montreal industrial firm. Apply to File No. 3208-W.

ELECTRICAL ENGINEER, Jr.E.I.C., 1947. Age 27. Experience in hydro-electric stations, electrical distribution and electrical repair work. Also experience as instrument man on a survey crew. Desires to obtain a position in power in Western Canada. Apply to File No. 3235-W.

ASSISTANT CITY ENGINEER

for

Regina, Sask.

Applicant must be graduate engineer with municipal experience. Salary based on qualifications and experience. Further particulars upon application.

Apply D. A. R. McCannel, City Engineer, Regina, Saskatchewan.

CITY MANAGER WANTED

for VICTORIA, B.C.

Applications for the position of City Manager will be receivable by the City Clerk, City Hall, Victoria, B.C., up to 5 P.M. Wednesday, 22nd February, 1950. Sealed applications marked "Application for Position of City Manager" should be addressed to the City Council, Victoria, B.C. Application form and copy of "Municipal Manager By-Law, 1949", may be secured from the City Clerk.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

January 20th, 1950

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** sball 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 bave been engaged in some branch of engineering for at least four years. Tbis 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 sball not remain in the class of Junior beyond the end of tbe 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 be 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 attined the age o 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

BOUCHER—JULIEN FRANCOIS, of Sorel, Que. Born at Sorel, Dec. 14, 1918 Educ.: B.A.Sc., C.E., Ecole Poly., 1944; R.P.E., Quebec; with Marine Industries, Sorel, as follows: 1937-43, (summers), ship dftng. and mould loft work, 1944-46, asst. chief loftman, 1947-48, millwork tenders (on quantities), traveller and salesman, joiner dept., 1948 to date, asst. and spare chief loftman.

References: P. P. Vinet, J. A. Lalonde, L. Cartier.

COURTNEY—ALEXANDER GORDON, of St. James, Man Born at Sperling, Man., Nov. 7, 1908. Educ.: B.Sc., (Elect.), Manitoba, 1931; 1929-30, engr.'s aid, Dept. Public Works, Manitoba; 1932-35, engr.'s aid, San Antonio Gold Mines; 1935-36, electrician, God's Lake Gold Mines; with Manitoba Power Commission, as follows 1946-48, elect. mtce. man, 1948 to date, elect. equipt. mtce. engr.

References: T. L. Woodhall, R. Noonan, D. B. Leightner, J. W. Tomlinson, G. M. Bell, D. C. Brooking.

DUNIKOWSKI—ANDREW ANTONI, of Sydney, N.S. Born at Krakow, Poland, Oct. 24, 1917. Educ.: B.Sc., (Gas Engrg.), Univ. of Leeds, 1948; Member, Assn. Polish Engrs. in Canada; 1948, (Sept.-Dec.), demonstrator, Dept. Mech. Engrg., McGill Univ.; 1949 to date, jr. engr., Dominion Steel and Coal Corporation. steel plant research lab., Sydney, N.S.

References: N. A. Parlee, E. J. Prince, A. M. Miller, W. S. Wilson, J. A. McLeod.

DUNN—RUTHVEN CAMERON, of London, Ont. Born at Burford, Ont., Jan. 10, 1920. Educ.: B.Sc., (Civil), Queen's, 1942; R.P.E., Ontario; 1941, levelman, highway constrn., Dept. Highways, Ontario; 1942, instru'man., dock constrn. at Lauzon, Que., and Sault Ste. Marie, Ont., Dept. of Munitions and Supply; 1942-44, Lieut., R.C.E.; 1944-45, Pilot Officer, R.C.A.F.; 1945-46, asst. county engr., County of Middlesex, Ont.; 1946 to date, township engr. and road supt., all engrg. requirements for drains, bridges, sanitary sewers, waterworks, curbs and gutters, sidewalks, London Township, London, Ont.

References: R. W. Garrett, F. C. Ball, E. V. Buchanan, V. A. McKillop, F. A. Bell.

GREENIUS—ARNOLD WILLIAM, of Sydney, N.S. Born at Vancouver, B.C., Jan. 8, 1925. Educ.: B.A.Sc.; M.A.Sc. (Metall. Engrg.), 1947 and 1949 respectively, British Columbia; 1945 and 1946, (summers), A. I. M. Forge Ltd., Vancouver (engaged in steel forging, heat treating and steel sales); 1947-48, metall. research in Dept. Mining & Metall., as research asst., Univ. of British Columbia; 1949 (June) to date, about to finish training plan, and will be connected with dept. research and development, Dominion Steel and Coal Corp., Sydney, N.S.

References: N. A. Parlee, E. J. Prince, C. N. Murphy, J. N. Finlayson, S. G. Naish.

IRWIN—EUGENE HICKS, of Arvida, Que. Born at Picton, Ont., Nov. 24, 1920. Educ.: B.Sc., (Chem. Engrg.), Queen's, 1943; 1948 to date, supervisor potrooms, Aluminum Co. of Canada, Arvida, Que.

References: T. T. Anderson, B. E. Bauman, R. W. J. Lewis, G. M. Mason, D. F. Nasmith.

JOHNSON—CARLYN IVER, of Baie Comeau, Que. Born at Fillmore, Sask., Jan. 1, 1909. Educ.: B.Sc., (Elect.), Saskatchewan, 1930; R.P.E., Ontario; 1930-32, res. engr., Dept. Highways, Regina, Sask.; 1935-37, sales engr., Dominion Rubber Co., Toronto; 1937-39, engr., Dept. Highways, Owen Sound, Ontario; 1939-41, engr., International Petroleum Co., Guayaquil, Ecuador, S.A.; 1942-43, asst. to project engr., Defence Industries Ltd.; 1943-46, Works and Buildings Officer, R.C.A.F.; 1946-47, constrn. supt., Towland Construction Co., London, Ont.; 1947 to date, constrn. supt., Quebec North Shore Paper Co., Baie Comeau, Que.

References: M. H. Jones, S. J. Simons, C. Morrison, A. H. Douglas, C. Miller.

LESTER—ROY MACDONALD, of Montreal, Que. Born at Ottawa, Ont., April 8, 1919. Educ.: B.A.Sc., Toronto, 1944; 1939-41, lab. asst., National Research Council, Ottawa; 1942-43, mech. dftsman., R.C.A. Victor, Montreal; 1944 to date, test equipt. and methods engr., design or purchase of testing and industrial electronic equipt.—for past 2 yrs. sr. engr. for small group handling this work. Northern Electric Co., Montreal, Que.

References: R. E. Grout, J. H. Budden, D. A. J. McDonald, M. J. Oldershaw, A. J. Lawrence.

LYNCH—DENNIS HERCHMER, of Havre St. Pierre, Que. Born at Sydney, N.S., July 5, 1914. Educ.: B.Sc., (Elect.), New Brunswick, 1936. 1932-35, (summers), instru'man. and rodman, Dept. Highways, Nova Scotia; 1936-37, electrician, Dominion Steel & Coal Corp., Sydney, N.S.; 1937, electrician, Seaboard Power Corporation; 1938-39, trainee on rotating equipt., General Electric Co., Birmingham, Eng.; 1939-40, trainee, H.T. switchgear, A. A. Reyrolle Ltd., Hebburn on Tyne, England; 1940-43, asst. engr. on design and instln. in steel works, McLellan & Partners, consultg engrs., London, Eng.; 1943-47, Major, Commanding 2nd E.C.H. Workshop, R.E.M.E./I.E.M.E., H.M. Armed Forces; 1948-49, elect. engr., planning and detailing electrical instlns. in paper mills, Canadian International Paper Co., Three Rivers, Que.; at present, elect. engr., Quebec Iron & Titanium, Montreal (employed at Allard Lake (Que.) Mines Ltd., Havre St. Pierre, Que

References: J. A. MacDonald, A. F. Baird, R. W. McColough, H. J. McCann, W. E. Bown.

MACLAREN—ALEXANDER MUNRO, of Niagara Falls, N.Y. Born in Scotland, Nov. 7, 1888. Educ.: Diploma, Mech. Engr., Gordon's College, Aberdeen, Scotland; R.P.E., Ontario; R.P.E., State of New York; 1903-06, 3 yrs. apprent. training, R. Pullar & Sons, Ashfield, Scotland; 1906-09, (summers), apprent. dftsman., J. M. Aberdeen, Scotland; 1909-12, designer and inspector, Stewarts & Lloyds, Airdrie, Scot.; 1912-14, design engr., Bradford Dyers Assn., Bradford, Eng.; 1915-25, chief designer also supervisor on tech. training of apprentices, Rowntree, York, Eng.; 1925-31, design engr., H. G. Acres & Co., Niagara Falls, Ont.; 1931-32, design engr., Roessler & Hasslacher, Niagara Falls, N.Y.; 1932-34, engr. i/c of constrn., Bridge Public Park, Observatory platform, Scenic Highway, Niagara Escartment, Niagara Township; 1934-40, design engr., International Nickel; 1940-42, mech. engr., American Cyanamid; 1942-46, mech. engr., Welland Chem. Co., Niagara Falls, Ont.; 1946 to date, design engr., Hooker Electrochemical Co., Niagara Falls, N.Y.

References: W. O. Maclaren, A. Harvie, C. O. Maddock, S. W. Andrews, A. W. F. McQueen, H. E. Barnett, L. L. Gisborne.

McKAY—DONALD WILSON, of London, Ont. Born at Woodstock, Ont., Feb. 14, 1914. Educ.: B.Sc., (Mech.), Queen's, 1938; R.P.E., Ontario; 1938-39, jr. engr., Dept. Public Works, Canada; 1939-1944, Lieut. and finally Capt., Ordnance Mechanical Engr.; with Dept. of Public Works of Canada, as follows: 1944-45, jr. engr., 1945-47, engr. grade 2 (civil), 1947 to date, engr. grade 3 (civil).

References: G. N. Scroggie, J. E. Bright, A. L. Furanna, R. W. Garrett, W. J. Bright, W. M. Veitch.

MILLSAP—JOSEPH WILMOT, of Winnipeg, Man. Born at Saskatoon, Sask., Aug. 22, 1915. Educ.: B.Sc., (Chem. Engrg.), Saskatchewan, 1938; 1939-40, chemist, dftsman. and asst. soils surveyor, Soils Dept., Univ. of Saskatchewan; with Canadian Industries Ltd., as follows: 1940-41, material testing and product develop't., Brownsburg, Que.; 1941-42, adminis. asst., divisional mgr.'s office, Montreal, Que.; 1942-45, Aero. Engrg. Officer, R.C.A.F.; 1946 to date, plant mgr., Geetee Limited, Winnipeg, Man.

References: N. B. Hutcheon, A. H. Douglas, W. A. Trott, J. W. Greenlaw, L. G. Scott.

PAPPIUS—STANISLAW WALDEMAR, of Montreal, Que. Born at Boryslaw-Wolanka, Poland, Jan. 30, 1921. Educ.: Royal Naval College, Keyham, Devonport, Eng., 1942-1945; Graduated as Lieut. (E), 1945; Associate, Inst. Marine Engineers; 1945-46, Engr. Officer, Polish Cruiser "Conrad"; 1946-47, Engr. Officer, at Comb. Operations Base, H.M.S. Rosneath, Scotland; 1948 to date, design engr., Canadian Vickers Ltd., Montreal, Que.

References: R. C. Flitton, P. F. Stokes, P. W. Gooch, S. Fromson, W. J. Routley.

PATTON—WILLIAM JOHN, of Winnipeg Man. Born at Winnipeg, March 18, 1917. Educ.: B.Sc., (Mech.), Manitoba, 1949; 1948 (May to Sept.), rodman, rly. sewage and constrn. surveying (with survey party under E. Ashton, C.E.) Fort Churchill, Manitoba; 1949, (July) to date, research asst., N.R.C., interrivet buckling of aircraft panels; part-time demonstrating in civil engrg., Univ. of Manitoba, Winnipeg, Man.

References: A. E. Macdonald, N. M. Hall, G. H. Herriot, W. F. Riddell, J. Hoogstraten.

SWAIN—ROBERT FRANCIS, of Halifax, N.S. Born at Holywood, Ulster, Ireland, July 24, 1909. Educ.: 1925-30, Royal Technical College, Glasgow; Member, Institute Marine Engineers, London; 1925-30, apprent. engr., Fairfield Shipbldg. & Engrg. Co., Glasgow; 1930-31, jr. engr., African Royal Mail; 1932-33, student, Sothern's College of Marine Engrg.; 1933-34, jr. engr., City Line Ltd.; 1935-40, 3rd, 2nd and chief engr., China Navigation Co.; with R.C.N.R., as follows: 1940-42, Lieut. (E), 1942-43, Lt. Cmdr. (E), Halifax, 1943-45, Lt. Cmdr. (E), Principal Engr. Overseer, new constrn., Halifax; 1945-46, student, Stow College of Engrg., Glasgow; 1946 to date, engr. supt., Foundation Maritime Limited, Halifax, N.S. (from 1948 to date, rejoined R.C.N., Active Reserve, promoted to Cmdr. (E) i/c Naval Division, Halifax).

References: E. M. Woollcombe, A. C. M. Davy.

VADAS—ALEXANDER SHANDOR, of Montreal, Que. Born at Kispest, Hungary, May 12, 1895. Educ.: Civil Engr., Royal Josef Technical University, Budapest, 1922; 1918-20, pupilage, Municipality of Kispest, Hungary; 1920-22, pupilage, reinforced concrete, J. Bhien, Kispest; 1923-25, civil engr. and surveyor, Companía Industrial, Brazil; 1925-27, civil engr. and surveyor, Engenerios, Construct., Architectos, Brazil; 1929-31, land and catasteг survey, road location, mapping, bridge, highway, design layout, etc., Public Works Dept., Turkey; 1931-41, irrg. engr., irr. scheme, bldg. mtce., survey, tech. expert adviser in land survey cases, bldg. design, etc., Dept. Public Works, Iraq; 1941-43, British Forces in Iraq, C.R.E.'s/M.E.C., bldg., road, water supply constrn., mapping, etc.; 1944-45, British Forces, East Africa, E.A.E.'s/E.A.C., dam constrn., inventions, instruction of recruits; 1946-47, chief surveyor, bldg., roads, drainage design, layout, survey, Public Works Dept., Uganda; 1947-48, dept. chief, rly., road, bldg., design, location, topograph, Sugar Works Ltd., Uganda Prot.; 1949, chief of survey parties, organization of survey for road location, Hydro-Quebec, Montreal, Que.

References: C. G. Kingsmill, L. Galler, E. Stearns, F. S. Hardy, M., I.C.E.

WADE—GARTH SWEETEN, of Peterborough, Ont. Born at Duncan, B.C., Aug. 2, 1916. Educ.: B.A.Sc., (Mech.), British Columbia, 1941; R.P.E., Ontario; Canadian General Electric, Peterborough, as follows: 1941-42, test dept., Peterborough and Toronto, 1942-43, engrg. dept., Peterborough; 1943-44, Armaments Design Dept., Ministry of Supply, Fort Halstead, Kent, Eng.; with Canadian General Electric, Peterborough, as follows: 1944-45, engrg. dept., 1945-46, plant engrg. dept.; 1946 to date, plant engr., responsible for all bldg. repair and constrn., machinery and equipt. design, procurement, instln. and mtce., power plant operation, Canadian Nashua Paper Co., Ltd., Peterborough, Ont.

References: I. F. McRae, C. B. Muir, R. T. Bogle, A. L. Malby, A. R. T. Hailey, R. L. Dobbin, A. J. Bonney, M. L. Wade.

WESTWOOD—RAYMOND, of Grimsby, Ont. Born at Pinner, Middlesex, Eng., May 10th, 1920. Educ.: B.Sc., (Eng.), City & Guilds College, London, 1949 (Imperial College of Science & Technology, London, 1946-1949); Associate, City & Guilds Institute of London; Graduate, I.M.E., London; 1940-46, Corporal, Fitter and Shop Inspector, R.A.F.; 1947, (8 weeks), student, C. A. Vandervel Co., Ltd.; 1948, (8 weeks), student, Associated Equipment Co., Ltd. (vacation experience organized by College); at present, fitter, Austin Motor Co., Grimsby, Ont.

References: A. O. Saunders, M., I.M.E., E. H. Lewitt, A.M., I.M.E., Dr. Howard, A.M., I.M.E., L. T. Treharne, A.M., I.M.E., F. Dyson, A.M., I.M.E., W. Collins, A.M., I.M.E.

VACANCY

POSITION OF LIBRARIAN

The Engineering Institute of Canada

Qualifications: Graduate of an accredited School of Library Science, and at least four years' experience, preferably in a special technical library.

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This advertisement is inserted in the hope that members will bring it to the attention of qualified persons of their acquaintance.

LIBRARY NOTES

Additions to the Institute Library
Reviews — Book Notes — Abstracts

BOOK REVIEW

LE CALCUL DU BETON ARME A LA RUPTURE; Compression, Traction, Flexion Simple et Composée.

A. Guerrin. Paris, Dunod, 1949. 335 pp., illus., 9½ x 6 in., paper, 1,960 Francs.

Reviewed by S. D. Lash, M.E.I.C.*

During the past few years there has been an increasing tendency to question the fundamental assumptions made in the design of flexural members of reinforced concrete. This has coincided with a renewed emphasis on the idea that the design of structures should be based upon loads causing failure rather than on loads causing certain calculated stresses. Many proposals for changes in design procedure have been made, particularly in Europe. In the United States interest in this topic has been stimulated by the work of Whitney and Jensen, and the Portland Cement Association has published design tables based on Jensen's theories.

"Le Calcul du Béton Armé à la Rupture" consists of a discussion of the ordinary methods of design of reinforced concrete members, alternative methods and the presentation of a new method, together with examples of its application. Guerrin, who is Professor at the School of Public Works in Paris, claims that it is possible to save from 10 to 30 per cent of the concrete and from 10 to 40 per cent of the steel in reinforced concrete structures without reducing the factor of safety below a reasonable figure. The reductions are primarily the consequence of maintaining the same factor of safety throughout the structure and of basing the calculations upon the ultimate load capacity of each part.

In a review of various proposals for the design of flexural members Guerrin discusses the suggestions of Emperger, Saliger, Bittner, Maillart and Steurmann (whose methods are the basis of the Russian regulations), as well as a number of others. The basis of Guerrin's own method is the assumption that when a reinforced concrete member fails in flexure it always does so as a consequence of the inability of the concrete to deform more than a certain amount. In the great majority of beams this result is brought about by the excessive strain in the steel. Occasionally the primary cause is excessive strain in the concrete. If these two effects occur simultaneously the beam is said to be reinforced with the optimum or critical percentage of steel. It is in the values indicated for the critical percentage that the difference between the various methods is shown most clearly. Using typical materials and the conventional method of design the critical percentage is usually about one per cent. According to Whitney's methods it is about three per cent and according to Guerrin it is somewhere in the neighborhood of seven per cent. It follows that if Guerrin's methods are correct there is seldom any value in compression reinforcement of beams.

One of the assumptions made in ordinary design theory is that the tensile strength of concrete is negligible. Guerrin admits that the tensile strength is small but he shows that its effects are not negligible, particularly in slabs. It has long seemed unreasonable that a slab, which is the least important part of a structure, should have the greatest factor of safety, yet this is the consequence of our present regulations. Guerrin's method makes allowances for the moment contributed by the concrete in tension up to the time of rupture.

Guerrin discusses at some length the effect of shrinkage and plastic flow upon the stresses in steel and concrete. He concludes that, although these effects are considerable, they do not generally influence the ultimate strength of the structure. He also gives considerable attention to a calculation of the loads which will cause cracking in the concrete and he suggests that in most cases the factor of safety should be chosen so that cracking is unlikely to take place at working loads.

In a discussion of the results of tests of tension members the author points out that the ultimate load of such members is somewhat greater than the load carried by the steel at yield. This is true even though the concrete has apparently cracked fairly completely. This factor is of particular importance in calculating the strength of slabs.

For members subject to direct compression it appears that European thinking is behind our thinking on this continent, as most American and Canadian regulations already recommend formulas based on ultimate strength rather than on the elastic theory. Guerrin advocates this and by establishing a logical basis for both axially loaded members and flexural members he is able to deal in a convincing manner with members subject to a combination of axial and flexural loads. Other design topics discussed by Guerrin include composite construction (encased I-beams) and pre-stressed construction.

A noteworthy omission from an otherwise comprehensive book is any discussion concerning the resistance of reinforced concrete members to failure as a result of excessive shear, or bond stresses. One of the difficulties in the way of adopting a plastic theory for flexural design is that it seems illogical to retain the elastic theory for shear and bond stresses and discard it for flexural stresses. Most designers feel that the whole subject of shear and bond is in an unsatisfactory condition and possibly when further knowledge has been obtained this difficulty will be resolved.

Often, the objection to a new method of calculation is that it is more complicated than the old. This is not true in the methods proposed by Guerrin, and in a comparatively small space he shows how they can be applied to all the cases of direct stress and flexure usually encountered in structural design.

It will be evident from the above that Guerrin's book is an important contribution to reinforced concrete theory and that the time has come when the fundamental assumptions first set down by the Joint Committee in 1916 should be re-examined This book should be required reading for all who have any responsibility for framing specifications and building codes.

Professor of Civil Engineering, Queens' University, Kingston, Ont.

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F. W. Cox and W. E. Swale.

Examines possibilities of full electrification in a basic industry in which a large amount of power is still supplied by private steam plant. Analyses power requirements of cotton spinning, weaving, dyeing and finishing, and discusses applications of electric metering and general condition of electricity supply.

Losses in Electrical Sheet Steel:

K. H. Stewart.

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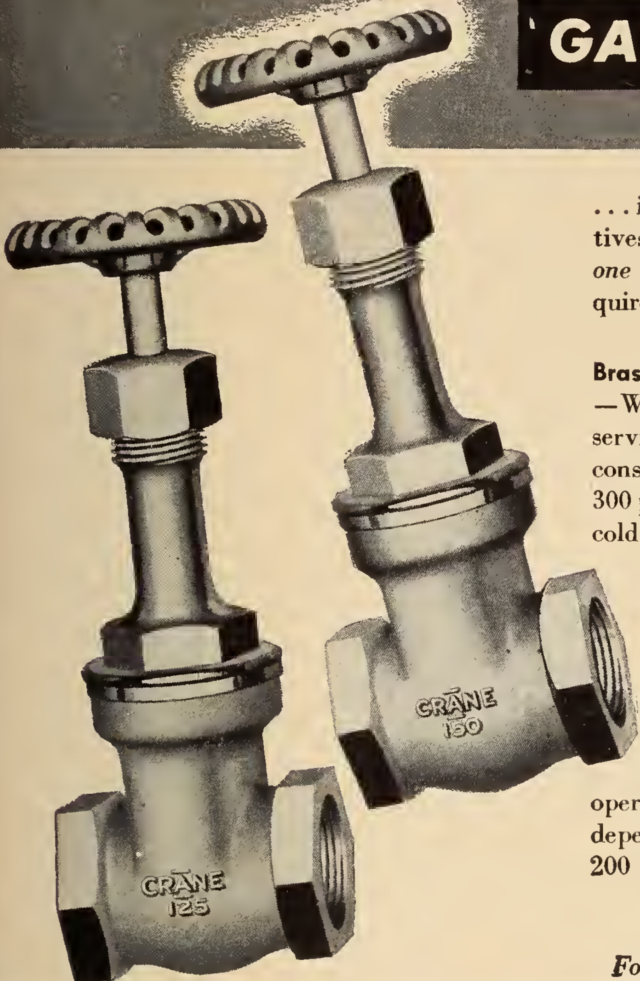

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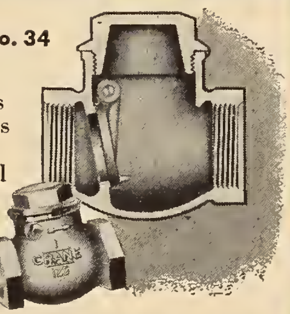

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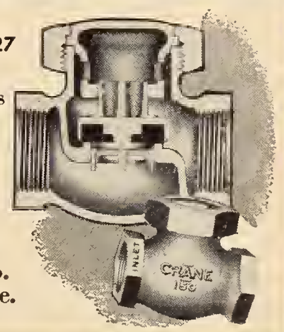

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Some Properties and Tests of Magnetic Powders and Powder Cores:

C. E. Richards, S. E. Buckley, P. R. Bardell, and A. C. Lynch.

This paper tells of the making, either mechanically or chemically, of powder of iron or iron-nickel alloys, of their pressing into cores and of the factors influencing the permeability of the cores. Various systems of expressing the electrical losses are discussed, tables giving conversion factors and data for various materials.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Aerials for Metre and Decimetre Wave-Lengths:

R. A. Smith. Cambridge, University Press, 1949, 218 pp., illus., cloth.

Applied Atomic Power:

Edward S. C. Smith and others. N.Y., Prentice-Hall, 1946. 227 pp., illus., cloth.

Applied Hydrology:

Ray K. Linsley, Jr., and others. N.Y., Toronto, London, McGraw-Hill, 1949. 689 pp., illus., cloth.

Applied Plastic Product Design:

Robert L. Davis and Ronald D. Beck. N.Y., Prentice-Hall, 1946. 285 pp., illus., cloth.

Australian Standard Engineering Drawing Practice:

Institution of engineers, Australia. Sydney, N.S.W., Science House, 1941. 188 pp., illus., cloth.

Basic Refrigeration and Air Conditioning:

Robert Henderson Emerick. N.Y., Prentice-Hall, 1948, 259 pp., illus., cloth.

Beama Catalogue 1949-1950:

British Electrical and Allied Manufacturers' Association, London. Iliffe & Sons, 1949. 852 pp., illus., cloth.

Climate Through the Ages:

C. E. P. Brooks. N.Y., Toronto, McGraw-Hill, 1949. 395 pp., illus., cloth.

Creep of Metals and Alloys:

E. G. Stanford. London, Temple Press, c1949. 162 pp., illus., cloth.

De Laval Handbook:

Austin H. Church and Hans Gartmann editors. Trenton, N.J., De Laval Steam Turbine Co., illus., paper.

Distribution of Deformation:

C. V. Kloucek. Prague, Kloucek, c1949. 510 pp., illus., paper.

Dust in Industry:

Society of Chemical Industry, London, 1948. 175 pp., illus., 1948.

Final Report of Joint Surge Conference:

Middle East, Pipe Lines Ltd., N.Y., 1949. 147 pp., illus., paper.

Foreman's Handbook; 2d ed.:

Carl Heyel, ed., N.Y., Toronto, London, McGraw-Hill, 1949. 463 pp., illus., paper.

Fractional Horse-Power Electric:

E. K. Bottle, London, Griffin, 1948. 209 pp., illus., paper.

Frequency Modulated Radar:

David G. C. Luck. N.Y., London, Toronto, McGraw-Hill, 1949. 466 pp., illus., cloth.

Handbook of Chemistry and Physics, 31st ed.:

Charles D. Hodgman, ed. Cleveland, Chemical Rubber Publishing Co., c1949. 2737 pp., paper.

Heat Transfer; Volume 1:

Max Jacob. N.Y., Wiley, London, Chapman, c1949. 758 pp., illus., cloth.

Industrial Electronics Maintenance:

R. C. Roetger. N.Y., Prentice-Hall, 1947. 190 pp., illus., cloth.

Manual of Spectroscopy:

Theodore A. Cutting. Brooklyn, Chemical Publishing Co., 1949.

Metal Rectifiers:

H. K. Henisch. Oxford, Clarendon Press, 1949. Monographs on the Physics and Chemistry of Materials. 155 pp., illus., cloth.

Methods of Joining Pipe:

J. E. York, N.Y., Industrial Press, c1949. 236 pp., illus., paper.

Modern Diesel:

Oliver Field Allen, N.Y., Prentice-Hall, 1947. 268 pp., illus., cloth.

Modern Timber Engineering; 3d ed.:

W. Fleming Scofield and W. H. O'Brien. New Orleans, Louisiana, Southern Pine Association, c1949. 147 pp., illus., paper.

Municipal Engineer:

L. B. Escritt. London, George Allen & Unwin, c1949. 252 pp., cloth.

Nature of Physical Theory:

P. W. Bridgman. N.Y., Dover, c1936. 138 pp., cloth.

Photography in Engineering:

C. H. S. Tupholme. London, Faber and Faber Ltd., 1945. 276 pp., illus., cloth.

Physical Principles of the Quantum Theory:

Werner Heisenberg, N.T., Dover, c1930. 183 pp., illus., cloth.

Principles of a New Energy Mechanics:

Jakob Mandelker. N.Y., Philosophical Library, c1949. 73 pp., illus., paper.

Radiant Heating; 2d ed.

T. Napier Adlam. N.Y., Industrial Press, c1949. 504 pp., illus., paper.

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Specifications, Tolerances, and Regulations for Commercial Weighing and Measuring Devices; NBS Handbook H44:

National Bureau of Standards. Washington, U.S. Govt. Printing Office, 1949. 144 pp., cloth.

Standard Methods for Testing Petroleum and its Products; 10th ed.:

Institute of Petroleum, London, 1949. 660 pp., illus., paper.

Theory of Groups and Quantum Mechanics:

Hermann Weyl, N.Y., Dover, 422 pp., illus., cloth.

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Transactions; Volume 68, Part I, 1949.

North East Coast Institution of Engineers and Shipbuilders:

Transactions; Volume 65, 1948-49. Index Volumes 53-65.

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American Society for Testing Materials. Technical Publications:

No. 92—Symposium on Lubrication of High-Speed Turbine Gear Equipment.

American Society of Civil Engineers. Manuals of Engineering Practice:

No. 28—Hydrology Handbook, Committee on Hydrology of the Hydraulics Division.

Canada. Forest Products Laboratories. Mimeographs:

No. 0-117—Glued Laminated Construction, D. E. Kennedy. No. 0-132—Catfaces and their Effect on the strength of Telephone Poles, W. E. Wakefield and D. E. Kennedy. No. 0-141—Transpiration Experiment; Observations of Trees Felled and Left With Foliage Intact, D. C. McIntosh.

Canada. Geological Survey:

Bulletin: *No. 12—Jurassic Formations of Maude Island and Alliford Bay, Skidegate Inlet, Queen Charlotte Islands, British Columbia, F. H. McLearn.*

...Memoir: *No. 251—McConnell Creek Map-Area, Cassiar District, British Columbia, C. S. Lord.*

Edison Electric Institute. Tentative Standard:

No. TD-72—Line Connectors and Splices.

Harvard University. Graduate School of Engineering Publications:

No. 471—Experimental Physiology of Amoebiasis, Shih L. Chang. No. 472—Water Power Storage in Maine, Howard M. Turner. No. 473—Non Harmonic Oscillations as Caused by Magnetic Saturation, Reinhold Rudenberg.

Institute of Metals. Journal Reprints:

No. 1182—The System Silver-Magnesium-Tin with reference to the Theory of Ternary Alloys, G. V. Raynor and B. R. Frost. No. 1183—Segregation in Aluminium-Copper Alloys, D. E. Adams. No. 1184—Embrittlement of Tough-Pitch Copper by Bismuth, A. P. C. Hallowes. No. 1186—A Rapid Method for estimating the Hydrogen Content of Wrought Aluminium Alloys, A. J. Swain. No. 1185—Note in a particular Type of Cold-Working of Grains of alpha-Brass by Rolling, J. Schoofs. No. 1187—Phenomenon of Anisotropy in annealed Polychrystalline Metals, A. Krupkowski and S. Kawinski. No. 1188—Metals in Clock and Instrument Manufacture, R. E. Tricker.

Institution of Electrical Engineers. Papers:

Losses in Electrical Sheet Steel, K. W. Stewart. Use of a Miniature Lloyd-Fisher Square for Power Loss Measurements at Audio Frequencies, O. I. Butler. Measurement and Calculation of Pulse Magnetization Characteristics of Nickel Irons from 0.1 to 5 Microseconds, W. S. Melville. Some Properties and tests of Magnetic Powders and Powder Cores, C. E. Richards and others. Laminated Ferromagnetic Cores at very Low Inductions for Use in Line Communication, R. J. Halsey. Some Metallurgical and Structural Factors Affecting Properties of Soft Magnetic Materials, W. F. Randall and H. H. Scholefield. Ferrite Materials, D. Polder. Routine Testing Equipment for Transformer Steels, N. F. Astbury, and others. A Survey of the Possible Applications of Ferrites, K. E. Latimer and H. B. MacDonald. Investigation of the Eddy-Current Anomaly in Electrical Sheet Steels, F. Brailsford. Electricity in *the Cotton Industry, F. W. Cox and W. E. Swale. The Incremental Magnetic Properties of Silicon-Iron Alloys, R. O. Carter and D. L. Richards. Some Considerations in the Design of Negative-Feedback Amplifiers, W. T. Duerdoth. Phase Neutral System of Supply for Rural H.V. Distributors, G. T. Garwood and G. J. Websdale.*

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An Experimental Investigation of Plastic Stress-Strain Relations, J. L. Morrison and W. M. Shepherd. Internal Expanding Shoe Brakes for Road Vehicles, I. M. Waller. The Engineering Implications and Economics of Surface Preparation of Mild Steel Prior to fabrication, W. A. Johnson. Piston Assemblies for Road Transport Oil Engines, J. L. Hepworth.

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Combustion Chambers for Open-Cycle Marine Gas Turbines, R. F. Darling. Steam-Gas Power Plant and Marine Propulsion, R. W. Bailey. What the Shipowner thinks, Sir John R. Hobhouse.

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No. 30—Executive Compensation. No. 30 A—Contributory vs Non-Contributory Pensions.

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No. 1—Petrography and Engineering Properties of Igneous Rocks, Richard C. Mielenz. No. 2—Multiple Correlation in Forecasting Seasonal Runoff, Preey M. Ford. No. 3—Welded Steel Penstocks, P. J. Bier.

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Jos Risi. Quebec, Laval University, 1945.

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Etude de la pénétration de Solutions Aqueuses d'Urée-diméthylolurée dans les Principaux Bois Québécois et de l'influence de ce Traitement sur quelques-unes de leurs Propriétés Mécaniques:

Jos. Risi and L. P. Amiot. Quebec, 1948. (Quebec Province, Laboratoire des Produits Forestiers, Bulletin No. 13).

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John Dando. Montreal, Northern Electric Co., 1949.

Isotopes and their Application in the Field of Industrial Materials:

Paul C. Aebersold. Phila., American Society for Testing Materials, 1948. (Edgar Marburg Lecture).

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Report on the Mining Subsidence and its Effects on Structures:

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Study of Efficiency and Thrust of Conventional Turbo-Jet Propulsor:

Boleslaw Szczeniowski. Montreal, 1949.

Submission of the Province of Saskatchewan to the Royal Commission on Transportation:

Regina, King's Printer, 1949.

Your Audience Has High Hopes:

Willis M. Hawkins. N.Y., Institute of the Aeronautical Sciences.

BOOK NOTES

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BRITISH STANDARDS INSTITUTION. STANDARDS:

London, British Standards Institution, 24-28 Victoria St., Westminster.

B.S. 74: 1949—Charging Plugs-and-Sockets for Electric Battery Vehicles. *2/6.*

This fifth revision of B.S. 74 modifies the details of the 50-ampere size plug-and-socket. These changes include reduction of the withdrawal pull to disengage a plug, the alteration of the position of the fixing flange to meet sockets mounted on vehicle dashboards, and the provision of an alternative means of interlocking an auxiliary switch with the insertion of the plug in a socket.

BS. 487: 1949—Fusion Welded Steel Air Receivers. *3/-.*

The 1939 edition has been extensively revised to make up this edition. The term "Design Pressure" is used throughout. Six constants affecting the thickness of the shell plate are given. Illustrations include large scale typical butt welds and butt weld with backing strip.

B.S. 1137: 1949 — Synthetic-Resin Bonded-Paper Sheets for Use at Power Frequencies. *2/6.*

Allows three alternative types of specimen for determination of tensile strength. Details of suitable grips for holding the specimens in the testing machine are included. An alternative type of electrode (tinfoil) is permitted for determination of power factor at 50 c/s.

B.S. 1543: 1949—Wrought Aluminium Rainwater Goods. *2/6.*

Two grades of gutters, pipes and fittings made from aluminium sheet strip or extrusions are dealt with in this standard. Gutters may be of the half-round or ogee types, pipes being limited to the round type. Valley gutters are dealt with by the specification of the minimum thicknesses appropriate to a range of girths.

B.S. 1557: 1949—Polythene-Insulated Cables Sheathed with Polyvinyl Chloride (P.V.C.) of Lead Alloy. *2/6.*

This specification covers single-, twin-, and three-core, polythene-insulated cables sheathed with polyvinyl chloride (P.V.C.) or lead-alloy for electric power and lighting up to 250 volts. Dimensions and resistances are specified for standard circular copper wires and standard solid and stranded circular conductors.

CHAUFFAGE ET RAFRAICHISSEMENT COMBINES DES HABITATIONS; 2d. ed.:

C. Boileau. Paris, Dunod, 1949. 201 p., illus., 8½ x 5½ in., paper, 650 fr.

The author proposes in this work a technique allowing heating and cooling of buildings with a single installation. The first part deals with the alternate use of heat and cold, the second with a combined production of heat and cold, while the third deals with adaptations to special buildings or conditions.

DIESEL ENGINE DESIGN:

T. D. Walshaw. London, George Newnes, 1949. 448 p., illus., 9 x 6 in., cloth, 35s.

The purpose of the author is to set out the principles underlying the design of compression-ignition engines. Following a consideration of the thermodynamic principles of design and of the chief types of compression-ignition engines, the main section of the book explains the methods and calculations necessary for the detailed design of the various engine components. This exposition of fundamental principles is illustrated by a number of examples of modern designs of representative types of British and American Diesel Engines.

ELECTRIC POWER TRANSMISSION.

M. P. Weinbach. N.Y., Toronto, MacMillan, 1948. 362 p., illus., 9½ x 6½ in., cloth, $5.50 (in Canada).

In this book transmission lines are treated with regard to their circuit properties, their formulae, their equivalent circuits, and their transformers. Other chapters also cover voltage control, steady state power limits, faulted transmission systems, transient stability and system instability. All these problems are treated more or less in detail, to give the student and the practising engineer a wholesome knowledge of the physical phenomena involved and the mathematical processes needed in their solution.

ELEMENTARY MATHEMATICS FROM AN ADVANCED STANDPOINT. VOLUME 2: GEOMETRY.

Felix Klein. N.Y., Dover, 1939. 214 p., illus., 8½ x 6 in., cloth, $2.95.

This second volume (Geometry) is the sequence of a first volume on "Arithmetic, Algebra, Analysis", by the same author. The Author's purpose has been to give a comprehensive view of the field of geometry. The book is divided into three sections: The Simplest Geometric Manifolds, Geometric Transformations, and Systematic Discussion of Geometry and its Foundations.

FAMILY HOUSING:

Deane G. Carter and Keith H. Hinchcliff. N.Y., Wiley, 1949. 265 p., illus., 9 x 6 in., cloth, $4.00.

This book is concerned with housing and house planning as they relate to family living. It is designed as a textbook for college students and as a reference for home economists, teachers and others interested in housing. It contains information on house-planning approach, remodeling, building, buying and financing. Also discussed are construction, materials, equipment and costs.

PATENT LAW FOR THE EXECUTIVE AND ENGINEER.

H. A. Toulmin. Dayton, Ohio, Research Press, 1948. 231 p., illus., 8 x 5½ in., cloth, $2.95.

The aim of the present work is to make the subject of patents readily understandable to the ordinary business man. The more important aspects of patent law, the obtaining of a valid patent, trade secrets, ownership of the invention, worth of patents, and foreign patent protection, are each discussed in separate chapters. Dozens of examples are given, to illustrate important points.

PERSONNEL SELECTION; TEST AND MEASUREMENTS TECHNIQUES.

Robert L. Thorndike. New York, Wiley; London, Chapman, 1949. 358 p., diagrs., 8½ x 5½ in., cloth, $4.00.

This book deals with the technical problems involved in developing a personnel testing program and in appraising its effectiveness, and discusses the administrative problems of maintaining an efficient, smooth-running program with good public acceptance. Certain statistical problems are presented, and about a year's work in statistics is assumed on the part of the reader.

RADIOACTIVITE ET PHYSIQUE NUCLEAIRE.

James M. Cork. Paris, Dunod, 1949. 324 p., illus., 9 x 5½ in., paper, 1350 fr.

Stating both the fundamental results and most recent applications of a fast progressing field, this book makes a survey of our knowledge of the intimate constitution of matter. Historic development as well as recent data is given on natural or artificial radioactivity, transmutations, cosmic rays, fission of heavy elements and other subjects dealing with radioactivity and nuclear physics.

SLIDE RULE.

Lee H. Johnson. N.Y., London, Toronto, Van Nostrand, c1949. 242 p., illus., 9½ x 6½ in., cloth, $3.50 (in Canada).

The purpose of this book is to present a technique of operation for the Duplex slide rule which makes full use of its versatility and efficiency. The technique is based on a new approach to the study of the slide rule and on new concepts of its operation. A chapter on a simpler type of slide rule used by engineers, the Mannheim type, is also included.

TOOL ENGINEERS' HANDBOOK

American Society of Tool Engineers. Edited by F. W. Wilson. New York, Toronto, London, McGraw-Hill, 1949. 2,070 pp., illus., 9¼ x 6 in., cloth, $19.50 (in Canada).

Further to information about this book printed in the December 1949 issue, page 859, of The Engineering Journal:—The Journal wishes to add that the book was prepared by the American Society of Tool Engineers under the editorship of F. W. Wilson, and published for The Society by McGraw-Hill Book Co.

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.

ANALYTICAL MECHANICS OF GEARS.

E. Buckhingham. McGraw-Hill Book Co., New York, Toronto, London, 1949. 546 p., diagrs., charts, tables, 9¼ x 6 in., cloth, $12.10 (in Canada).

This book is an advanced and thoroughly definitive treatise on analytical mechanics of gears with a purely mathematical and analytical approach. It is not a text on the design of gears but a source book providing an outline of all the fundamental relationships that form the foundation of the design of all types of gears. The first chapters give an analysis of conjugate gear-tooth action, nature of the contact, and resulting gear-tooth profiles of the several types of gears. The later chapters give analyses of gear teeth in action. Diagrams and tables illustrates and amplify the text material.

BARRAGES ET CANALISATION.

J. Aubert. Dunod, 92 rue Bonaparte (VI), Paris, 1949. 558 p., illus., diagrs., charts, maps, tables, 11 x 7½ in., cloth, 3200 frs.

Dealing particularly with the problem of the canalization of rivers, this treatise devotes the major amount of space to detailed description of the various types of movable dams which are employed for that purpose. General aspects and a brief treatment of fixed dams precede the main section. Following the main section are chapters on the utilization of dams and locks for canalization and description of a number of major projects in various parts of the world.

BASIC ELECTRONICS.

R. G. Kloeffler with the assistance of M. W. Horrell. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 435 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.00.

Intended as a text for electrical engineering students specializing in power work, this book serves as an introduction to the physics and basic theory of electronic tubes and associated components. The essentials of rectification, amplification, oscillation, modulation and detection are concisely covered. Curves and data of the basic tubes are included. Nine of the seventeen chapters are taken from Professor Kloeffler's "Industrial Electronics and Control".

EXTRAPOLATION, INTERPOLATION, AND SMOOTHING OF STATIONARY TIME SERIES WITH ENGINEERING APPLICATIONS.

N. Wiener. Published jointly by The Technology Press of the Massachusetts Institute of Technology and John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London, 1949. 163 pp., diagrs., tables, 9¼ x 6 in., cloth, $4.00.

Of interest to communication engineers and statisticians, this book represents the first stage of the statistical point of view in communication engineering. It contains the specific problems of the design of linear predictors and linear wave filters. The main ideas of the text are developed in a simpler mathematical form in the appendix.

FIVE-FIGURE TABLES OF MATHEMATICAL FUNCTIONS.

J. B. Dale. Edward Arnold & Co., London; Longmans, Green and Co., New York, Toronto, 2 ed., 1949. 121 pp., tables, 8¾ x 5½ in., cloth, $1.70 (in Canada).

This small book provides tables of logarithms, powers of numbers, trigonometric, elliptic and other transcendental functions. Decimal equivalents, conversion of time and angular measure, and a compilation of special numbers used in calculations are included. The five-figure entry has been used as the most effective for all-around practical use.

FUNDAMENTALS OF CIVIL ENGINEERING.

J. K. Minasian. School of Applied Engineering, 233 So. Broadway, Los Angeles 12, Calif., 1945. paged in sections, 10¾ x 8¼ in., photo offset, stiff paper, $3.50.

Following 16 lectures on the various phases of civil engineering covered by the California State Board of Registration are 107 practice problems. The appendix contains copies of the examinations given from May 1945 through June 1948. The Riley Bill and other local regulations are given.

GEOLOGY FOR ENGINEERS.

J. M. Trefethen. D. Van Nostrand Company, Toronto, New York, London, 1949. 620 pp., illus., diagrs., charts, tables, maps, 9¼ x 6 in., cloth, $6.50 (in Canada).

This book presents certain fundamentals of geology which will provide engineers with the basic knowledge they need for their work and to enable them to use the geological investigations of others. Courses in physics, mechanics and surveying are required prerequisites. Geological structures, subsurface water, earth movements, and shorelines are among the important topics considered. An extensive mineral-identification table appears in the appendix.

HISTORY OF THE DEVELOPMENT OF BUILDING CONSTRUCTION IN CHICAGO.

F. A. Randall. University of Illinois Press, Urbana, Ill., 1949. 388 pp., illus., tables, 10½ x 7 in., cloth, $5.00.

This book is a detailed history of the structures, the foundation engineering and construction methods of the buildings in the 'Central Business District" of Chicago. Since all buildings could not be described minutely, liberal reference is made to other sources of description and illustration. A chronological arrangement is used.

SYMPOSIUM ON INDUSTRIAL GEAR LUBRICANTS. (Technical Publication No. 88):

American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 1949.

21 pp., illus., diagrs., tables, 9 x 6 in., paper, 75c.

The three papers presented cover studies of various field problems, as follows heavy duty gear oils; gear lubricants used in steel (plants); and gear set servicing by the cathode ray oscilloscope.

STRUCTURE AND PROPERTIES OF ALLOYS.

R. M. Brick and A. Phillips. 2 ed. McGraw-Hill Book Company, New York, Toronto, London, 1949. 485 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.30 (in Canada).

This revision of a widely known text has been expanded to include a large amount of new material, the discussion of additional alloys in existing chapters, the expansion of certain sections, and the addition of new chapters on magnesium alloys and on corrosion- and heat-resistant steel alloys. The general approach of the first edition has been retained—the correlation of phase diagrams, structures, and properties of alloys, proceeding in order from the simplest alloys to the most complex.

TV PICTURE PROJECTION AND ENLARGEMENT:

A. Lytel. John F. Rider Publisher, Inc., 480 Canal St., New York, 1949. 179 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $3.30.

Intended for the serviceman as well as for the student, this book presents detailed treatments of the Schmidt projection system, of commercial television receivers which utilize modifications of the Schmidt system, and of refractive projection systems. Dark-trace systems are briefly dealt with, the principles of light and of lenses are explained, and a comparison of TV with motion pictures is presented in the final chapter.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

BIBLIOGRAPHIC SURVEY OF CORROSION 1945, a Compilation of Corrosion Abstracts:

R. D. Misch, J. T. Waber and H. J. McDonald. Corrosion Research Laboratory, Illinois Institute of Technology, Chicago, Ill. Publ. by National Association of Corrosion Engineers, 905 Southern Standard Bldg., Houston, Texas, 1948. 129 pp., 11¼ x 8¼ in., cloth, $5.00.

The abstracts included in this survey are divided into two main classes, general material and patents, each classified into nine main groups: types of attack; investigations in corrosion; effects of specific media; effects in specific equipment; resistance of materials; methods of prevention; coatings; removal of corrosion products; general and miscellaneous, including books. References included have been taken from the 1945 issues of the six principal indexing services covering the field. A detailed subject index and an author index are included.

BUSINESS PLANNING AND CONTROL:

F. H. Rowland. Harper & Brothers, New York, 1947. 337 pp., diagrs., charts, tables, 8½ x 5½ in., cloth, $4.00.

Using as a background his experience as a consultant to many corporations, the author considers the problems which face top management today, and analyses the essentials of modern business organization and control. The first half of the volume outlines the factors in product selection, market forecasting, sales methods, and production plans. Specific techniques of budgetary control, organization procedures, and personnel policy are considered in the second half.

INTRODUCTION to the ELECTRON THEORY of METALS. (Institute of Metals Monograph and Report Series No. 4):

(Institute of Metals Monograph and Report Series No. 4.)

G. V. Raynor. Institute of Metals, 4 Grosvenor Gardens, London, S.W.1, England, 1947. 98 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, 7s. 6d.

Written for the metallurgists who have not had recent training in physics, this text gives a picture of the development of the electron theory of metals. It outlines some of the ideas which lie behind the theory, and indicates its applications to physical metallurgy and the properties of metals. References to both general and specific topics are included.

MODERN DIESEL:

Edited by G. G. Smith, revised and rewritten by D. H. Smith. 11th ed. Iliffe & Sons, Ltd., London, Birmingham, Coventry, Manchester and Glasgow, 1949. 277 pp., illus., diagrs., charts, tables, 7 x 4¼ in., cloth, 7s. 6d.

Diesel theory, fuel-injection systems, cylinder-gear design, fuel and lubricants are dealt with in the first half of the book. The remainder is devoted to specific descriptions of engines in current production in Great Britain, the United States, and the major producing countries in continental Europe. Engines for highway, railway, marine and aircraft service are covered.

MOULDS FOR PLASTICS:

W. M. Halliday. Publ. by English Universities Press, Ltd., for Temple Press, Ltd., London, 1948. 259 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, 30s.

Meeting the needs of both mold designer and tool maker, this book deals with the varied and numerous problems associated with mold designing, construction, operation, and efficient maintenance. A number of illustrations of preferred design forms of the basic mold elements are included.

ORGANIC COATINGS IN THEORY AND PRACTICE:

A. V. Blom. Elsevier Publishing Co., New York, Amsterdam, London, Brussels, 1949. 298 pp., illus., diagrs., charts, tables, 10¼ x 6¾ in., cloth, $6.00.

The intention of the author has been to detail the considerable progress of the last two decades in the fundamentals of organic coatings, film-forming materials, chemical and physical film formation, pigments, and coating film properties. The comprehensive coverage includes a wide variety of materials with their constitution and characteristics. Some testing methods are given, and there is a selected list of important fundamental books.

PROGRESS AND PHYSICAL METALLURGY:

J. E. Garside. Charles Griffin & Company, Ltd., London, 1949. 499 pp., illus., diagrs., charts, tables, 9 x 6 in., cloth, 40s.

Written from the viewpoint of the user of metals and alloys, this book gives an account of some of the chief aspects of process and physical metallurgy. Methods of fabrication, fuels, refractories, furnaces, molding materials, and the various processes of mechanical deformation of metals and alloys are dealt with fully. Iron, copper, light metals, nickel, lead and zinc are considered as well as their alloys. Numerous illustrations and tables are included.

SIMPLIFIED GRAPHICAL DISTRIBUTION OF MOMENTS IN RIGID FRAMES:

A. A. Eremin. The author, 1541-37th St., Sacramento 16, California. Diagrs., charts, tables, photo offset, 11 x 8½ in., paper, $3.00.

The method presented in this pamphlet is similar to that in the author's previous book on the "Analysis of Continuous Frames". Various improvements have, however, been made. The diagrams have been rearranged, and the graphical constructions have been classified by solving the numerical examples from practice.

WORK OF THE SANITARY ENGINEER, based on original work by A. J. Martin:

Rewritten and enlarged by L. B. Escritt and S. F. Rich. Macdonald & Evans, London, W.C.1, 1949; available through American Agent, Edward W. Sweetman, 1 Broadway, New York 4, N.Y.; 689 pp., illus., diagrs., charts, tables, 10 x 6 in., cloth, 42s.

Intended equally for the practical designer, the administrator, and the student, this British textbook presents detailed, practical information on water supply, building sanitation, sewerage and land drainage, sewage treatment and disposal, and public cleansing. In view of the importance of legal and administrative knowledge to those concerned with municipal work, a 60-page section has been included covering these aspects

THREAD GRINDING AND MEASUREMENT.

A. C. Parkinson and W. H. Dawney. Sir Isaac Pitman & Sons, Ltd., London, and Pitman Publishing Corp., New York, 1949. 227 pp., illus., diagrs., charts, tables, 8¾ x 5¼ in., cloth, 21s.

This book serves as a text for beginners as well as a reference work for more experienced personnel on both the production and inspection sides of thread-ground work. Thread terms and definitions have been classified and explained in detail, the same applying to limit systems in general and their special applications to screw threads, worms, and hobs. In regard to thread measurement, a fairlyconsiderable amount of space is devoted to the wire methods. A group of useful tables is included at the end.

ULTRASONICS.

B. Carlin. McGraw-Hill Book Company, New York, Toronto, London, 1949. 270 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.00.

This book deals with the many engineering aspects of the ultrasonic field, including the vital theory as well as a great deal of practical information. Electronic considerations and outlines of circuits are specifically reviewed, and mechanical and electrical design of ultrasonic systems are discussed. Particular features are the information on testing materials, agitation, ultrasonic transducers, and ultrasonic systems. The interesting work being done in biological, physical and chemical fields is presented.

BUSINESS & INDUSTRIAL BRIEFS

A Digest of Information received by The Editor

New Equipment and Developments

U.K. Television. — The world's most powerful television station was opened iu the United Kingdom on Saturday, December 17th. This new transmitter will add another six million potential users to those now viewing the regular daily programmes trausmitted from London. Situated some ten miles north of Birmiugham it has been planued by the B.B.C.'s engineers aud is entirely equipped with apparatus of British design and manufacture. The tallest mast yet built in Britain supports combined television and sound aerial. It is 750 ft. high and weighs about 140 tons. When working at full power the transmitter has an output of 35 kilowatts and the heat generated by the equipment is used to warm the building in cold weather.

World Power Conference. — Experts from many nations will assemble in Britain next summer to discuss how to use world sources of energy to best advantage. They will exchange views at the World Power Conference to be held in Loudon duriug July. Representatives of The Engineering Institute of Canada will attend.

Balanced By-pass. — Eco Engineering Company, 12 New York Ave., Newark, N.J., announces the Eco built-in hydraulically balanced by-pass.

With this balanced by-pass, the Eco pump, when acting as a booster pump for city water, delivers a constant volume of water at constant pressure, regardless of any variation in the pressure of the city water lines. For further information write to the manufacturer.

New Ship.—On December 15th the new lighthouse tender and buoy vessel the S.S. " Edward Cornwallis ", designed by German & Milne and built by Canadian Vickers Limited, for the Department of Transport, left Montreal for Halifax where she will be stationed.

Electrical Insulation. — " Quinorgo No. 4,000 " is the name of an electrical insulation which has been added to the line of Johns-Manville products for the electrical trade. It has been specifically developed for use as a Class B (hot spot temperatures to 130C) electrical insulating carrier sheet to be combined with other electrical insulating sheets or films.

Basically, this new Quinorgo No. 4,000 is the same as Quinorgo No. 3,000 introduced last year. Both contain 80 per cent, or more, specially purified and processed asbestos fibres, the remainder being organic fibres and binders. The difference between them is in penetration characteristics. Quinorgo No. 4,000 contains a small amount (3 per cent or less) of resin not present in Quinorgo No. 3,000. This resin used with Quinorgo No. 4,000 reduces absorption and penetration.

Quinorgo No. 4,000 is available in continued rolls in widths up to 36 ins., and in sheets cut to size. The manufacturers will be pleased to supply further pertinent data.

Stud Welder. — The establishment of the Nelson Stud Welding Company of Canada, Limited, with manufacturing facilities in Toronto, has been announced by the Nelson Stud Welding Division of Morton Gregory Corporation and its recently appointed Canadian distributor, the Rudel Machinery Company Limited.

Richard O. Blankmeyer, Nelson field engiueer who handled Canadian sales prior to the appoiutment of Rudel, is continuing as co-ordinator of customer service activities of the two organizations in Canada.

Western Steel Warehouses.—Two new offices and warehouses for the distribution of steel to meet the needs of rapidly expandiug industry in western Canada were opened by Atlas Steels Limited on January first. They are located at Vancouver, B.C. and Winnipeg, Man.

A full line of Atlas steels will be warehoused in these new premises. All personnel in both Winnipeg and Vancouver are mill-trained specialists from the Welland, Ontario, plant of the company. The Vancouver office and warehouse is located at 714 Cambie St., A. D. Harding is the manager. The Winnipeg premises are located at Ellice Avenue and Berry Street. Alex. W. Gerrard is the manager.

Odourless Paint. — Spielman Agencies Limited, 420 Lagauchetiere St., West, Montreal 1, are Canadian agents for Valdura No-Odor finishes. It is claimed that the manufacturer has removed paint odour from this new type of oil wall paint.

Nickel Sales. — Speaking at Copper Cliff, Ontario, on December 15th, Robert C. Stanley, chairman of the board of directors of The International Nickel Co. of Canada, Limited, said " Total world consumption of Canadian nickel in all forms for the year 1949 is expected to be about 15 per cent lower than in 1948, when a new high peace-time record was established ".

French production of nickel showed an increase over the preceding year although it was relatively small as compared with Canadian production. Most of the French output comes from mines in New Caledonia. The nickel mines in Cuba are closed and no production was reported from that Country; and Russia continues to produce nickel but is not releasing any information on output. Mr. Stanley said, also, " The United States again was the largest consumer of Canadian nickel, with approximately 65 per cent of the total being used in that Country. Consumption in the United Kingdom was about 20 per cent. These two countries with Canada accounted for approximately 88 per cent of consumption. The remainder went to other countries throughout the world. The United States price of nickel continued unchanged throughout the year. Other world prices were adjusted at the time of the currency devaluation in September to retain parity with United States prices.

Measuring Heat Radiation. — Heat-O-Meter, 424 West 42nd St., New York 18, N.Y., has announced that a new calculating dial is available for measuring radiation on steam and hot water heating systems.

Canso Bridge. — On December 9 the Hon. Lionel Chevrier, Transport Minister, stated in the House of Commons, that the Government hopes to be in a position by March, 1950, to call for tenders for the construction of a bridge across the Strait of Canso, connecting the mainland with Cape Breton Island, N.S.

He said that borings have been completed and no difficulties are anticipated, but a great deal of preliminary work remains to be done. The matter of co-ordinatiug the work is in the hands of the Canadiau National Railways and a department of the Nova Scotia Government.

U.K. November Exports.—British exports to Canada in November, 1949, were about $7,500,000 as compared with $6,400,000 in October.

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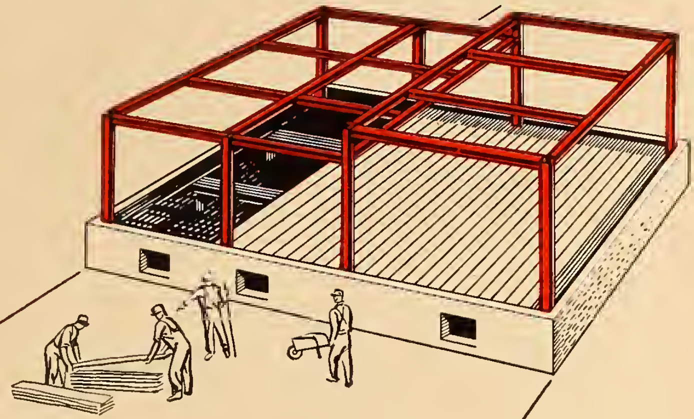
Small buildings . . .



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Calgary

Surveying School. — The Nova Scotia Department of Education has opened, at Lawrencetown, Annapolis county, what is believed to be the only full-time school of surveying in Canada. The school now has ten students and shows signs of developing into something considerably larger.

The school offers in the short space of one year a concentrated course in land surveying. E. K. Ford, provincial director of vocational education, says that there is a prospect that a post-graduate course in aerial surveying will be given at the school when the first class finishes the regular course.

Standards for Plastic Tiles.—A recommended commercial standard for polystyrene plastic wall tiles and adhesives for their application, has been submitted by the Commodity Standards Division of the National Bureau of Standards (U.S.), to manufacturers, distributors, users and other interested groups for their consideration and acceptance.

This recommended standard establishes a minimum standard of quality through approved methods of test, materials, requirements for workmanship, tolerances, thickness, opacity, internal stress, colourfastness and other details of manufacture, which should insure a satisfactory product for wall or ceiling installation in private or multiple-unit dwellings as well as for commercial, industrial and other types of building where a non-absorbent, sanitary surface is desired. A limited number of mimeographed copies of the recommended standard are available. Apply to the Commodity Standards Division, National Bureau of Standards, Washington 25, D.C.

Canadian Economy.—According to information issued by the Canadian Manufacturers Association, manufacturing now accounts for over half the total net value of national production in Canada.

In 1939, manufacturing accounted for 41 per cent, and 25 years ago for 32 per cent of the national production. Since 1945 there has been a diversification and expansion of the manufacturing industry equalled in no other peace-time period in Canada's history. This process is still in progress and the government's figures covering the gross value of manufacturing production in 1948 show a growth of $11,800,887,000, an increase of nearly one and three-quarter billion dollars, or 17 per cent over the preceding year.

Gains were registered for each of the nine main groups of industry, the largest dollar advance being shown by the iron and its products section, while the largest percentage rise was shown by the non-metallic minerals group.

New Die Metal.—Deloro Smelting and Refining Co. Limited, has developed a new permanent die material for casting brass parts which will withstand both the heat and wear of service. In this development, they have produced a die alloy that will not surface check in service and which is designated as "Deloro Stallite Grade 8".

The new development affects all types of foundry work wherever long runs of a size are required, where long die life is important to speed up production and where it is an advantage to have all castings uniform to size. Once a pattern for the Stellite die has been provided, costs are reasonable and the total die cost per unit casting produced is lower than with present dies or moulds.

Air Pressure Gauge.—A new development in the measurement of air pressure has been introduced by F. W. Dwyer Mfg. Co., 317 South Western Avenue, Chicago, Ill. The device is known as the "Magnehelic" Gauge. It is said to be extremely sensitive, responding to the slightest pressure changes. According to the manufacturer, it is unusually efficient in checking furnace draught, testing filter resistance in ventilators and air conditioning equipment, measuring static pressure and air deliveries of fans and blowers, air velocity measurement from 400 f.p.m. to 10,000 f.p.m., and for checking the operating efficiencies of such equipment as dust collectors and processing systems using air.

The Canadian distributor is Frederick C. Baker & Co., 229 Yonge St., Toronto, Ont.

Fire Alarm System.—A new fire alarm system, including among its many features a phonalarm system was put into operation in Calgary in December. The new system was designed, engineered and installed by the electronics division of the Northern Electric Co. Limited.

The City's eight fire stations are connected to the central office over three separate circuits; the primary alarm, the secondary alarm, and phonalarm loud-speaking communication system. The last-named means of communication may be used to supplement alarms transmitted from the central office to give specific verbal instructions to the fire station. It speeds up, immeasurably, transmission of verbal instructions, such as orders of the day, emergency routes, which were formerly sent by telephone.

New Rheostat.—A plate-type rheostat from Canadian General Electric's Control Division.

The new rheostat is furnished in three forms: the 6-inch form (27 resistance divisions), the 9-inch form (52 resistance divisions), and the 12-inch form (70 resistance divisions). All three forms are available immediately.

The rheostat is specifically designed for field control of d-c shunt- or compound-wound motors, self excited generators, exciters, separately-excited generators and synchronous motors. Consequently it is suitable for use in paper, textile, machine tool, machinery, and wood-working industries as well as by rotating equipment builders and motor generator manufactuers. Further details may be obtained from any C.G.E. office.

●

Geiger Counter. — Electronic Equipment, room 220, 26 Queen St., East, Toronto, Ont., announce the development of the "ƎE" Counter for Detecting and Measuring Radioactivity. The counter weighs under 5 lbs. and measures only 10 in. by 7 in. by 2½ in. The two batteries 1½ volts and 45 volts are standard and replaceable in the field. The current drain of the conventional counter is halved. A high quality standard Geiger tube is used. Operation is extremely simple, no probe is needed. The instrument is guaranteed for one year against defective materials and workmanship.

●

U.K. Coal Here.—The Tyne (U.K.) has entered the dollar market with its coal by arranging to send a shipment of 8,500 tons to Canada during January. This is the first coal to go from the Tyne to Canada since before the war.

●

New Pulp Mill. — Work on the construction of the dissolving pulp mill of Columbia Cellulose Company, Ltd., on Watson Island, near Prince Rupert, B.C., is several weeks ahead of schedule according to Charles H. Klotz, resident engineer.

●

Sodium Benzoate. — Food processors will be interested to learn that now they can obtain Sodium Benzoate made in Canada. At their Montreal plant Monsanto (Canada) Limited are producing both powder and flake forms identical in purity and uniformity, B.P. formula. Technical data and samples are available on request.

●

New Fluorescent Lamps. — General Electric's Lamp Department announced recently in New York that, after a great deal of research, it has developed new fluorescent lamps which, for the first time, bring out the "full beauty" of all colours, and are complimentary to people's complexions.

Described as the most important fluorescent lamp improvement since the introduction of fluorescent lighting in 1938, the two new lamps were said to have been made possible by the development of a special fluorescent powder, designated the "DR" phosphor. The company plans to make these new lamps available as early as possible in 1950. Details may be obtained from the Canadian General Electric Co. at 27 King St., W., Toronto.

●

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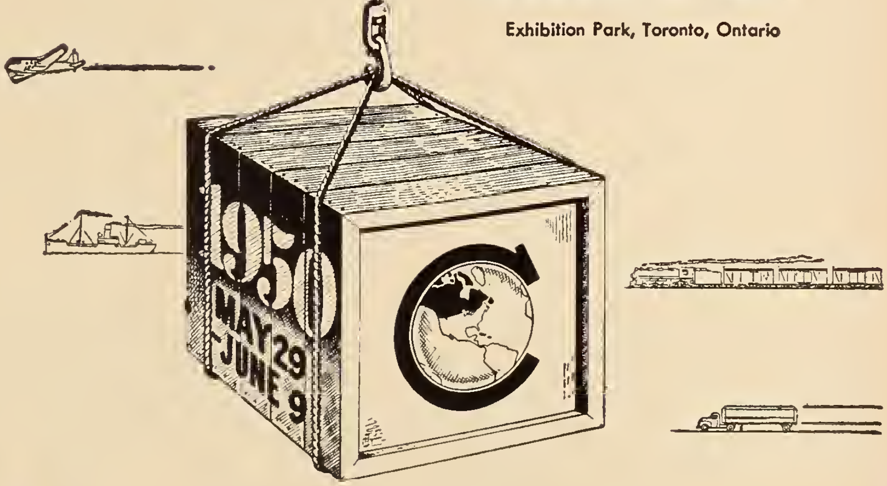
THE ADMINISTRATOR
CANADIAN INTERNATIONAL TRADE FAIR
Exhibition Park, Toronto, Ontario



Canadian International Trade Fair

MAY 29—JUNE 9, 1950 TORONTO, ONTARIO

DEDICATED TO THE PROMOTION OF INTERNATIONAL TRADE BY THE GOVERNMENT OF CANADA

Chain Saw Sharpener. — The Dumore Company, Racine, Wisconsin, announces a new medium-priced, heavy-duty hand-grinder for sharpening logger, contractor and maintenance chain saws. Equipped with a 1/10-h.p. motor, the sharpener runs on 115 volt a-c or d-c. The sharpener is reasonably priced. For further information communicate with the manufacturer.

●

Portable Compressors.—Gardner-Denver Company, announce a new line of trailer-mounted portable compressors designed for operating small air tools on miscellaneous service jobs. Their capacity is ample for operating paint spray guns, chipping hammers, light paving breakers, spaders, tampers and similar pneumatic equipment.

These trailer-mounted units are furnished complete — the air-cooled compressor, with V-belt drive to gasoline engine, mounted on a sturdy pipe tank type base. The units are equipped with semi-pneumatic rubber tired roller bearing wheels, drawbar, trailer hitch and stabilizer leg. Three sizes are available, and all units are carefully balanced for one-man handling.

●

Shoulder Retainer.—What is claimed to be the only shoulder maintainer on the market was announced recently by the Lull Mfg. Co. of Minneapolis. This new road tool, designed for the maintenance of road shoulders beyond the pavement, is equipped with a unique patented automatic windrow eliminator.

The maintainer is available in 8, 10, 12 and 14 foot sizes. The address of the manufacturer, is 3612 East 44th St., Minneapolis 6, Minnesota.

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C. M. Lovsted & Co. (Canada) Limited, Vancouver

Appointments and Transfers

A. H. Frampton. — A. H. Frampton, formerly general manager of the English Electric Co. of Canada Ltd., St. Catharines, has been appointed vice-president and general manager of the Company. Mr. Frampton has also been elected to the Company's board of directors.

Superheater Co. Appointment. — The products of the De Laval Steam Turbine Co. of Trenton, N.J., will be sold and serviced in eastern Canada by the Superheater Co. Ltd. of Montreal. De Laval products include turbines, pumps, gears and compressors.

●

M. R. Robitaille. — M. R. Robitaille, Montreal, has been appointed Quebec sales manager for John Inglis Co. Ltd. Mr. Robitaille has had 20 years' experience in the sale of electrical appliances.

●

Grant Mitchell. — Grant Mitchell has been appointed chief engineer of the car division of the Canadian Car & Foundry Co. Ltd. Mr. Mitchell is a graduate of Queen's University.

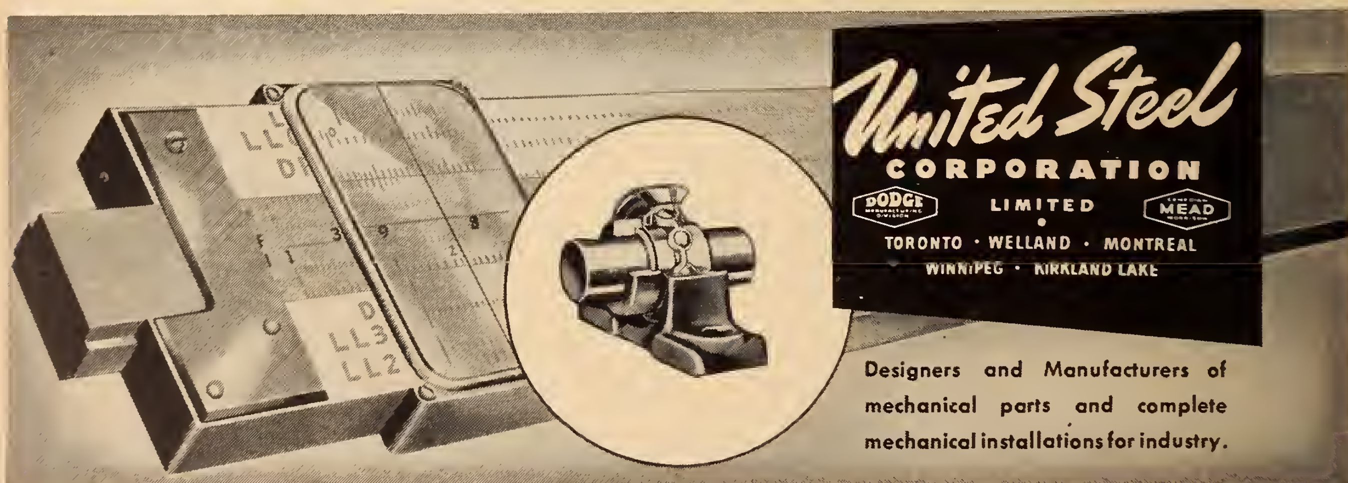
●

Burlington Steel. — Frank P. Wood, chairman of the board and George A. Morrow, vice-president and director, tendered their resignation at a recent meeting of the board of directors of the Burlington Steel Co. Limited. Two appointments have been made to fill the vacancies arising from these resignations. Graham Morrow, O.B.E., has been appointed a vice-president and director, and Robert S. Hart will serve as a director.

●

D. M. Smith.—Air Vice-Marshal D. M. Smith, C.B.E., of New Westminster, B.C., has been appointed a member of the board of directors of Canadian Arsenals Limited.

●



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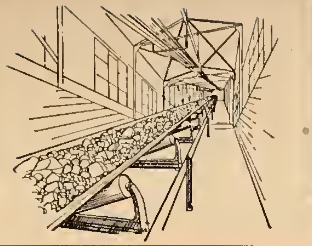

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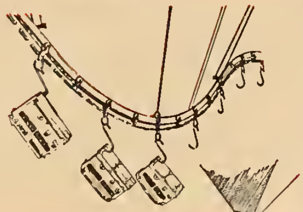

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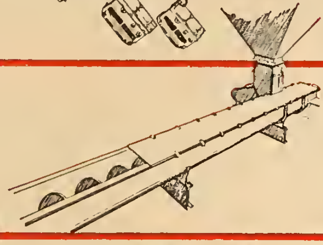

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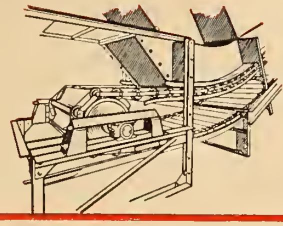

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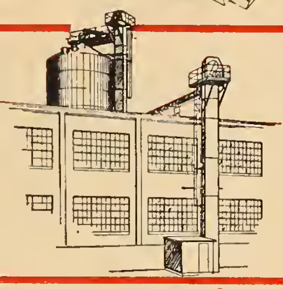

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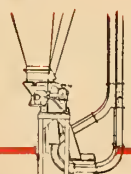

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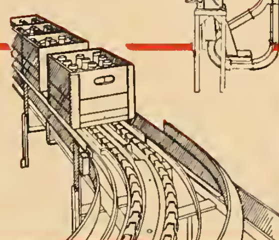

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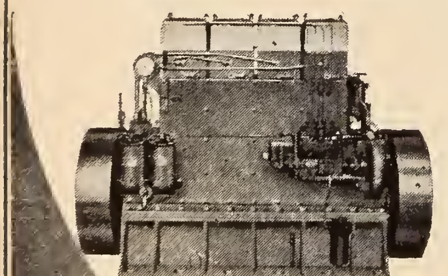

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"Castalloy".—Canada Iron Foundries Limited, 921 Sun Life Building, Montreal, Que., has released a thirty-page two-colour bulletin "Castalloy". This profusely illustrated publication describes an alloy cast metal which has been produced exclusively by the Company for many years. Many outstanding properties are claimed for this product. Copies of the publication will be forwarded on request.

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Barrett Publications. — The Barrett Company Limited, 5551 St. Hubert Street, Montreal, has available copies of many excellent publications. Among these are: "A Colour Guide and Specification Sheet for Asphalt Shingles and Sidings"; "Plan for Waterproofing and Damp-proofing" (which describes causes and cures for dampness); "Rock Wool Insulation"; "Everjet Elastic Paint"; "Elastigum Cement" (in which is described a general utility bituminous coating and cement for repair and maintenance); "Carbosota" (in which is described a coal-tar creosote oil prepared for wood protection); "Eternium Paint" (an acid and alkali-resisting protective coating for metal, wood and masonry). Any of the above mentioned publications will be forwarded to readers of the *Journal* on receipt of request.

•

Steel Joists. — Dominion Bridge Company Limited, P.O. Box 280, Montreal, Que., has published a well illustrated booklet "DB Long Span Joists". The bulletin has been produced to describe all-welded steel joists, developed by the Company, to provide economy in the construction of buildings with long, clear, spans. The features of the joists are described and a uniform load table is given. Copies are available.

•

Flue Gas Control.—Thermix Engineering Company, Greenwich, Conn., offers an eighteen-page condensed catalogue — No. 200, in which is described the Company's fan-stacks, fans, tubular dust collectors, duplex dust collectors, multicyclones, and recirculators, for flue gas control.

•

Welding Magazine.—"Dominion Oxygen Tips" is the name of a publication produced by the Dominion Oxygen Co. Limited, 159 Bay Street, Toronto 1, Ont., for the benefit of those who are interested in the development of welding techniques. Now in its twenty-fifth year, this publication is highly regarded by all who receive it. *Journal* readers will be placed on the mailing list on receipt of request.

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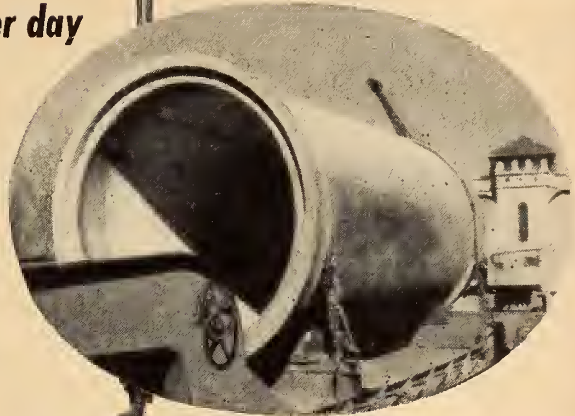

Constructing a new intake to provide water for 1,400,000 Montrealers is a sizable job — an important job, where choice of materials is determined on the basis of over-the-years dependability. That is why concrete was selected for building Montreal's new water intake at Ville LaSalle.

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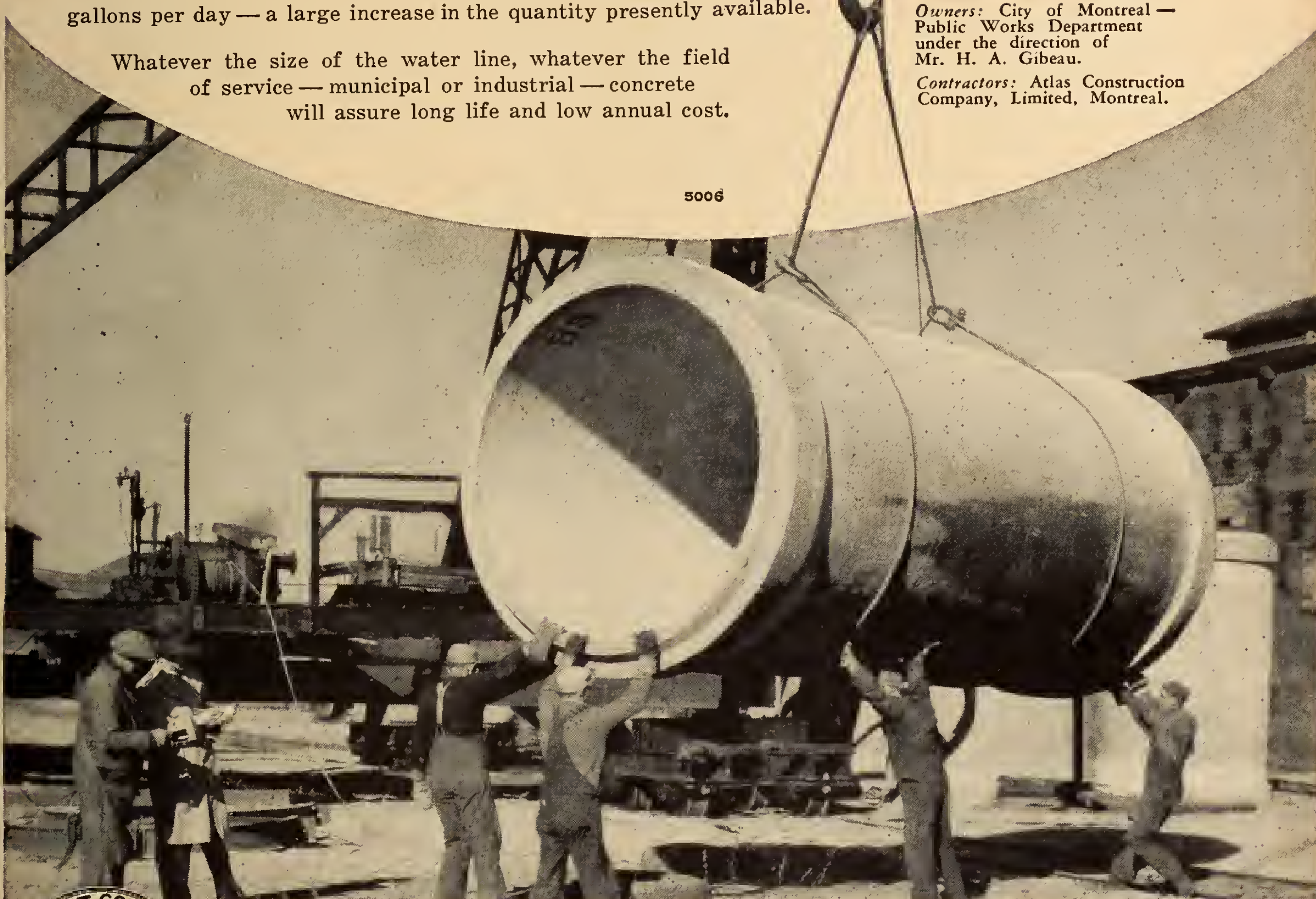

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A copy of this booklet, which contains much data, may be had by writing to the publisher, The Master Builders Co., Cleveland, Ohio.

●

Welding Manual. — Dominion Oxygen Co. Limited, Toronto, offers a 208-page (6 in. by 9 in.) Welding and Cutting Manual. This new handbook on the oxy-acetylene process should be useful as a reference and instruction book for anyone who does welding and cutting. The style is simple and easy to read and instructions are given in step-by-step photographs of actual repair jobs.

The book is written primarily for the repairman, and maintenance man, but it contains hints, shortcuts, and instructional material which will help any welding operator to do a better job. The price is $2.00.

●

Fluid Drives.—Link-Belt Fluid Drives are featured in a new 28-page catalogue and engineering data book No. 2385 released by the Link-Belt Limited, Eastern Avenue at Leslie and Keating Streets, Toronto 8. This publication replaces earlier Company catalogues on this subject.

●

Gear Catalogue.—Hamilton Gear and Machine Co. Limited, 950 Dupont St., Toronto 4, have produced a 48-page catalogue, punched for ring binding, entitled "Helical Gear Units Single and Multiple Reduction with Parallel Shafts". This handy volume should be of extreme use to engineers who are interested in helical gearing, because every page is filled with important data. Ask for Bulletin No. 113.

●

Fluorescent Materials.—To aid in the study of fluorescent materials, the search for new phosphors, and the design and manufacture of light sources, a new colour-sensitive instrument called a "recording spectroradiometer" is available from C.G.E. Special Products Section.

This new device breaks up a light beam from any source into its spectrum, measures the relative spectral energy at each wave length, and makes a permanent record of the measurements in the form of a graph. Theoretically, the recording spectroradiometer is capable of making an indefinite number of different graphs. Additional information about this new C.G.E. product is contained in Bulletin G.E.C.-604. For copies apply to the Canadian General Electric Company, 212 King Street West, Toronto 1.

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Geological Survey. — A geological reconnaissance of the Peribonka River from Passe Dangereuse northward to Lake Onistagan is described in Geological Report 39 of the Quebec Department of Mines. The survey was carried out by S. H. Ross for the Geological Surveys Branch of the Department.

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Copies of the report are available, on request, from the Deputy Minister, Department of Mines, Parliament Buildings, Quebec.

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Stainless Steel. — The Carpenter Steel Co., Reading, Pa., announces a new chrome-nickel austenitic stainless steel which, they claim, "has made practical the economical production of parts which have been classed as impossible jobs". It is also claimed that this new material work-hardens much slower than the conventional 18-8 types of stainless, and is, therefore, well suited for the fabrication of fastenings and similar parts by drastic cold heading or upsetting. The name assigned to the steel is Carpenter Stainless No. 10. The analysis, made by the Company, is — Carbon 0.08 per cent max., Chromium 16.00 per cent, Nickel 18.00 per cent. A bulletin describing the new steel and giving its properties and uses is available.

●

Discharge Mixer. — Chain Belt Company, Milwaukee, Wis., has released Bulletin 49-13 in which is described an adjustable discharge mixer of new type and design.

●

"Northern Circuit".—"Northern Circuit" is the title of a quarterly publication produced by the Northern Electric Company, Limited, 1600 Notre Dame St., West, Montreal. It is a well produced, well illustrated, publication of a semi-technical nature and recommended to those who are interested in semi-technical literature.

●

Export Trade. — *"Foreign Trade"* is the title of a weekly publication published by the Foreign Trade Service of the Department of Trade and Commerce, Ottawa, Ontario. It may be obtained for the nominal charge of $1.00 per year. Address subscriptions and orders to — The King's Printer, Government Printing Bureau, Ottawa.

In the November 19th issue there is an excellent article dealing with Canadian marine radar equipment. The "Queen Elizabeth", "R.M.S. Caronia", "Empress of Canada", the "Lady Ships", and many other well known vessels are carrying radar equipment of Canadian manufacture.

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14,050 copies of this issue printed

WHAT PRICE ENGINEERS?

by

K. F. Tupper, M.E.I.C.

Dean of the Faculty of Applied Science and Engineering,
University of Toronto, Toronto, Ont.

A paper presented to the Toronto Branch of the Engineering Institute of Canada on October 20, 1949.

It is my intention this evening to discuss some of the factors bearing on the remuneration of professional engineers, with special emphasis on the operation of the economic law of supply and demand.

I choose this topic for one good reason. We hear a good deal these days about the effects on the engineering profession of the very large numbers of young men — mostly veterans — who have proceeded through our engineering schools and obtained degrees. Personally, I am not the least bit apprehensive about the effect of this influx, and I would like to tell you why.

Validity of the Law of Supply and Demand

To begin with, I should say that I agree that an engineer's services are a commodity; they can be bought, they can be sold. Beyond any question of doubt, when the supply is limited the price tends to rise, and vice versa. Many of you will remember very clearly the condition that prevailed during the war years. It was one of my tasks, during that period to recruit engineering personnel for work on new war projects. At the time, practically every engineer was employed and there were lots of vacancies.

Suppose, for the sake of the argument, that you are the one and only engineer seeking employment under these conditions. You shop around and discover jobs at all sorts of prices, with probably a factor of two between bottom and top prices. Salary alone does not dictate your choice as you are interested in the kind of work, the future outlook, the location, and many other factors. But salary is an important factor and no doubt the job you accept carries a salary toward the high end of the range. Soon the employers who were offering low salaries realize that they are unable to fill their jobs at their offered price. But they must fill the jobs as the work is vital to them and must proceed. So they raise their offer until their price is competitive and they are able to get men.

You will remember the internal consequences of this rising market. Joe Brown has just been hired—so far the firm does not know how good Joe is. He is an unknown quantity, unfamiliar with the firm's procedures and policies, and new to the particular job he will do. He is assigned to a small group

There have been indications of concern among engineers over the effects of the great numbers of young men graduating into the profession each year from our Canadian Universities.

In this paper Dean Tupper considers the problem and it is significant that he begins with an admission that the law of supply and demand is fundamental to the discussion. He refers to the influence of specialization and adaptability and considers the present and estimated future size of the engineer population. The paper concludes with a discussion of engineers' remuneration.

headed by Tom Smith. Tom has been with the firm three years and has a lot on the ball. Tom started when salaries were much lower, and although he has had two modest raises his present salary is a few dollars less than the price the firm had to pay to get Joe. So we have a characteristic type of salary anomaly to be found in a rising market, an inversion at the bottom end of the salary structure. It may be possible for the firm to carry on for a while with some of these anomalies. At first the men do not know what others get. But sooner or later the operation of the " grapevine " spreads the news and unpleasant consequences start to develop. Eventually, it becomes necessary for the firm to make an upward revision of its whole salary structure to reach equilibrium with the new market condition.

Gentlemen, I assure you the laws of supply and demand operate with great effectiveness in the matter of engineers' salaries.

Influence of Specialization and Adaptability

The next point I would like to make deals with specialization. I will not define specialization as I propose to use the word, but I will give a hypothetical example which I think will serve to illustrate. Let us suppose a man is trained as a mechanical engineer. His first employment is with a firm making only gears, geared speed reducers, and geared drives. He soon lands in the design department and spends about ten or twelve years in the single kind of work, the design of gears. He is now highly skilled and can produce very successful designs. It happens that (let us say) there are only ten firms actively engaged in gear design in the whole of eastern Canada. Now a deficiency or a surplus of even a single man, represents a serious factor in so limited a market. Suppose two of these firms lose their gear designers suddenly—one retires on account of ill health, the other emigrates. Not content with any of their other men, or perhaps through failure, all too common, to train a replacement they each advertise the job seeking a senior man, " ten years' experience in the design of gears is essential." We now have an interesting situation, ten jobs and only eight qualified men. In such cases it is not uncommon for many of the qualified men to relocate, often with a substantial increase in remuneration. Eventually, new men are introduced to fill the vacancies and the equilibrium of the market is restored.

My point here is that specialization means one's services are being bought and sold in a very limited market, where the price is very much more sensitive to variations in supply and demand.

Engineering training today is built on a broad base of science and mathematics. On this base is erected a small superstructure of specialization in a given field, electrical engineering, chemical engineering, and similar well-known fields. As a result of the excellence of this basic training it is relatively easy for an engineer trained in one field to adapt himself to another.

Many engineers gain practical experience in several different fields, and breadth of experience is usually considered a desirable asset. An eminent engineer of my acquaintance says that he advises a young engineer on graduation to spend his first six years working one year for each of six employers on as wide a variety of work as possible, and at the end of that time to choose employment where he will be content to stay at least ten years. Experience is a saleable commodity, and breadth of experience carries extra values.

The engineer is a very adaptable creature. He rather thrives on a variety of jobs and does not care too much for repetition. This has a definite effect which I wish to point out.

I know men trained as engineers who have sold life insurance and have done very well; who have sold motor cars; who have run a wholesale grocery business; who have taught high school and who have been commissioners of income tax. All of these men were quite successful in their non-technical vocations. In some cases their training provided an excellent background, in others it was irrelevant.

At any time when engineering employment is dull I am sure you will not find the engineers living on the dole. Instead they will be moving to these other spheres of activity, quietly and easily. This results in a decrease in the numbers of men competing for the purely technical jobs and acts as a dampening factor on the oscillations of market price. Similarly, when engineering employment is booming, and there is a scarcity of men as compared with jobs, these engineers often return to their profession. This action tends to restrict the movement of price which might otherwise occur.

Past and Present Size of Engineering Body

It is important to consider the present size and also the growth of the Canadian engineering population. The best estimate of the present number of engineers is 25,000 obtained by adjusting a 1946 base figure for losses and gains since that time. The base figure is believed to be highly accurate, coming from the records of the Bureau of Technical Personnel of the Federal Department of Labour. All engineers and scientists in Canada were registered with this Bureau during the war period.

The growth is illustrated by the figures below obtained by the Dominion Bureau of Statistics at the decennial census. Due to differences in definition there is not exact agreement with the B.T.P. figure given above.

Year	Number of Engineers	Percent Increase in Decade
1901	2,608	...
1911	7,339	181
1921	12,814	75
1931	15,818	23
1941	20,501	30

The Doubling Problem

In order to appreciate the effect of a few large graduating classes let us look for a moment at a hypothetical problem — the doubling problem. This is the study of how large our classes must be if we were to double the number of engineers in a given period of time.

First let us glance at the steady state condition. If our schools were turning out, say, 1,000 new engineers each year, how large a working force of engineers would this maintain? Assuming the students graduate at age 23, that the usual mortality rates apply to engineers and that engineers retire at age 65, we find that the continuous working force would be almost exactly 30,000. Each year 1,000 young men enter, 454 men of various ages die and 546 retire at age 65.

To double this 30,000 men in five years requires that we graduate 7,100 men per year, and to double it in ten years requires 4,090 graduates annually. Since we have never attained an annual production of these amounts it is obvious that there is no possibility of suddenly having two trained men where only one existed before.

The actual age distribution of our engineering population differs considerably from that of the hypothetical steady state considered above. We have in reality more younger engineers and fewer older engineers. In addition we actually have quite a number of men practising well beyond the assumed retirement age of 65 years. The result of this difference is that the losses are less and a given input will support a larger population than would be the case with the theoretical age distribution.

Estimates of Future Demand

As to the future demand for engineers I cannot bring any science to bear to produce facts for you. Instead, I can offer only my unsupported opinion.

First I would call your attention to the growth curve given in the table above. I think we are justified in making a small extrapolation, as I find it hard to believe we have abruptly reached a ceiling. At the present time we have about one engineer per 500 of our population. I deem it not improbable that, as our civilization becomes more technological, we might need one engineer per 200 of our population.

Quoting Dr. Harvey Davis, in his First Wallberg Lecture, "This means that we in the States should be graduating from our engineering schools at least twenty and perhaps thirty cadet engineers per year, per hundred thousand of our population, even after the present post war bulge has subsided." If this conclusion were valid also for Canada, our schools would be required to produce from 2,700 to 4,000 engineering graduates per year.

It seems hardly necessary to call your attention to changes taking place which create engineering employment where none existed before. You will appreciate that many growths are still very vigorous. In 1924, the Bell Telephone Co. of Canada had one-half million telephones in its system. In 1945, the number was one million, today it is one and a half million. A similar rapid growth is evident in the production of electric power. In a typical distribution system the total primary demand shows increase as follows:

Date	Demand in Megawatts
1920	349
1930	808
1940	1.170
1949	2,180

The operation, alone, of these great systems takes an increasing number of technical men. I could point out similar expansion in the chemical industry, where the possibilities for further growth are almost without limit.

Today we have many engineers employed in activities that did not exist a few years ago — in the development of aircraft jet propulsion engines and the operation of atomic energy plants, as examples close at hand.

I am convinced, gentlemen, that we are still on a steeply rising portion of the curve relating to the need for engineers.

Estimates of Future Supply

The graduating class of 1949 was the largest in Canadian history, with somewhat over 3,000. I do not have a final figure as fall convocations will add to the present numbers. It is estimated that the 1950 class will be nearly as large. From that point the numbers will be sharply reduced and by 1953 the numbers of engineers turned out of our Canadian schools should be back in the vicinity of 1,000.

If there should be any popular belief that the engineering profession was becoming overcrowded, I have no doubt the number of students choosing engineering would diminish. However, I do not expect this phenomenon to occur and I feel that the figure of 1,000, quoted above, is a reasonable estimate of the post-war supply once the veterans' classes have graduated.

Artificial Control of Engineers' Remuneration

I wish to say that I am vigorously opposed to any suggestion that by limiting artificially the number of men trained as engineers we should control the remuneration of those in the profession. On the other hand, I would prefer to see a definite surplus trained, and let survival of the fittest determine those who practise their profession. I have no doubt about the ability of the remainder to make a good living and obtain satisfying careers in other callings.

Fair Market Price

A contractor engaged on a half million dollar highway contract once said to me, "When I hire a man at a dollar an hour I expect him to do a dollar and twenty cents worth of work. If he does only a dollar's worth of work we would soon go broke."

No matter what the temporary state of the market, the salary a man is paid must, in the long run, be closely related to his actual value to his employer. Since his employer is in business for the purpose of making a profit, an engineer's services must be somewhat more valuable than the buying price, his salary.

This fact is one which I feel is too frequently lost sight of by the employee. How often have we heard something like the following, "Do they think I'm going to stay late and work my fool head off for them? Not on my salary, brother! As soon as that whistle blows I'm getting out of here fast." Which clearly indicates an attitude on the part of the man to render services equal to his remuneration, using *his own* estimate of the value of his services.

In the final analysis the pay of an engineer must represent his worth to the community. Only by increasing our contribution to society can we hope to increase our aggregate remuneration. It is my hope that we, as engineers, will ever strive to increase our contribution; that we will, by better training, fit ourselves for the most difficult tasks; that our efforts will make possible better roads and bridges, safer automobiles and speedier aircraft. I hope that we can by honest effort make a valuable contribution to the society in which we live. Gentlemen, I insist that our rewards must fully and fairly be earned! √

THE TRANSDUCTOR

or

MAGNETIC AMPLIFIER

A Review of Recent Literature

by

William J. M. Moore, Jr.E.I.C.

Radio and Electrical Engineering Division,
National Research Council, Ottawa, Ont.

This paper is a review of the published literature on the subject of presaturated reactors and will be valuable to engineers whose work includes this field.

The author first outlines the basic theory and then describes various forms in which the device has been used. Operating characteristics are considered, with emphasis on the important factors of amplification, linearity, and response.

The paper concludes with a discussion of materials, design, and applications.

Since the end of the war, much has been written about the d-c presaturated reactor, now more commonly called the "transductor" or the "magnetic amplifier". Most of the material consists of the fundamentals of operation and descriptions of various applications. This paper presents a review of papers published up to January, 1949, and reviews the theory and techniques which have appeared in them. Several papers have since been published(11)-(15) which deal more thoroughly with the theory and design; these are not discussed here.

The idea of using an iron-cored inductance with controlled d-c saturation for regulating a-c currents is not new, but it is only in the last decade that suitable techniques and materials have been developed to make it a useful and versatile component of control circuits. The first patent on the transductor in the United States was filed in 1901; some fifteen years later it was used for modulating a 100-kilocycle carrier wave for transatlantic radio communication. From then until recently, little was done in North America to further its development, except to investigate its possibilities as an alternating current regulator for uses such as theatre lighting control. In Europe, however, several refinements were developed which have resulted in an amplifier that has replaced the electron tube in many control applications. The transductor was used in fire-control systems of the German Navy as early as ten years before the last war, and in Sweden it has found many industrial applications, both as an amplifier and as a regulator.

Elementary Theory

In order that the operation of the transductor may be discussed, it is necessary to recall some of the theory of magnetic circuits. The saturation curve of a magnetic material may be represented as in Fig. 1(a) where the ordinate is usually B, the flux density, and the abscissa H is the magnetizing field intensity. B is equal to μH, where μ is the permeability of the magnetic material. H is directly proportional to the ampere turns, and inversely proportional to the mean length of the flux path. For a given core, the cross sectional area and the length of path are known, so that the units may be converted to ϕ, the flux, and NI, the magnetomotive force, by a mere change of scales.

Figure 1(b) shows a typical saturable reactor. The d-c winding is on the centre leg, and two a-c windings, so connected that there is no fundamental frequency flux coupling with the d-c winding, are wound on the outside legs. The saturation curve of the core is shown in Fig. 1(a) and is, in shape, somewhat inferior to that preferred today, as will be shown later. Suppose now that sufficient d-c current is supplied to the centre winding to provide a magnetomotive force "a" and a flux "b", linking the a-c coils. If an a-c voltage is applied to the a-c windings, then an a-c magnetizing current will flow which will set up an alternating flux, and hence a voltage or back emf, which is equal and opposed to the applied voltage. (The flux and required magnetomotive force are shown for one a-c winding only in this case). If the d-c magnetomotive force is now changed to "c", and the applied voltage left unchanged, the magnetizing current required is much larger. What has been done is that in effect the impedance offered to the a-c voltage has been reduced by increasing the d-c current. This action may be compared to that of the triode vacuum tube, where a change in grid voltage will change the resistance offered to a d-c

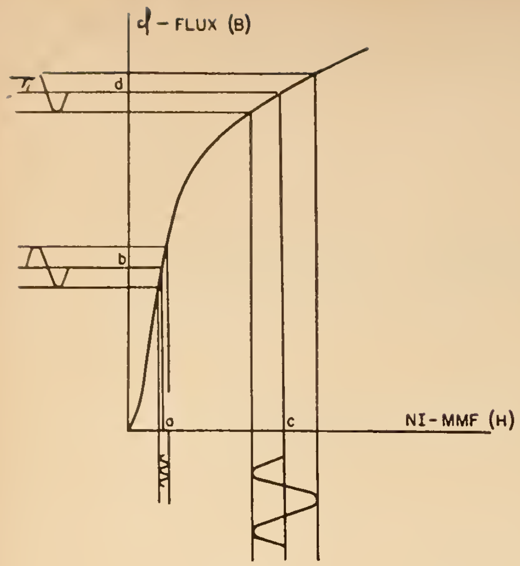


Fig. 1 (a)

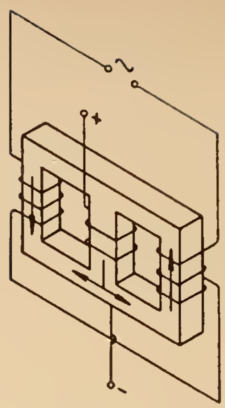


Fig. 1 (b)

voltage. The difference is that, in the vacuum tube, a d-c voltage is applied to a controlled resistance, whereas in the saturable reactor, an a-c voltage is applied to a controlled reactance.

The slope of the curve at any d-c operating point is often referred to as the "incremental permeability", because it is a measure of the relation between the a-c flux and the a-c magnetomotive force when an incremental a-c voltage is applied. Thus, analyses of saturable reactors are often made using the concept of incremental permeability. In present day use, however, the a-c voltage applied is by no means incremental, hence this concept is not applicable except in a rough way. The a-c voltage may in some cases be sufficient to vary the flux density from full saturation in one direction to near saturation in the other, and, in fact, the average flux density is no longer purely dependent on the d-c current, but also upon the a-c voltage. It is because of this fundamental difference in the mode of operation that the term "transductor", a condensation of "transinductor", has been proposed to describe this device.[2][6]

D-C Current Transformer

In order to see how the transductor works, consider the so-called d-c current transformer developed in Germany in 1936 for measuring large d-c busbar currents (Fig. 2(a)). It consists of two magnetic circuits which surround the busbar, and upon each of which is wound a coil carrying a-c current. Notice that these coils are so connected that no voltage of fundamental frequency is induced in the busbar. There will be a voltage of double frequency induced, as will be shown later, but it is assumed that the busbar current is supplied from a source of large capacity and the second harmonic voltage will have negligible reaction on the d-c current.

One method of analysing the mode of operation of the transductor consists of determining the flux variation in each core, then using the magnetization curve to find the required magnetomotive force and thence the currents flowing. For simplification, it is usually assumed that

(1) There is no resistance in the a-c windings.
(2) There is no flux leakage.
(3) There is no hysteresis effect.

Neglecting these quantities ensures that, for a sinusoidal applied voltage, the total a-c flux will also be sinusoidal.

To simplify the analysis further, an ideal saturation curve will be used here (Fig. 2(b)), where the permeability is infinite before saturation and zero above saturation. An important point to notice is that the only time the flux can change is when the algebraic sum of the magnetomotive forces in each core is zero.

Suppose now that the d-c current is such that the magnetomotive force produced by it is *OA* in one core and *OD* in the other. (As a convention, the positive direction of flux in each core is specified to be that produced by the a-c magnetomotive force during the positive half-cycle of total a-c flux). At the instant the a-c current is zero, one coil will be saturated in one direction at *B*, while the second will be saturated in the other direction at *E*. The total flux linking the a-c coils will be zero at *P* due to the counter connection.

Suppose this flux is increasing positively. The flux in core *A* cannot increase because it is saturated. In order that the total flux be equal to that required by the applied a-c voltage then, the flux in core *B* must decrease. But if the flux in

Fig. 2 (a)

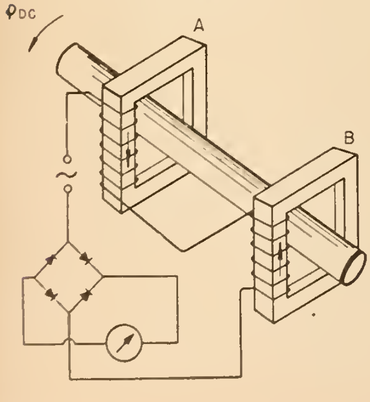


Fig. 2 (b)

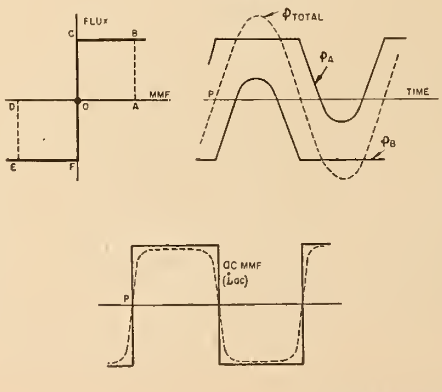
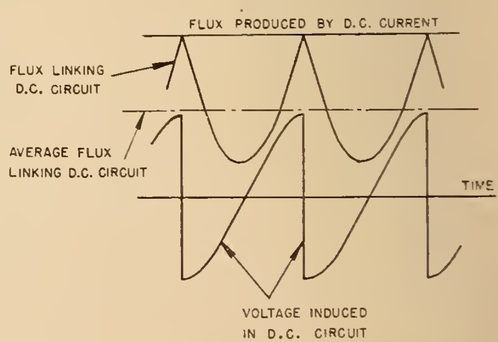


Fig. 2 (c)



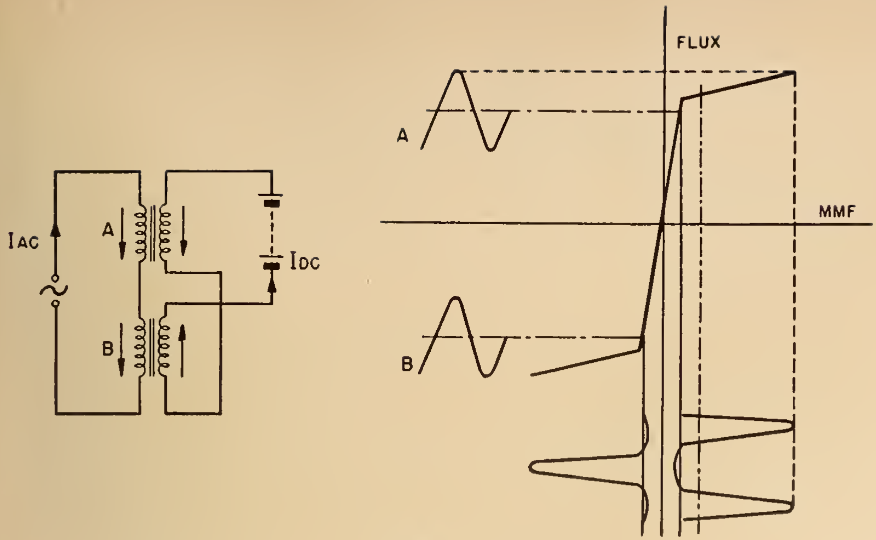


Fig. 3 (a)

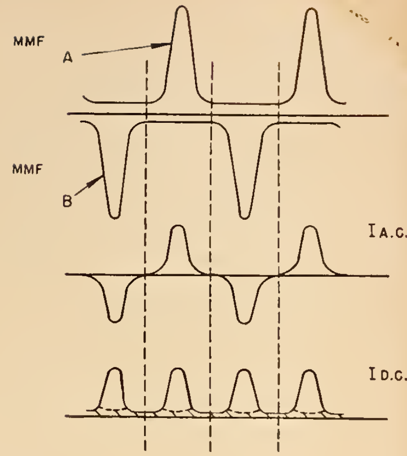


Fig. 3 (b)

core B is to vary, the algebraic sum of the magnetomotive forces in that core must be zero. That is, the a-c magnetomotive force must be equal and opposite to the d-c magnetomotive force in that core.

Following the diagram through, it may be seen that the flux in core A is saturated at all times when the total flux is positive, while in core B, the flux is varying so as to make the sum of the two fluxes linking the a-c windings equal to the total flux required by the applied voltage. The a-c magnetomotive force varies in such a way that when the flux is varying in one core, it is equal and opposite to the magnetomotive force produced by the d-c current. Since the d-c current is constant, the a-c magnetomotive force will be a square wave, the amplitude of which is equal to twice the d-c magnetomotive force. The shape of the a-c current wave will be similar, although actually, due to imperfection in the saturation curve, both current and magnetomotive force waves will be more like the dotted curves. If this current is passed through a bridge-type rectifier as shown, the meter will read a constant current which is proportional to the busbar current.

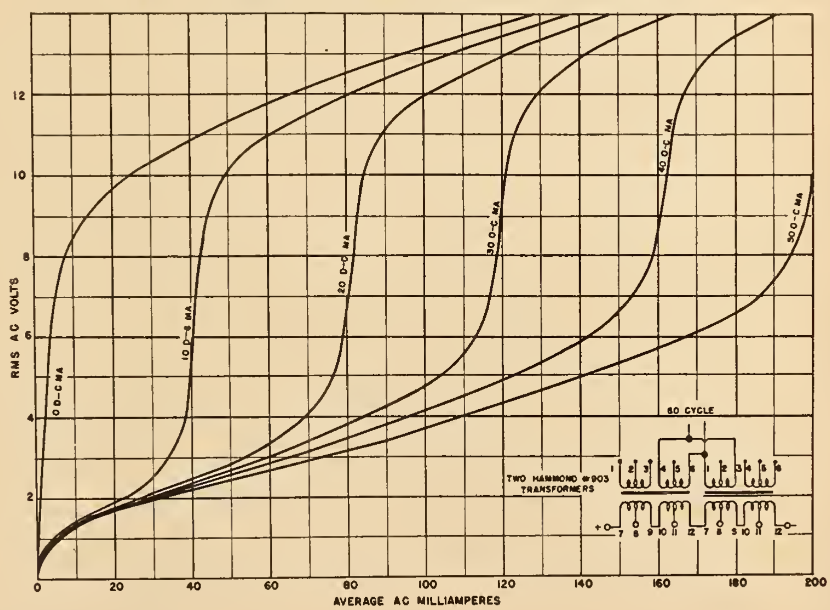
Before leaving this circuit it is interesting to note what happens on the d-c side. The total flux linking the d-c circuit will be the difference between the flux in core A and the flux in core B. The result is shown in Fig. 2(c). Notice that there has been a sort of flux rectification that has resulted in the average value of the total d-c flux linkages being reduced by $2/\pi$ times the peak value of total a-c flux linkages. Only if the a-c flux is zero does the average d-c flux linkage equal that produced by the d-c current. Since this d-c flux is also the saturation flux, it follows that the flux shift is dependent only on the value of the a-c flux and hence on the applied a-c voltage. Thus, if the d-c current changes, the a-c current change will be instantaneous, since there is no change in the average flux in the cores.

From the statement that the average value of the d-c flux linkages is dependent on the a-c voltage, it might be deduced that the device could be used as a rectifier. This is not so, however; though an alternating flux will produce an alternating voltage, a d-c flux will not produce a d-c voltage. The voltage induced in the d-c circuit is proportional to the rate of change of flux and is of second harmonic frequency as shown in Fig. 2(c).

Constrained and Natural Magnetization

In the foregoing analysis the flux variation in each core is shown to be non-sinusoidal, although the total flux variation is, of necessity, a sine wave, since the applied a-c voltage was sinusoidal. This phenomenon is often referred to as "constrained" magnetization, as compared to "natural" magnetization, wherein the flux variation in each core is sinusoidal. Due to the non-linear nature of the B-H curve, a sinusoidal variation of flux requires that the magnetizing current contain not

Fig. 4. Transductor characteristics (without feedback).



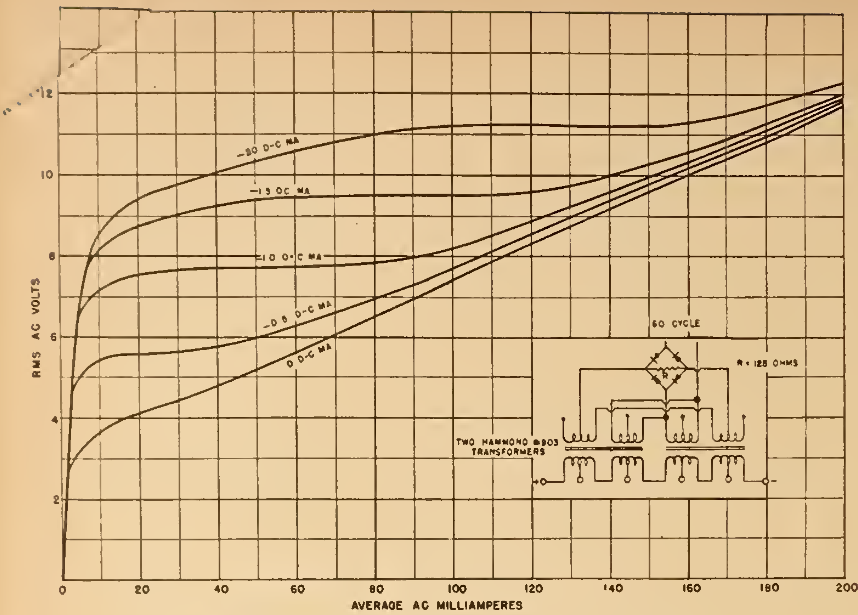


Fig. 5. Transductor characteristics (with feedback).

only a component of the fundamental frequency, but also the odd harmonics, and, if there be also a superimposed d-c flux, the even harmonics as well. If the circuit configuration is such that the flow of certain harmonics be restricted in any way, sinusoidal flux variation, or natural magnetization, will not be possible, and the magnetization is said to be "constrained".

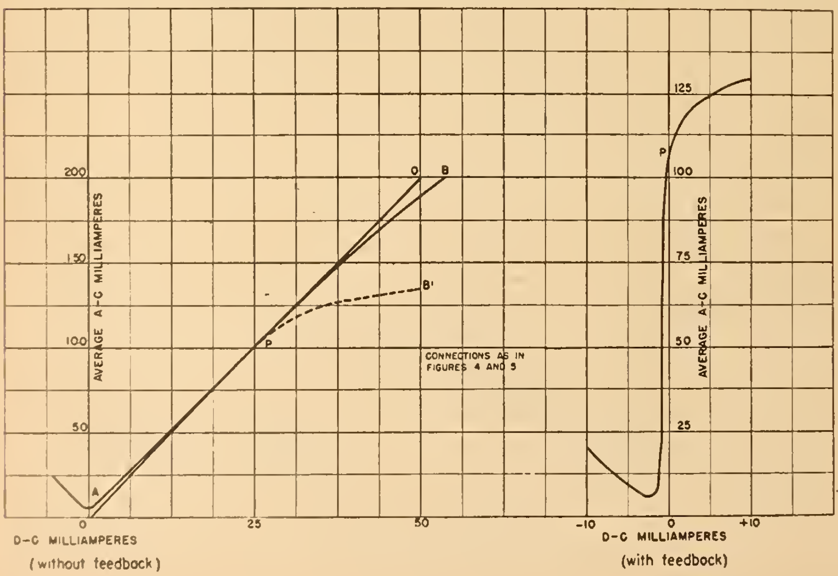
In the usual transductor, the d-c windings are so connected that the fundamental frequency component of the a-c voltage induced in one is opposed by an identical component induced in the other and is thereby cancelled. This applies to all the odd-harmonic voltages as well, because for each odd harmonic induced in one d-c winding, there is an identical harmonic 180 degrees out of phase induced in the other. The fundamental and odd-harmonic components of the magnetizing current can flow only in the a-c circuit, and will be subject to the impedance provisions of that circuit. These impedances are as a rule relatively small.

The phase angle between corresponding even-harmonic voltages in each d-c winding is 360 degrees, and hence these voltages are in phase, or additive. Therefore, even-harmonic currents will flow in that circuit unless restricted. Constrained magnetization, if desired, may be obtained by inserting a choke in the d-c circuit, or by using a d-c supply of high internal impedance. If, in the presence of a high-impedance d-c supply, natural magnetization is desired, a capacitor may be used to by-pass the d-c supply. Another way of obtaining natural magnetization independent of the d-c circuit is to connect the a-c windings of both magnetic circuits in parallel. This connection allows the second-harmonic currents to flow in the a-c windings as circulating currents which are not affected by the impedance of the a-c supply.

The difference between constrained and natural magnetization may be observed in the common three-phase transformer where, if the connection is YY, there is no circuit in which the third-harmonic currents can flow, and the phase-to-neutral voltages are not sinusoidal, even though the phase-to-phase voltages are. In the Y△ connection, third-harmonic currents can flow in the delta winding and hence all voltages are sinusoidal.

The importance of constrained or natural magnetization in the transductor depends on the desired wave shape of the a-c current. With constrained magnetization, this wave shape is almost square (Fig. 2(b)), whereas, with natural magnetization, the current wave is peaked, as will be shown in the next example. It has been pointed out that by suitably adjusting the impedance of the d-c circuit, when the a-c circuits are connected in series, the a-c current wave shape can be made to approximate a sine wave very closely.

Fig. 6 (a) at left; and Fig. 6 (b) at right.
Transductor amplification characteristics. (a-c voltage—7.5 rms volts.)



Series Transductor with Natural Magnetization

In considering a case where the magnetization is not constrained, a good starting point is to assume that the voltage across each a-c winding, and hence the flux variation in each core, is sinusoidal. In Fig. 3(a) the total flux has been divided into two equal sinusoidal waves and the magnetomotive force required by each is shown. A saturation curve not approaching the ideal quite so closely as before has been assumed and hence the magnetomotive force waveshapes are not so nearly rectangular as before. Note that the average value of the magnetomotive force in each core does not coincide with the zero axis of the a-c flux in that core. This flux shift is due to the flux rectification already mentioned. The total a-c magnetomotive force is obtained by adding the magnetomotive forces required for the flux variation in each core, and the total d-c magnetomotive forces by subtracting the two magnetomotive forces. This may be shown by the following:

In core A: $mmf_A = mmf_{\text{a-c}} + mmf_{\text{d-c}}$
In core B: $mmf_B = mmf_{\text{a-c}} - mmf_{\text{d-c}}$

$$\tfrac{1}{2}\,(mmf_A + mmf_B) = mmf_{\text{a-c}}$$
$$\tfrac{1}{2}\,(mmf_A - mmf_B) = mmf_{\text{d-c}}$$

Figure 3(b) shows the time variation of the total magnetomotive force in each core, also the magnetomotive force produced by the a-c winding and the magnetomotive force produced by the d-c winding. If the number of turns on the a-c winding is equal to the number of turns on the d-c winding (a simplifying assumption), then the peak of the a-c current will be nearly equal to the peak of the d-c current. The difference is the small magnetizing current shown in the diagram. This is of little importance here, but in the self-excited transductor where the a-c current is rectified and used for d-c excitation, it is a measure of the additional magnetomotive force which must be supplied from the d-c source.

Parallel Transductor

Before discussing the self-excited transductor a word might be said about the so-called "parallel transductor" in which the a-c windings are in parallel. Natural magnetization only can occur in this type, because the even harmonics can always flow in the closed circuit formed by the parallel windings. The behaviour of this type is similar to that of the series transductor, naturally magnetized.

Self-Excited Transductor

In the self-excited transductor, the a-c current is rectified and fed back through a winding in such a way that it tends to increase the saturation and hence the a-c current. For 100 per cent feedback, the number of ampere-turns produced by the feedback winding is equal to the ampere-turns produced by the a-c winding, and the feedback magnetomotive force is equal to the average of the a-c magnetomotive force rectified. This average rectified a-c magnetomotive force is only slightly smaller than the average d-c magnetomotive force required, and hence the feedback winding will supply all but a small portion of the required d-c magnetomotive force. The remainder must be supplied by the d-c control winding.

Operating Characteristics

A glance at the operating characteristics of a transductor will show the effects of self-excitation more clearly. As an example, the characteristics of a transductor using two Hammond No. 903 audio transformers with Mumetal cores will be shown. Figure 4 shows the a-c volt-ampere characteristics, with d-c excitation as a parameter, for a transductor without feedback. Note that a nearly constant-current region is present. Figure 5 shows the same characteristics for a transductor with positive feedback. Here a constant-voltage region is present instead of a constant-current region. It is apparent that the device may be used as a constant-current or a constant-voltage regulator, as desired.

If the characteristics are replotted on an a-c current vs. d-c current basis, the amplification property may be shown. The line APB, in Fig. 6(a), shows the characteristics of the transductor without feedback. Here the scales are divided in actual current units; a gain of 4 to 1 in current is shown to be possible with this transductor. If the scale units were changed to magnetomotive force or ampere-turn units, however, the gain in magnetomotive force would be shown as unity. This equality between d-c ampere-turns and a-c ampere-turns is characteristic of the non-self-excited transductor. Amplification is obtained by varying the turns ratio.

The characteristics for 100 per cent feedback may be obtained by drawing the line OPQ, which, in this case, will be at an angle of 45 degrees between the two axes, since the units of both axes are equal on an ampere-turns basis. Note that the two lines cross at P, the point where the excitation supplied by the feedback winding is equal to that supplied by the d-c winding when no feedback is present. By adding or subtracting excitation from the feedback excitation with the d-c winding, excursions may be made in both directions from P along APB. Unfortunately, this is true only if the feedback winding contains no resistance. In an actual case, where a certain amount of resistance has been added to the a-c circuit by the inclusion of the feedback winding, the excursions will be made along APB. The amplification characteristic obtained is plotted on a basis of d-c control current in Figure 6(b); the increase in amplification is obvious. Notice that this curve is nearly vertical. If a greater percentage of feedback were added, a negative slope, indicating instability would result;

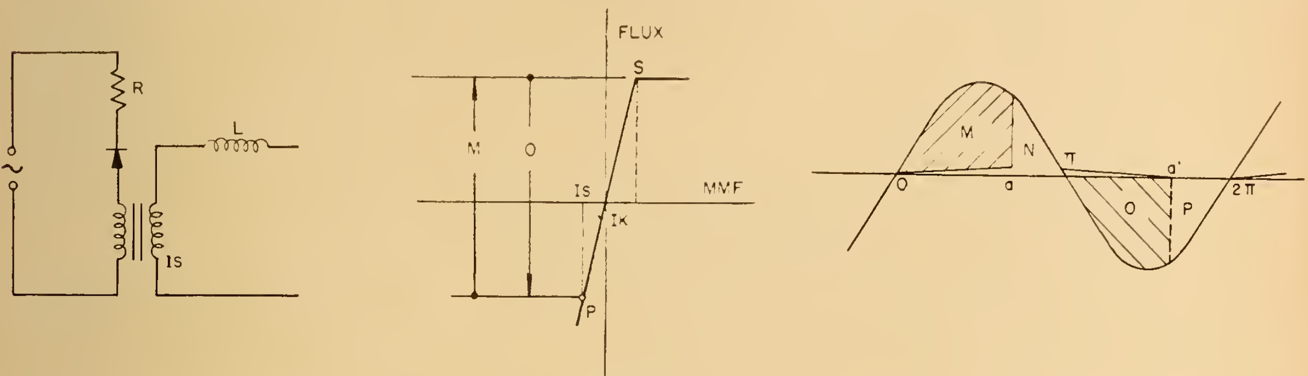


Fig. 7.

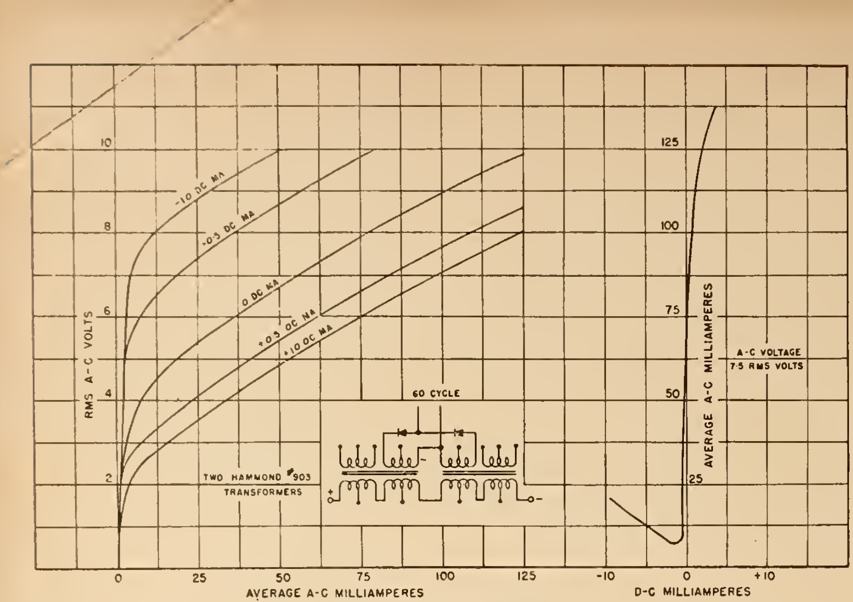


Fig. 8. Transductor characteristics with simplified self excitation. (natural magnetization).

the accompanying trigger action is useful for some applications.

Transductor with Simplified Excitation

The most recent development of the transductor has resulted in what is called "simplified self-excitation". In the usual 100 per cent self-excited transductor, the magnetomotive force in each core varies between a small positive or negative value and a large positive value. Rectifying elements can be inserted in each a-c winding in such a way as to give the same excitation as the feedback winding. (Fig. 7).

Analysis of this type of transductor may be made using a method proposed by some Swedish engineers.(3) It is based on the equation

$$e = N \frac{d}{dt} \phi$$

which, when integrated, becomes

$$\int e dt = \phi_2 - \phi_1$$

showing that the change in flux is equal to the voltage-time area.

Proceeding with the analysis, consider the point O, where the a-c voltage is zero and the flux is equal to that produced by the d-c control current I_s at P. As the voltage rises, there will be a small magnetizing current before saturation, as shown by the slope of the magnetization curve and this will produce a small voltage drop across the resistance. At "a", the voltage-time area has become equal to the change of flux from P to saturation, hence the element cannot absorb any more voltage. The current then increases until the voltage across R becomes equal to the applied voltage.

At the point where the voltage has reached zero again, the magnetomotive force has returned to that shown by the knee of the saturation curve and the current through the transductor is equal to I_k. This slowly decreases to zero at the point a, a point such that the area O is equal to the area M. For the remainder of the cycle, the current is blocked by the rectifier. Had the saturation curve been less nearly ideal, the current pulse would have been somewhat rounded off. The area substracted from the voltage-time area during which the current flows, however, would be equal to the area gained.

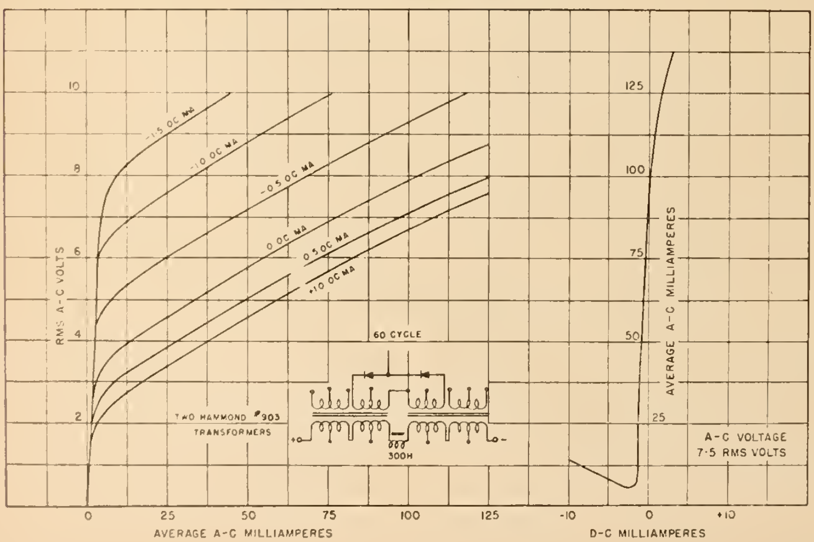
The resemblance of this current pulse to that of a thyratron is obvious. If the value of the flux P is varied by changing the control current, the "firing angle" can be adjusted to any value. This is, therefore, a method of controlling the output of a dry-disk-type rectifier in a way similar to the thyratron.

The circuit just illustrated is not used in practice however, because of d-c saturation of the a-c source, usually a transformer, and also because of the requirement for smoothing the d-c current. Hence, transductors of this type are usually connected back-to-back. With this connection, a-c output results; if d-c is desired it is necessary to add a bridge rectifier. Volt-ampere characteristics of this type of transductor with natural magnetization are shown in Fig. 8 and with constrained magnetization in Fig. 9.

Multiphase Transductors

The foregoing method of analysis may be applied to multiphase transductors to show that their mode of operation is similar to that of a grid-controlled mercury-arc rectifier. In particular, it has been shown that by using a special connection (Nordfelt connection)(4), the kva. rating of the transductors may be reduced to one-third of the rating which would be required if three single-phase units were used together. The use of multiphase

Fig. 9. Transductor characteristics with simplified self excitation. (constrained magnetization).



transductors is preferred when large amounts of power are required.

Amplification, Linearity and Response

Three factors are important in all amplifiers—amplification, linearity and response. In transductors, these are interdependent, and one can be improved only at the expense of the other two. Usually a compromise which best suits the application must be effected. One or two of these factors may be accentuated by proper dimensioning and thus the desired characteristics obtained. It has been shown that amplification can be greatly increased by positive feedback. The power gain of non-self-excited transductors may be as high as 400 but with self-excitation this may be increased to one million or more. It is well known that positive feedback will increase the non-linearities of the output. Linearity is for the most part dependent on the magnetic characteristic of the core material. At very low values of d-c control current, the output is practically independent of the d-c, mainly because the flux does not at any time reach saturation. This renders the transductor inoperative for low values of input current, and is responsible for considerable time delay when small d-c signals are applied, a factor of some importance in a few applications. Of course, at high values of d-c the transductor may also be non-linear, because the flux is at saturation continuously. Usually the transductor is operated only at values of d-c where the a-c flux is above saturation for a time duration of not more than one-half cycle.

These then, constitute the limits of linearity for the transductor. Little can be done about non-linearity at high values of d-c excitation, except to point out that it is a matter of designing for a given input. However, the other non-linearity, a sort of cut-off point, may be improved by biasing. This may be done by the use of a d-c coil, which would require a very stable supply, or by employing permanent magnets,(5) as shown in Fig. 10. Notice how this bias is

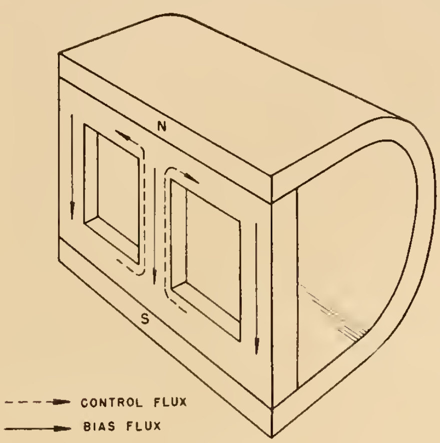


Fig. 10

applied; the flux crosses the core but does not follow either the d-c or a-c magnetic circuit completely. When the control signal is negative, the flux in the control (centre) leg is saturated negatively and there is little coupling between it and the other circuits. When the control signal is positive, the control leg becomes less saturated and greater coupling is obtained between the d-c and a-c windings. This results in improved performance for positive signals and increases the upper limit, but renders the transductor inoperative for negative signals. By proper amounts of biasing, the small horizontal portion of the amplifier characteristic may be eliminated entirely. Operation in both the positive and negative regions may be obtained by using two transductor elements in push-pull.

The time of response is dependent to a large extent on the d-c winding. A large number of turns in this winding will increase the power amplification, but it will also increase the inductance and hence the time delay. This may be counteracted to some extent by increasing the supply frequency and also by using positive feedback. Low time constants may be achieved by using several transductors, which have positive feedback and small d-c control windings, in cascade. Time constants as low as 1/20 second at 60 cycles, and 1/50 second at 300 cycles have been obtained.

Core Materials, Core Shape, and Winding Configuration

The sensitivity or ratio of change in a-c ampere turns to a change in d-c ampere turns for a given transductor, depends for the most part on the materials used in the magnetic circuit and to a certain extent on the shape and winding configuration. The sensitivity is dependent on the exciting current drawn by the transductor from the a-c source at zero excitation. For this reason, the most desired magnetic characteristic is the ideal type already mentioned. This is approached by some metals, notably Mumetal and Permanorm 5000-Z.(10) As a comparison, Mumetal is some 12 times more sensitive than silicon steel and Permanorm is over 100 times more sensitive.

In considering shapes and winding configurations, a considerable amount of work has been done by Verplanck and Fishman at the Carnegie Institute of Technology.(9) They have investigated some 15 different combinations which may be classified as follows:

Type I —Two separate magnetic circuits containing both d-c and fundamental frequency a-c fluxes (Fig. 11(a)).

Fig. 11 (a)

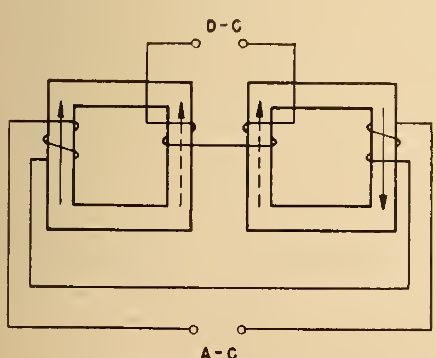


Fig. 11 (b)

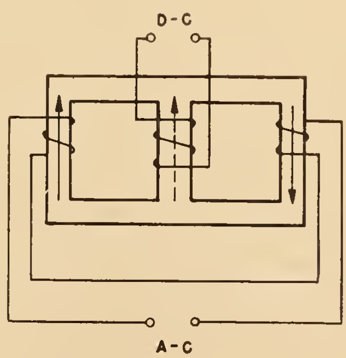
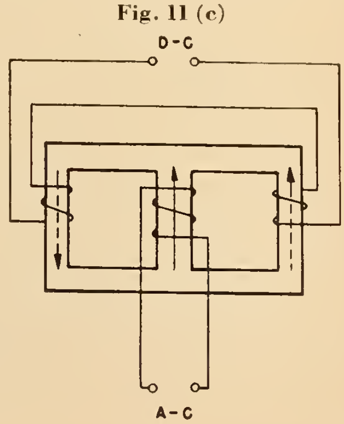


Fig. 11 (c)



Type II —Partial overlapping of magnetic circuits, with no fundamental frequency a-c flux present in common portion (Fig. 11(b)).

Type III—Partial overlapping of magnetic circuits, with fundamental frequency a-c flux present in common portion (Fig. 11(c)).

Of these, Types I and III have greater sensitivity than Type II. For a given size, Type III requires more d-c excitation energy than Type I. From an insulation point of view, the best winding configuration has no a-c voltage of fundamental frequency induced in any part of the d-c winding. Hence, a d-c coil which embraces both cores at the same time is preferable. However, this type is difficult to manufacture and it is generally conceded that the best all-round type is one with two magnetic cores, with both a-c and d-c coils wound on each.

Design

A few points may be mentioned in connection with the design of transductors. From the foregoing, it might de deduced that the only requirement for high amplification in non-self-excited transductors is a high turns ratio. However, for a given winding space, the power required to produce a certain number of ampere-turns is independent of the wire size, and hence of the number of turns (assuming negligible space factor).

For a given core a set of characteristic curves, similar to those shown in Fig. 4, may be plotted in terms of a-c volts per turn versus a-c ampere-turns, with d-c ampere-turns as a parameter. These curves may be used in a manner similar to the plate characteristic curves of vacuum tubes, remembering that the transductor is essentially reactive and that the characteristic for a resistive load will be elliptical rather than a straight line. The maximum abscissa, which represents more or less the maximum power in the load, will be limited by the thermal rating of the winding. This value will be determined by the number of turns on the a-c winding and, for a given core size, the relation between amplification and maximum power output may be shown graphically. The winding space for the a-c and d-c windings can then be properly proportioned for the desired output and amplification.

Application

Because of similarity of characteristics the transductor may be used to replace the vacuum tube in many applications where unlimited life, negligible maintenance, and reliability are desired. It requires no filament heating power nor complicated d-c power supply, and is as robust as a transformer. Several inputs may be used at once, each of which is galvanically isolated, and each of which may be designed for a given input impedance. The device also offers an easy and effective means of amplifying d-c signals without the need of complicated circuits for stability. It has been used in Europe in servo systems, in voltage regulators for a-c generators, in battery charging units, and in measuring systems for some time, and has been shown capable of power gains up to 10^8, input power detection as low as 20×10^{-12} watts, and control of output power to 50,000 kw.

The transductor does not surpass the vacuum tube completely. Its disadvantages are a relatively long time constant and a low input impedance. Also the fact that the power supply and the output are a-c quantities and the output impedance is reactive, may render the device unsuitable for some applications. Its main use at present is in the control field where these features are not of major importance.

Acknowledgement

Figures 2(a), 2(b), 2(c), 3(a), 3(b) are reproduced by permission from S. E. Tweedy's article① in *Electronic Engineering*. Figure 7 is taken from Hedstroem and Borg's article③ in *Electronics*, by permission of the McGraw Hill Publishing Company.

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Members are reminded that the Institute now maintains a fund for the separate publication of authoritative papers covering original engineering design, investigation or research.

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WIDER PROBLEMS FOR THE ENGINEER

by

F. Saturnino de Brito Filho,
President of the First Pan-American Engineering Congress

A condensation of an address presented before the Congress at Rio de Janeiro, Brazil, June 15, 1949.

Science and technology have amplified, to an incredible extent, the physical abilities of the human being. Fantastic extremes have been reached in amplifying the visual range, in broadening the hearing, in the progress of transportation, in multiplying the poor human muscular power, in the guarantee of health and comfort, in the establishment of supplies for the countless needs of life, and in the improvement of our housing facilities. However, destructive power has also developed in an immeasurable way, because of devices and explosives. Finally, to all known sources of energy, has been added a greater one, one which resulted from nuclear fission, making it possible for us to think of interplanetary trips in atomically propelled ships. At the same time, one can now also foresee the possibility of the destruction of our own planet by the mere pressing of a button.

But have man's moral faculties developed in accordance with the extraordinary amplification of his physical power? Have these powerful resources been obtained by human beings at a rate superior to the ability of their minds to assimilate the achieved, and to use it in fair measure? Must not we, like Horace, blame the authors of this material development, which came about long before the creating of a moral control on it? Or must we of the West follow Gandhi in his condemnation of western civilization, urging that Manchester cloth be substituted by hand-made material and that India return to her primitive simplicity?

To quote Edward Steidle, Director of the School of Mineral Industries of Pennsylvania State College, "Human relationships have not kept pace with scientific achievement; as a result, man, in desperation, wittingly, premeditatively sacrifices freedom for security". Professor Steidle has also emphasized the danger of concentrating all efforts exclusively on material progress, and cites as an example the present consequences of splitting the atom, the invention of guided missiles and the possibility of bacterial warfare. In this connection he points out that whereas primitive man was at the physical mercy of Nature, modern and future man will be to a large extent at his own mercy, or rather at the mercy of his own mental and spiritual shortcomings. He will need the strongest power of self-control to survive. The analysis of the facts demonstrates that to put aside the self-control which Steidle mentions is in effect personal and national selfishness, instead of a fundamentally human altruism.

The New World, as the impersonal study of facts has demonstrated, must evolve under new determinants, under new signs, which will prevent it from going through the same mistakes and sufferings as the Old World. The first natural consequence of this sociological fact was Pan-Americanism. One can no longer deny that the natural affinities of the American countries lead them to a common and pacific destiny, and aim, not at substituting a continental selfishness by a national selfishness, but at better serving mankind.

From such facts emanate the series of inter-American conferences and treaties which our peoples approve and ratify. However, although these conferences and treaties may be highly valuable, it is easy to understand that they will not be complete unless they include the sector of technical activities.

Among the resources that should be linked there are certainly, above all, those of engineering, due to their great influence on the economy and future of nations. We thus reach another new aspect of present day Pan-Americanism: that of the unification of professional criteria.

Thus it has been decided to assemble this 1st Pan-American Engineering Congress, which opens today under the best of auspices, and which, we hope, will be the first step toward the achievement of continental unity. We engineers have come here to found the Pan-American Union of Engineering Associations — U.P.A.D.I.—which will be entrusted with the preservation of the links established by the great movement in which we are now united.

...al recommend the establishment of specialized technical committees entrusted with the study of common problems, and of close contact with the existing Pan-American technical institutions, among which are the Pan-American Railroad Congress Association, the Pan-American Institute of Geology and Mining Engineering, and the Inter-American Association of Health Engineering (A.I.D.I.S.). The foundation of the Pan-American Committee of Technical Rules, which has just been achieved in Sao Paulo, represents the first step of this great future work.

This Congress was given a wide programme, in order to afford the engineers of the Americas a wide field in which to submit reports of their work. The number of contributions received shows how South American technicians have responded to this challenge. Nine committees, sub-divided into sub-committees, will shortly seek solutions to widely diversified problems of great interest.

The engineering profession is what made the United States the greatest industrial nation in the world; engineers have irrigated the dry lands on which Argentine and Peruvian wine cultures grow; they have opened the Panama canal; they have studied and determined how to keep Mexico City from collapsing into its inconsistent subsoil; they have transformed inferior Brazilian coal into metallurgical coke for our principal steel mill; they have made Havana into a modern and attractive capital; and they are carrying out similar tasks in every one of the American countries.

There are nations which are acting as if they did not know that full knowledge among men is a better guarantee for conditioning world peace than the signing of formal treaties. Mutual knowledge, specially in the professional sector, constitutes the basis for the consolidation of peace. This is the great truth which glorifies the people who understand it, and condemns those who put obstacles in the path of its free manifestation.

If a feeling of American brotherhood grows in the technical atmosphere of our meetings, it is because it has long ago become inherent to the surroundings into which we were born and in which we live. And such sentiment becomes even finer when we enter the social sector of engineering.

The importance which engineering has assumed in modern society is accented when one considers that it is the engineer who has to act in all phases of the solution of the peace problem. The professional engineer is among those best equipped to alleviate "tension centers" which arise in the social field, in a task similar to that he performs when planning material structures.

It has long been realized that engineering, through its essentially constructive functions, possesses the means of providing practical solutions for the social and economic problems of human well-being and to world peace. We want to see the engineering profession aiming towards solving these problems. We want to see it fighting for the improvement of man's standard of living, through the solution of fundamental questions related to food, housing, hygiene, education and improvement of working conditions, thus solving that great problem which Auguste Comte called incorporation of the proletariat into modern society.

The engineer is every day becoming more interested in the world he lives in. For this reason, his profession should be entrusted with finding the solution of problems related to human welfare and general peace; in the certainty that establishment of closer contact and personal relationship among technicians is a necessary element for the pacific and well-organized evolution of our nations.

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Snare River Project, North West Territories,
by B. E. Russell, M.E.I.C., and G. C. Eckenfelder, M.E.I.C.

Induced Precipitation Experiments in Canada,
by D. Fraser, John L. Orr, K. G. Pettit

Ontario Hydro's Frequency Conversion Project,
by H. H. Leeming, M.E.I.C.

Modern Diesel Generating Station for Mexico City,
released by Nordberg Mfg. Co.

A Report on Television,
by J. A. Ouimet, M.E.I.C.

United Nations Scientific Conference,
Abstracts of papers.

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Engrg. & Development Divn.,
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P.O. Box 541, Winnipeg, Man.

Report of Council For the Year 1949

Together with Committee and Branch Reports

Engineering activity continues at a high level and The Engineering Institute of Canada continues to increase its membership and to expand its interests in conformity with the expansion of the interests and activities of the engineers it represents.

Engineers in Canada are appreciating more and more that the recognition accorded by the public to the professions is directly related to the vigour and activity of the national organizations of those professions. The membership of the Institute, therefore, continues to grow and the increase during 1949 was once again in the neighbourhood of 15 per cent. On December 31st the roll of the Institute stood at 12,566 which total will be considered in detail later in this report.

As the Institute comes more and more to represent all professional engineers in Canada its force and influence become increasingly effective on behalf of the profession and each individual member. This should encourage each and every member to seize upon all possible opportunities to bring the work of the Institute and the advantages of membership to the attention of those engineers who have not yet seen fit to lend their support. If each member will resolve to persuade one other engineer of his acquaintance, the time will not be far distant when the Institute will be the completely representative national organization of the engineering profession in Canada.

New Branches

The full advantages of membership are realized only through branch activity. During 1949 new branches were opened in Newfoundland, and at Kitchener and Sudbury, Ont. There are now thirty-two branches established with at least three more in prospect.

Annual Meeting

Because of the increasing expressions of members' interest in the affairs of management the annual meeting at Quebec was held in conjunction with the First Western Hemisphere Conference of the International Committee of Scientific Management. This innovation was well received and the management sessions, as well as the usual technical and social programmes of the meeting, were considered excellent by all those who attended. The Quebec Branch handled the duties of host in a notably efficient manner.

Branch officers' and students' conferences were again convened during the annual meeting, and the delegates expressed satisfaction with the results.

Headquarters

As the activities of the Institute have increased, so the work of the Headquarters' staff has increased. During 1949 the House Committee continued to study means for relieving the congestion in the office space. A great improvement was effected when the second-floor reading room was taken over for the use of the accounting, records, and mail departments. Reading room space was provided at a table near the library stacks in the back of the general office, and the new arrangement has worked exceedingly well.

In spite of congestion, moving of departments, and rather inadequate facilities in some respects, the staff has continued the loyal and efficient service which has always been an outstanding feature at Headquarters.

Roll of the Institute

Membership in all classifications now totals 12,566 an increase of 15½ per cent over the previous year. The 2,345 new names added were classified as follows: 2 honorary members, 201 members, 61 juniors, 2,083 students. 23 names were reinstated to give total additions to the roll of 2,368. Deaths, resignations and removals reduced the net gain to 1,688.

Transfers in membership grade were: 3 members to honorary members, 157 juniors to members, 5 students to members, 1 affiliate to member, 795 students to juniors, 1 student to affiliate, 36 members were elected to life membership by permission of by-law 26. There have been removed from the roll during the year for non-payment of fees and by resignations, 189 members, 315 juniors, 101 students, and 5 affiliates (total 610).

Deceased Members

During the year the deaths of 70 members of the Institute, including 3 honorary members, have been recorded as follows:

Honorary Members

Brown, Ernest
Magrath, Charles Alexander
Rabut, Jacques

Members

Alexander, Richard C. F.
Bell-Irving, Robert
Billings, Asa White Kenney
Bohraus, Werner
Brooke, John
Burgess, Frederick Victor
Campbell, John Murdoch
Cawthra-Elliot, H. M.
Christie, Frank Carl
Colwell, Charles Herbert
Dalziel, Norman Pearson
Dann, Norman Leslie
DeBlois, Howard Crawford
Delvin, Ray Birn
Denton, Herschel Eugene
Desbaillets, Charles Jules
Deschenes, Adrien Miville
Eddy, Albert Clarke
Ellacott, Charles Herbert
Gardner, Albert Charles
Gray, Alexander
Heckle, George Rogers
Hunt, Edwin Harold
Jarvis, Gerald Walter
Jenkins, William Ernest
Jones, Charles Hugh LePailleur
Kenrick, Robert Boteler
Kilbourn, Frederick Binns
Lamb, Henry John
Latimer, Frank Herbert
Laughton, James Alexander
Lewis, Hugh Miles
Linton, Adam Pearce
Little, Harold Robert
Logan, Robert Samuel
Maude, John Henry
Martin, Lawrence Thomas
Murphy, John
McCoubrey, James Addison
McDonald, Claude Knox
MacKenzie, John Fraser
McLean, William Arthur
Macphail, Alexander
Perley, Ernest Clint
Pickering, Albert Ernest
Pierce, John Wesley
Pinto, Enrico Arthur
Plow, John Foss
Price, Joseph Lewis Edgar
Robertson, James
Scoular, William Buick
Sefton, Frank Hugh C.
Shooner, Jacques
Sisson, Charles E.

Smith, William Raywood
Swan, Russell Grey
Thomas, David Rhys
Thomson, Reginald Heber
Whyte, George Herbert
Wood, James Robert

STUDENTS

Armstrong, Edward Irwin
Boshuck, Victor
Hunter, Robert Lewis
Mott, Derek Phillip Francis

AFFILIATES

Burrows, Acton
Mussen, William H. C.
McKerlie, Jardine

RECAPITULATION

The membership of the Institute at December 31, 1949 was as follows: (the figures for the preceding year are shown for comparison):

	1948	1949
Honorary Members	19	21
Members	5,288	5,410
Juniors	2,166	2,558
Students	3,318	4,498
Affiliates	87	79
	10,878	12,566

Respectfully submitted on behalf of the Council.

JOHN E. ARMSTRONG, M.E.I.C.,
President.

L. AUSTIN WRIGHT, M.E.I.C.
General Secretary.

Legislation Committee

Section 50, E.I.C. By-Laws:

"The Legislation committee shall consider all suggestions and reports concerning legislation which may be made by a branch or provincial division".

"It shall keep itself advised of all legislation, either actual or proposed, which is likely to affect the interests of the Institute or of its members, and shall report to the council thereon".

The first paragraph has led your committee to study and recommend a draft of branch by-laws which could be used by new branches when drawing or modifying their own by-laws.

The second paragraph has been adhered to as a matter of constant endeavour.

J. A. BEAUCHEMIN, M.E.I.C.,
Chairman.

Employment Service

The activities of this department during 1949 have maintained the same high levels as were reported last year. It is noteworthy however that requests for engineering personnel declined during the latter few months.

The record shows 113 satisfactory placements made. However, many engineers who use the service do not advise when they are placed and it is believed that the actual number far exceeded this figure. Well over 900 interviews were granted and correspondence reached its usual high volume.

The employment bulletin, introduced in 1947, has proven to be of great value and, at the year's end, its publication had increased to approximately 1000 copies, not only distributed throughout Canada but to engineers in foreign countries contemplating immigration to this country. The operation of this advance notice of employment opportunities is still maintained and it is the department's sincere hope that it will continue to be of help to the employer and employee in the coming year.

The efforts of the department to find suitable employment contacts for the 1949 graduating class were very successful. The department has placed itself again at the service of these young engineers and will continue to use its extensive contacts, to be of some assistance to the 1950 class.

As was the case last year, many successful contacts were again made for recent arrivals in Canada and there was a notable increase in interviews and correspondence with British engineers and engineers from other countries.

The activities of the Employment Service presently require the full-time attention of three staff members at Headquarters. It stands ready at all times to place at the disposal of members and employers of engineers, its facilities and the advantages of the wide contacts it has established throughout Canada. It will operate most effectively if those using its services will co-operate by acknowledging communications promptly and advising when satisfactory placements have been made.

(MISS) A. SUMMERS,
Employment Service.

Publication Committee

The Publication Committee believes that the year 1949 was one of accomplishment in the publishing activities of the Institute.

For the first time since the inception of *The Engineering Journal*, advertising revenue has met the full cost of publication. The major credit for this accomplishment belongs to the publications manager, and the committee takes this opportunity to express its appreciation of his work.

Because of the all-inclusive character of the membership, the committee has felt that the *Journal* must be used as the general news vehicle of the profession in Canada, and members will have noted an increasing swing toward material unrelated to technical branches of the profession. The committee is aware however of the Institute's obligation to provide for the dissemination of technical information. The steady improvement in the financial situation of the *Journal* permitted the allocation at the beginning of 1949 of $1,500.00 to finance separate publication of technical papers to be sold at cost, or less than cost.

This action is in line with the policies of many technical societies and is particularly advantageous to the Institute, whose membership covers an unusually wide range of technical interests. Most engineers will readily admit the need of the profession as a whole for the "large general cultivation" specified by William Barton Rogers, founder of The Massachusetts Institute of Technology as a necessary (but so often lacking) ingredient of a complete engineering education. The Publication Committee believes that *The Engineering Journal* is an excellent vehicle for material conducive to this cultivation.

The committee believes that the membership supports this policy and was particularly gratified to receive the endorsement of the branch officers' conference at the annual meeting in May of last year.

The committee takes this opportunity to remind the members that the fund for separate technical publications places the Institute in a position to pursue actively its object "to facilitate the acquirement and interchange of professional knowledge among its members and to encourage original research". The committee would like to have additional technical papers drawn to its attention.

The fact that the cost of producing the *Journal* last year amounted to roughly $6.50 per member against a member's subscription of only $2.00, emphasizes the necessity for substantial advertising revenue if the *Journal* is to continue as an effective publication. The Committee tries to maintain a ratio of at least 50 per cent of editorial matter; the break-even point for a single issue on this basis is about 60 pages each of editorial and advertising copy. As more advertisers become convinced of the *Journal*'s merit as a medium for their messages to engineers, so will the *Journal* be able to carry more editorial content and at the same time contribute some surplus towards strictly technical publishing activities.

C. E. GELINAS, M.E.I.C.,
Chairman.

Membership Committee

A programme consisting of cataloguing desirable prospective members and soliciting their membership in the Institute through the voluntary efforts of E.I.C. members of their acquaintance has been initiated. It is anticipated that through the branches an organization can be developed that will insure that no engineer can claim that he has not been invited to join the Institute or that the unique advantages of membership have not been presented to him.

The clerical work is underway, instructions are drafted and approved, the organization is being built up and the programme is being developed in specific localities to work out the practical aspects.

It is expected that next year's operations will bring many engineers into the Institute, or at least provide the committee with specific information as to why they are not members.

H. R. SILLS, M.E.I.C.
Chairman

Committee on Professional Interests

In comparison with the several preceding years, the year 1949 has been comparatively inactive.

Contacts between Headquarters and the various branches have been maintained through the presidential and general secretary's visits to the branches, frequently attended by senior officers and members of the Institute. This custom of senior members accompanying the president or general secretary on their branch visits is becoming more popular as the years pass and its value to both the individual visitor and to the branch membership cannot be overestimated.

The Institute Family has been increased by the addition of three branches, details of which have been reported elsewhere. The benefits to the profession in our youngest province of Newfoundland will be many and possibly in no part of the Dominion was organization in the Engineering profession more urgently required.

This committee was particularly interested in the work to be undertaken by our recently appointed field secretary and the untimely passing of Mr. C. E. Sisson, the first incumbent of that office was an extremely serious loss.

Preparations were being made during the year for the 1950 meeting in Toronto where the Institute will be joined by the American Society of Civil Engineers. This committee regards the forthcoming meeting as a rare opportunity to strengthen the relationship between these organizations and commends to our membership attendance at that important event.

J. B. Stirling, M.E.I.C.,
Chairman.

Papers Committee

Following its appointment at the annual meeting in May 1949 your committee restudied the annual reports of preceding committees since 1935 inclusive. The chairmanship during those years was held by men who were unquestionably qualified to render aid to the branches, insofar as lies within the power of persons outside the branch executives. Their reports offered many opinions and suggestions, but the outstanding feature of them collectively was their expressed dissatisfaction with their achievements, and some degree of frustration in their efforts to accomplish positive results.

The 1935 report of Councillor C. S. L. Hertzberg recommended that the general papers committees be relieved of that section of its duties concerning furnishing papers for the Institute's annual meeting. Since then successive papers committees have followed this recommendation, but the procedure has not been regularized by an amendment to par. 1 of section 48 of the by-laws. This year's committee concurs in the procedure which has been adopted for the past fourteen years, and strongly recommends that the Council of the Institute consider, before another papers committee assumes duty, the desirability of endorsing this procedure and initiating action to revise the by-law accordingly.

Realizing the difficulties under which previous papers committees have laboured, this year's committee considered it would be wise to obtain the current views of the officers of all branches. The chairman therefore requested the aid of the general secretary, Dr. L. A. Wright, and the field secretary, Mr. C. E. Sisson, as committee members. The recent death of Mr. Sisson has deprived us of the inspiration and advice of a valued friend, and leaves us with a sense of great loss, both personal and professional.

In July 1949 a questionnaire, including ten items, was sent to all branch chairmen. Twenty-eight replies were received, and the committee wishes at this point to express its sincere gratitude to the branch officers, and its appreciation of the interest apparent in their replies.

Space does not permit including here the analysis of the views received, but certain outstanding opinions are of interest. The opinion that isolation is a major handicap in obtaining speakers and maintaining activities is not unanimous. It is considered by some that this difficulty can be often offset by an aggressive branch papers committee.

In order that each branch may be kept advised of its neighbours' activities, and that Headquarters may also be informed, practically all branches agreed, if requested, to send to Headquarters and to their neighbours within 500 miles copies of the notices of their meetings.

Apparently few, if any, branches prepare a whole season's programme ahead. Some cannot manage to arrange meetings more than one month in advance. The importance of arranging a programme well in advance was acknowleged and stressed by several branches. The number of meetings held per year per branch is variable,—five or six seems common, even in some busy centres,—a few branches set no objective,—others in more fortunate circumstances have 15 to 30 per year,—nearly all cease action in June, July, and August.

These two matters,—number of meetings and advance planning of programmes, are basic to the planning of branch activities, and have a direct bearing on the aid that can be given by headquarters or this committee. If it were known on what dates branches planned to hold meetings, arrangements to fit in travelling speakers might be added; but lacking such information outside help can only be haphazard.

Another important point made evident by the questionnaire is the inability or unwillingness of many branches to underwrite the expenses incurred by visiting speakers. It is, of course, entirely the prerogative of the branches to conduct their own activities, but it will be readily understood that this important feature must have a major influence on the activities of such branches.

This report of your committee is one of study and resultant conclusions, rather than one of achievement in actual aid to the branches. Our study leads us to conclude that the problem of rendering aid to those branches which express a wish for aid, is chiefly one of organization. All are agreed that the maintenance of the interest of its members and the increasing of the prestige of the Institute by providing speakers and papers of high rank, is of major importance. But it is not good to ask a qualified speaker to prepare a paper unless he can be, at the same time, advised as to the who, when, and where of his audience. If the branches would organize themselves into geographical groups, with a mutual undertaking within each group to arrange a schedule and share expenses when a speaker is available, the work of approaching speakers and arranging for short tours would at least start off on the right foot.

Your committee's second conclusion is that, as its work is so closely tied in to that of Headquarters, the chairman should always be within easy reach of Headquarters. In his 1938 report, R. L. Dobbin recommended that a special department should be set up at Headquarters to handle this work. Most of the annual reports since then have referred to the fact that Headquarters can do, and does do most of the work, and that the Papers Committee's action is merely supplementary. Your committee this year agrees entirely in this. The fact that Headquarters staff is already overloaded with work and overcrowded for space does not alter the other fact that the work hitherto done nominally by the Papers Committee, can be done more efficiently by Headquarters.

It is therefore recommended that,—

(a) In the agenda for the branch officers' meeting, to be held at the next annual meeting, there shall be included a discussion of the matters covered by this report, and that every branch be urged to have a representative at that meeting. It is quite possible that considerable progress towards arranging for local tours of speakers could be made then and there.

(b) The Council give consideration in the near future to the relationship between the Papers Committee as established by the by-laws, and the work of the Headquarters staff, with a view to establishing an organization and procedure which will improve the possibility of rendering aid to the branches in the matter of speakers, papers, and films.

K. G. Cameron, M.E.I.C.
Chairman.

Nominating Committee

Chairman: T. E. Storey, Winnipeg

Branch	*Representative*
Border Cities	J. M. Wyllie
Calgary	W. E. Robinson
Cape Breton	J. R. Morrison
Central B.C.	M. L. Wade
Cornwall	C. I. Bacon
Edmonton	F. R. Burfield
Halifax	L. E. Mitchell
Hamilton	I. Macdonald
Kingston	S. D. Lash
Kitchener	A. J. Girdwood
Kootenay	A. C. Ridgers
Lakehead	H. M. Olsson
Lethbridge	J. Haimes
London	A. L. Furanna
Moncton	V. A. Ainsworth
Montreal	R. S. Eadie
Newfoundland	H. Forbes-Roberts
Niagara Peninsula	C. G. Cline
Ottawa	Norman Marr
Peterborough	A. L. Killaly
Quebec	C. H. Boisvert
Saguenay	H. R. Fee
Saint John	A. R. Bonnell
Saint Maurice Valley	H. O. Keay
Sarnia	E. W. Dill
Saskatchewan	Stewart Young
Sault Ste. Marie	R. A. Campbell
Toronto	A. E. Berry
Vancouver	G. W. Allan
Victoria	Kenneth Reid
Winnipeg	H. W. McLeod

Library and House Committee

Three meetings of the committee were held in 1949. As for the past several years, the need of additional space at Headquarters has been the main problem to which the committee has devoted its attention. Two schemes for providing additional space at Headquarters were considered thoroughly during the year. Either scheme would cost approximately the same and would provide accommodation for Headquarters' staff for perhaps some twenty years.

At a meeting of council last spring a tentative estimate of $60,000.00 was placed before the meeting resulting in a request to the Finance Committee to consider whether this amount might be made available.

Early this summer, it was decided that some relief must be given at once to the very pressing demands for extra staff space and a further study of the quarters at Mansfield Street was made. As a result, it was found that the reading room on the second floor was used very little — in fact by not more than two or three people a week. It was therefore decided to take over this space for the office staff. A reading room was opened on the first floor and facilities are still available for those desiring to examine current periodicals or books from the library. The old reading room space upstairs is now occupied by the accounting and records staff, consisting of eleven persons. The new arrangements have proven very satisfactory and it is expected that the staff will be able to carry on for some little time — perhaps three to five years before space requirements again become pressing. On the other hand, if Headquarters' activities continue to expand as they have in the past, this period may be very materially shortened.

It is now felt by all concerned, including the Finance Committee, as well as this committee and the general secretary that plans for the extension of Headquarters can be held in abeyance, for the time being, at least. In the event that space requirements become urgent in the near future, the various schemes proposed for enlarging Headquarters can again be reconsidered with perhaps a reduction in overall costs.

During the summer the auditorium was redecorated in a modern colour scheme, the floor scraped and refinished and new curtains provided. The resulting effect is most attractive.

During the past summer, the furnaces for heating the building were changed from coal to oil to achieve more satisfactory heating, greater convenience, and freedom from coal dust and ash. With all the various activities of the Institute and the large staff, cleaning of the building alone has become quite a chore and it was felt that the janitor should be relieved of stoker duties. By changing to an automatic oil system, this could be done without employing additional labour. It is felt that this method of heating, considering the overall costs, will be the most economical.

A lamp has been installed over the front door of Headquarters building which illuminates the entire entrance of the building, including the steps and approaches. This lighting system is in keeping with the architectural appearance of the building and will add much to general safety.

During last winter, several experiments were carried out using a public address system for several of the lectures. These experiments were carried out under the supervision of the Montreal Branch. It is still a question as to whether such a system is necessary or desirable.

Library

A great change, and one very much for the better, was effected in the Library during the month of July. As mentioned above, two departments of the general offices were moved upstairs. The Library facilities were all arranged on the ground floor in one location resulting in a combined reading and reference room with periodical and book stacks, pamphlet files, library catalogue, indices and other bibliographical material, telephone, reference and circulation desk (with an assistant in charge) all readily available for use and consultation. It has been interesting to note that the combined reading-reference room has resulted in increased use of the facilities.

Re-arrangement of files and stacks to provide a work room and an office for the librarian which has created more efficient behind-the-scenes working conditions.

In spite of almost drastic weeding of material, and the donation of some 3,000 volumes (mostly duplicates) to the March of Books, shelving space is still at a premium. If the library continues the present rate of expansion, space will be exhausted in two years.

The Library consists of approximately 12,000 volumes including text books, reference books, periodicals, transactions, etc.; some 2,500 feet of shelving and 63 vertical file drawers.

New material, not including pamphlets, bulletins, and miscellaneous items, to the value of $2,750.00 has been added to the Library during 1949.

Accessions	1949	1948
Books	259	202
Periodicals and Transactions.	34	48
Reports and Bulletins	651	445
Standards and Tentative Standards	128	104
Pamphlets	133	169

We take this opportunity of thanking the publishers and reviewers for their excellent co-operation during the past year. Reviews, book notes, and abstracts, numbering in all 419, have been published in *The Engineering Journal* during 1949. Unfortunately, only eight signed reviews were published. However, 1950 should see an increase in this figure if present plans materialize. By publishing, in the *Journal*, reviews and notes of new books, new publications are brought to the attention of our readers, and also considerable new material for the Library is acquired.

Although no new films have been added to the film collection, further work has been done on this phase of the service and branch secretaries are now being advised of industrial films which come to Headquarters' notice.

Use made of the Library has shown a steady increase during the year. However, the physical change in the library facilities has required a change in the basis of recording statistics. The comparisons which follow are therefore not very accurate.

	1949	1948
Days Open (for service)	262½	272
Evenings Open (5 to 8 p.m.) Thursdays (winter months)	31	22
Inquiries Received:		
By Phone	2,978	2,791
In Person—Day	2,013	1,693
—Evenings	202	176
By Letter	1,578	1,399
Total	6,771	6,059
Increase 712 or 11.74 per cent.		

Circulation:	1949	1948
Books Borrowed	2,089	1,562
Periodicals, etc., Borrowed	2,036	2,375
Pamphlets Borrowed	677	1,054
Inter-Library Loans Borrowed	68	77
Indices Consulted	2,185	1,011
Films Borrowed	8	6
Total	7,063	6,085
Increase of 978 or 16 per cent.		
New Borrowers Added	206	226
No. of Borrowers as of Dec. 31st.	356	265
Special Services:		
Bibliographies Prepared	74	101
Pages	132	211
Photostat Orders	32	29
Prints	264	182
Orders for Members	459	318

Work on the new subject classification has been at a standstill due to staff changes, the re-arrangement of the Library, and general pressure of day to day work. The new year should see this and other reorganizational projects resumed.

Attention of members is drawn to Library Regulations printed herewith.

LIBRARY REGULATIONS

Hours

	Oct-Apr	May-Sept
Mon-Fri	9–6	9–5
Thurs (Oct-Mar)	9–8	9–5
Sat (closed Jy-Sept)	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.

The Library is for the use of the members. Inquiries and suggestions are welcome.

The committee expresses its appreciation of the continued loyalty and co-operation of the Headquarters Staff.

H. F. Finnemore, M.E.I.C.,
Chairman.

Admissions Committee

The Admissions Committee met prior to each meeting of Council. Admissions or transfers were recommended for 344 Members in addition to the 272 automatically admitted under co-operative agreements, 1763 student memberships and automatic transfers from Student to Junior, 717.

Work on the manual was temporarily suspended pending possible revision of the by-laws to simplify and reduce the work involved in processing applications at headquarters.

J. M. Crawford, M.E.I.C.,
Chairman.

Committee on Employment Conditions

This committee has no specific development to report during the current year as no requests were made to it.

We may report that we have kept an eye on developments in collective bargaining in general and in particular for the profession in Canada and in the U.S.

G. N. Martin, M.E.I.C.,
Chairman.

Board of Examiners

The Board of Examiners has met from time to time during the year and has considered the cases of applicants referred to it by Council. These have fallen into the usual categories and have been dealt with by recommending in each case, such examinations as seemed called for.

At the request of the Winnipeg Branch, we have ceased to recommend to applicants from Manitoba that they should seek admission to the Institute by first becoming members of the Manitoba Association, but we still follow this practice in other provinces where professional associations exist.

We are receiving an increasing number of applications from those who possess university degrees in some field other than engineering, who have been doing responsible engineering work for a considerable period and who have often established outstanding reputations therein. It seems to your Board of Examiners that some machinery for dealing with such cases other than the existing examination system might be formally set up, especially as the number of such cases will probably increase.

R. DeL. French, M.E.I.C.,
Chairman.

Committee on the Training and Welfare of the Young Engineer

The 1949 conference of engineering undergraduate societies held during the E.I.C. Annual Meeting in Quebec May 10-13 was one of the highlights of the year's student guidance activity. The conference was exceptionally successful as a demonstration of the Institute's sincere interest in the engineering undergraduate, and we believe that the delegates carried back to their universities a high opinion of the E.I.C. and of its members. Following the practice of previous conferences, and encouraged to do so by the E.I.C., the delegates prepared a number of resolutions. Where these resolutions ask for action on the part of the E.I.C., it is strongly recommended to the council that suitable and positive action be initiated.

The E.I.C. booklet "The Profession of Engineering in Canada" issued some years ago was a credit to the E.I.C., a very valuable aid in guidance work, and stimulated a demand for a publication to cover the field in greater detail. The work of preparing material for the larger booklet was undertaken by the Canadian Committee for Student Guidance in Science and Engineering, of which the writer representing the E.I.C. is chairman. The Bureau of Technical Personnel and the Canadian Council for Professional Engineers and Scientists gave valuable assistance, and the booklet has now been published by the Department of Labour in both French and English. It is titled "Careers in Natural Science and Engineering" and contains sixteen monographs covering different branches of engineering and science, together with much valuable and authoritative information of a general nature. The friendly co-operation shown by all who had a part in the planning and preparation made it a great pleasure to have had a part in the work. The booklet will have a wide distribution to schools and student counsellors.

Guidance work by E.I.C. councillors at the high school level remains spotty. Some branches are doing an excellent job and other branches are doing nothing. It is clear that this situation cannot be appreciably improved by correspondence — personal contact with the branches is needed. Mr. Sisson was greatly interested in this and would have succeeded in stimulating a much more general interest in this subject. The committee will look to his successor for assistance.

It is recommended that the committee itself be reorganized with a vice-president or councillor as chairman and a membership composed of the chairmen of branch guidance committees. It appears particularly important to have the chairman a member of the Institute's ruling body, so that the committee's activities and ambitions can always be presented first hand and receive correspondingly better sympathy and support.

It is recommended also that, at the annual meeting in Toronto next July, provision be made for a discussion on student guidance, at which everyone interested in this work could have an opportunity to criticize constructively the committee's activities and inactivities. The young engineer located in proximity to a branch is well looked after, but no satisfactory plan has yet been thought up to care for the Young Engineer in isolated locations. The committee would particularly welcome suggestions on this aspect of the committee's duties.

G. R. Langley, M.E.I.C.,
Chairman.

Canadian Standards Association

The year just past has been a busy one in the Canadian Standards Association. Thirty-seven specifications have been reviewed and reaffirmed as representing satisfactory present-day practice, and fifty-four new standards have been published or are on the press ready for publication, fully approved by all interested committees.

Besides this numerous revisions to operative specifications have been issued to bring these specifications into line with up-to-date practice. At the end of the calendar year, sixty-nine projects were under consideration by the various working committees, to say nothing of new projects under preliminary investigation.

One of the outstanding achievements of the year has been the publication of the C.S.A. edition of the specification for "Unified and American Screw Threads". This new standard was prepared in association with the American Standards body and the A.S.M.E., and is based on the general principles established in the Declaration of Accord signed in November, 1948 between the B. S. I., A. S. A., C .S. A., and the representatives of the respective national governments.

Another matter of interest to the Canadian public as well as to the industry concerned is the new C.S.A. standard for 2½-in. fire hose couplings and fittings. A survey of fire-fighting equipment throughout the Dominion revealed a deplorable situation regarding the non interchangeability of hose equipment between neighbouring municipalities. The establishment of a standard for this equipment will thus be of great assistance in permitting mutual aid when conflagrations become sufficiently serious to be beyond the scope of a single municipal or industrial fire-fighting group. Other standards are in view for fire-fighting apparatus, all designed in the public interest and for greater speed and efficiency in combating fire. The significance of these projects in relation to plans for civil defence as well as in the normal work of fire prevention and fire-fighting will be obvious.

A similar line of activity carried on during the year by the C.S.A is the development of standardization in the field of marine valves and fittings. The object here is to provide standards acceptable to the various services, ship builders, and the mercantile marine.

Progress is also being achieved in an entirely different type of standardization, namely protective packaging, and standards are being developed for wooden containers, corrugated and fibre board containers, moisture barriers, and devices for the safe handling of materials. Research and test work are being carried out, and consideration is being given to projects dealing with multi-wall sacks, folding cartons, bags, metal containers, and glass containers.

Two new safety codes were issued under Part V of the Canadian Electrical Code, dealing respectively with the use of electricity in coal mines and in metalliferous and other mineral mines and quarries.

New work is also being undertaken with respect to timber standards. Structural timbers, wood piles, railway and bridge ties, plywood, hardwood flooring, and similar materials will be dealt with under this classification and a proposal to establish a new Sectional Committee which would take over from the existing committees the work on timber products, is being given consideration.

Important progress has been made with the specifications for highway and railway bridges, each of which is being reviewed in accordance with the general policy of keeping these documents as up-to-date as possible, having regard to the frequency of changes and the cost of publication. New fields are constantly being opened up for standardization practices throughout the country and of course the C.S.A. is ever ready to welcome proposals for the establishment of standards in the general interest.

During the year an extensive publicity programme has been carried out with the objective of promoting greater support for the Association, and the results have been encouraging, indicating as they do most conclusively that there is a growing recognition throughout Canada regarding the function of the C.S.A. and its capacity to be a useful co-ordinating medium between manufacturers and consumers of Canadian products through the process of standardization.

P. L. Pratley, M.E.I.C.,
Representing E.I.C. *on Main and Executive Committees.*

Treasurer's Report

As will be indicated from the audited statements of Assets and Liabilities and of Revenue and Expenditures submitted herewith, the year 1949 was one of the best in Institute history, at least from the financial angle.

Income from membership fees totalled $84,064.21, an increase of $5,065.23 or approximately 6.5 per cent over 1948.

Revenue from publications, including $18,627.57 for *Journal* subscriptions and sales, totalled $122,690.70, an increase of $27,754.92 or 29 per cent over the previous year. Expenses of publications totalled $100,995.89, an increase of $16,463.89 or 19.5 per cent over 1948.

After transferring $8,000 to the Building Fund, surplus for the year amounted to $1,873.53.

According to actual audit the securities in the Institute's investment accounts amounted to $56,434.92, being an increase of $5,003.85 over the previous year due to the purchase of $5,000 of 3¼ per cent Province of Nova Scotia Interim Debentures in July, 1949. The approximate market value as of 31st

Comparative Statement of Revenue and Expenditure

For the Year Ended 31st December 1949

Revenue

	1949	1948
Membership Fees:		
Arrears	$ 3,816.43	$ 3,860.86
Current	76,037.83	71,569.92
Advance	1,634.78	1,778.86
Entrance	2,412.17	1,789.34
Compounded fees	163.00	......
	$ 84,064.21	$ 78,998.98
Publications:		
Journal subscriptions	$ 18,440.82	$ 16,624.28
Journal sales	186.75	58.65
Journal advertising	104,063.13	78,252.85
	$122,690.70	$ 94,935.78
Income from Investments	$ 1,203.49	$ 1,158.19
Refund of Hall Expense	1,025.00	895.00
Sundry Revenue and Profit on Sale of Securities	644.85	194.04
Total Revenue for Year	$209,628.25	$176,181.99

Expenditure

	1949	1948
Building Expenses:		
Property and water taxes	$ 1,367.82	$ 1,349.82
Fuel	172.06	649.09
Insurance	297.44	233.66
Light, gas and power	741.81	428.19
Caretaker's wages and services	1,403.00	1,367.00
House expense and repairs	2,002.98	1,422.25
	$ 5,985.11	$ 5,450.01
Publications:		
Salaries	$ 8,663.63	$ 8,101.29
Printing and sundry expense	66,574.80	56,077.94
Advertising commissions	25,757.46	20,348.77
	$100,995.89	$ 84,528.00
Office Expense:		
Salaries	$ 40,375.16	$ 30,681.13
Telegrams, postage and excise	3,103.14	2,778.44
Telephones	1,082.50	966.23
Office supplies and stationery	7,519.35	7,537.87
Audit and legal fees	600.00	600.00
Messenger and express	78.37	115.99
Miscellaneous expense	682.32	683.71
Depreciation—furniture and fixtures	869.70	522.23
	$ 54,310.54	$ 43,885.60
General Expense:		
Annual and professional meetings	$ 999.41	$ 3,355.60
Students' conference	1,199.95	1,450.15
Meetings of council	1,301.99	755.76
Travelling	3,774.27	4,761.20
Branch stationery	315.63	210.53
Institute prizes	577.12	498.50
Library salary and expense	5,821.45	4,635.01
Interest, discount and exchange	195.83	190.26
Committee expenses	210.87	313.00
Cost of membership—sister societies	1,659.81	709.28
Sundry expense	558.80	717.94
Pension plan	3,009.74	3,107.60
Membership directory	4,592.44	......
	$ 24,217.31	$ 20,704.83
Rebates to Branches	$ 14,245.87	$ 14,847.46
Total Expenditure	$199,754.72	$169,415.90
Transferred to Building Reserve	8,000.00	4,000.00
Transferred to Technical Publications Fund	......	1,500.00
Surplus or *Deficit* for Year	1,873.53	1,266.09
	$209,628.25	$176,181.99

December, 1949, of all our securities stands at $58,072.

Total Assets now stand at $123,929.85, an increase of a little over $10,000 or 9.1 per cent over 1948.

The excellent showing for the year is due in large measure to the splendid work of the general secretary and his staff.

A. W. Whitaker, jr., m.e.i.c.,
Treasurer.

Finance Committee

During the year 1949 there was an increase in revenue due to further expansion in membership, to transfer of Students and Juniors to a higher grade and to increased volume of advertising in the *Journal*.

There was likewise an increase in expenditure due to the installation of oil burners for the heating of Headquarters, to the larger number of *Journals* printed and distributed, to necessary increase in staff including the opening of a field secretary's office in Toronto, to advance payments of almost $4,600 on the membership directory which will be published in 1950 when revenue following its distribution will offset to a large extent its total cost.

The Institute has come through a year of intense activity with a good financial statement. Due to excellent management the *Journal* has for the first time carried itself with a small margin to spare. An amount of $8,000. was transferred from the year's surplus to the building fund which now stands at $17,000, and $1,873 credited to surplus account. A special effort should be made to increase the building reserve in particular and other reserves in general, in order to provide for expansion and the uncertainties of the future.

The Finance Committee met twelve times during the year and reported to Council at each of its meetings.

The excellent results of the past year are due mainly to, and reflect great credit on, the general secretary and his staff.

R. E. Heartz, m.e.i.c.,
Chairman.

Comparative Statement of Assets and Liabilities

As at 31st December 1949

Assets

	1949	1948
Current:		
Cash on hand and in banks	$ 7,517.41	$ 6,914.20
Accounts receivable—less reserve	10,462.04	8,739.77
Arrears of fees—estimated	3,500.00	3,500.00
	$ 21,479.45	$ 19,153.97
Investments at Cost: (Approximate market value as at 31st December 1949—$58,072.00)	56,434.92	51,431.07
Sundry Advances	350.00	350.00
Deposit with Postmaster	175.00	175.00
Prepaid Insurance	170.00	260.00
Gold Medal	45.00	45.00
Library—At cost less depreciation	1,448.13	1,448.13
Furniture and Fixtures—At cost less Depreciation	7,827.35	4,700.08
Land and Buildings—Assessed Valuation	36,000.00	36,000.00
	$123,929.85	$113,563.25

Liabilities

		1949	1948
Current:			
Accounts payable		$ 7,637.22	$ 6,665.41
Rebates to Branches		......	1,000.00
		$ 7,637.22	$ 7,665.41
Special Funds:			
As per statement attached		18,348.00	17,711.95
Reserves:			
Building fund		17,000.00	9,000.00
Building maintenance		2,000.00	2,000.00
Contingent reserve		5,000.00	5,000.00
Pension fund reserve		8,000.00	8,000.00
Technical publications fund		1,385.21	1,500.00
Surplus Account:			
Balance as at 31st December 1948	$ 62,685.89		
Add: Excess of revenue over expenditure for year as per statement attached	1,873.53		
		64,559.42	62,685.89
		$123,929.85	$113,563.25

Audit Certificate

We have audited the books and vouchers of The Engineering Institute of Canada for the year ended 31st December 1949 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 1949, as attached, are properly drawn up so as to exhibit a true and correct view of the Institute's affairs as at 31st December 1949 and of its operations for the year ended that date, according to the best of our information and the explanations given to us and as shown by the books of the Institute.

(Sgd.) RITCHIE, BROWN & CO.,
Chartered Accountants

Montreal, 16th January, 1950.

National Construction Council

The Annual Meeting took place on May 26, 1949. Keen regret was expressed at passing of Major Thompson, first vice-president. The president's report and the treasurer's report were read. Appointment of ex-officio officer, and election of officers followed.

Mr. LeClair presented a submission to be sent to the Dominion Government and Provincial Governments warning of the danger to the construction industry and Canadian economy due to forest fires, and pointed out that the Dominion Government did not have the legal responsibility and the provinces did not vote money for that purpose, and that good timber was becoming increasingly scarce. He urged that every effort be made to have educational work undertaken in our schools to emphasize the importance of government action in this matter. The annual report of the president was presented.

A meeting on October 17, considered the matter of importation of engineers and contractors from the United States and the change made in Canadian customs regulations regarding duty free plans and blue prints. The following guests were invited and took part in the discussion (see minutes): Col. Grant, chairman of special committee of the E.I.C. to study this matter; Mr. Mathers, representing the R.A.I.C.; Col. Muir representing the Association of Professional Engineers of Ontario; Mr. C. E. Sisson, field secretary, E.I.C.; Mr. Ingles recommended that a list be prepared of engineering projects carried out successfully by Canadian engineers; Mr. Craig stated that the engineers' situation is now affecting the architects. He mentioned a specific project in London where an American architect was brought in and, on being unable to get resident architects to prepare the working drawings because no architect would undertake the work, brought in engineers from the United States. No objection was raised by the Association of Professional Engineers of Ontario.

It was felt that this meeting covered a lot of ground, all of which is set forth in the minutes.

W. E. Bonn, m.e.i.c.,
Representative of the E.I.C

Ontario Division

Activities of the Ontario Division during the year 1949 have not been as comprehensive as had been planned but have included action on several items of particular interest to the Ontario branches.

Two meetings were held during the year. The second general meeting of the Division, held in Hamilton on March 19, was attended by a total of 57 officers and members of the Division. This meeting preceded the Regional Council Meeting held in Hamilton on that date. It was not possible to hold the statutory meeting of the executive within the calendar year. However, this meeting was held in Hamilton on January 12, 1950.

During the year several items were considered by the executive and members of the Division as follows:

1. Shoreline Erosion

Following the resolution passed at the general meeting in March, all Ontario branches were contacted and a committee formed with the object of communicating with and assisting other

Statement of Special Funds

As at 31st December 1949

Leonard Medal Fund:		
Balance as at 31st December 1948....	$ 601.60	
Add: 3% interest..................	18.05	
	$ 619.65	
Less: Cost of prizes...............	......	
		$ 619.65
Plummer Medal Fund:		
Balance as at 31st December 1948....	$ 815.13	
Add: 3% interest..................	24.45	
	$ 839.58	
Less: Cost of prizes...............	......	
		$ 839.58
Past Presidents' Prize Fund:		
Balance as at 31st December 1948....	$ 8,269.43	
Add: 3% interest..................	247.56	
	$ 8,516.99	
Less: Cost of prizes...............	17.31	
		$ 8,499.68
Duggan Medal Fund:		
Balance as at 31st December 1948....	$ 2,828.44	
Add: 3% interest..................	87.85	
	$ 2,916.29	
Prize 1947 withdrawn...............	100.00	
		$ 3,016.29
Julian C. Smith Memorial Fund:		
Balance as at 31st December 1948....	$ 940.58	
Add: 3% interest..................	28.20	
	$ 968.78	
Less: Cost of prizes...............	......	
		$ 968.78
Fund in Aid of Members' Families:		
Balance as at 31st December 1948....	$ 3,796.45	
Add: 3% interest..................	113.89	
		$ 3,910.34
Pioneers of Science—Prize Fund:		
Balance as at 31st December 1948....	$ 231.66	
Add: 3% interest..................	6.94	
		$ 238.60
Life Members' Donation Fund:		
Balance as at 31st December 1948....	$ 228.66	
Donations for 1949..................	19.00	
Add: 3% interest..................	7.42	
		$ 255.08
		$ 18,348.00

Harry F. Bennett Educational Fund

Statement of Receipts and Disbursements

For the year ended 31st December 1949

Balance as at 31st December 1948................		$ 25,172.06
Add: Voluntary contributions during year	$ 438.00	
Interest on savings account...	16.45	
Interest on investments.......	600.00	
		$ 1,054.45
		$ 26,226.51
Deduct: Sundry bank charges......	.69	
Sundry printing, etc........	19.47	
		$ 20.16
Balance as at 31st December 1949.............		$ 26,206.35
Cash in Canadian Bank of Commerce..	$ 2,293.85	
Investments at cost (Approximate market value $20,340.00)...............	19,912.50	
Loans outstanding....................	3,700.00	
Amount owing by The Engineering Institute of Canada.................	300.00	
		$ 26,206.35

Investments—*At cost*:	
$10,000.00 Dominion of Canada Bonds 3% Sept. 1, 1966................	$ 10,037.50
10,000.00 Province of Ontario Bonds 3% Apr. 15, 1965......................	9,875.00
	$ 19,912.50

Auditors' Certificate

We have audited the books of the Harry F. Bennett Educational Fund of The Engineering Institute of Canada for the year to 31st December 1949 and have received all the information we required. The accounts do not record any interest received or charged on outstanding loans. In our opinion, the above statement of receipts and disbursements is properly drawn up so as to exhibit a true and correct view of the affairs of the Fund as at 31st December 1949 and for the period ended that date, according to the best of our information and the explanations given to us and as shown by the books of the Fund.

(Sgd.) RITCHIE, BROWN & CO.,
Chartered Accountants

Montreal, 16th January, 1950.

groups now specifically concerned with the problems of shoreline erosion, and of placing the whole problem before the communities involved. The committee, which was duly constituted at the statutory meeting, will consist of—

Peterborough	C. W. Holman
Toronto	W. E. Bonn
Border Cities	C. G. Russell Armstrong
Niagara Peninsula	P. Buss
Sault Ste. Marie	W. D. Adams
Sarnia	J. W. MacDonald
Hamilton	F. W. Paulin
Kitchener	J. F. Runge

Mr. P. Buss was duly elected chairman of the committee.

2. Co-operation with the Ontario Association of Professional Engineers

Informal discussions have taken place with officers of the Association indicating a mutual desire to improve cooperation between the two bodies.

3. St. Lawrence Waterway

Mr. E. A. Cross of Toronto was appointed chairman of a committee to make an informal investigation into the possibility that the Division could make a contribution to this subject as it particularly affects Ontario.

Officers for the forthcoming year were duly elected at the statutory meeting of the Division and are as follows:—

Executive Committee: W. L. Saunders, Owen Sound, Chairman; W. A. T. Gilmour, Hamilton, vice-chairman; L. C. Sentance, Hamilton, secretary; G. R. Turner, Ottawa, treasurer.

Board of Management: W. L. Saunders, W. A. T. Gilmour, L. C. Sentance, G. R. Turner, E. A. Cross, F. R. Pope, C. R. Warkentin.

The financial report submitted by the treasurer, G. R. Turner, follows:

Financial Statement

Income	
Balance Dec. 31, 1948	$245.77
Bank interest	.82
	$246.59
Expenditure	
Printing and mailing	67.25
Meetings	17.11
Bank exchange	.45
Miscellaneous	20.00
Total expenditures	$104.81
Balance Dec. 31, 1949	141.78
	$246.59

L. C. Sentance,
Secretary.

Committee on Conservation of Natural Resources

The Committee on Conservation has not been able to assemble in a plenary session but the chairman has had contact and discussions with individual members at various times. The consensus of opinion appears to be that, as reported to Council in December last, the urgent problems of conservation are essentially local problems and must be dealt with locally, i.e. through division or branch organizations, rather than through a Headquarters committee. Inquiry has shown that the local problem outlined in the report of December 10, including shore erosion, harbour silting, stream and ground water pollution, etc., are being given consideration by local government services. No report has yet come to hand that any branch or district has set up a local sub-committee to assemble facts on local situations and the committee can only assume that the branches are reasonably satisfied that local government services are doing all that can be expected under the circumstances.

Broader problems such as forest conservation, land rehabilitation, fishery protection, mineral conservation, ground water studies, etc., are obviously problems of government policy, federal, provincial, and municipal. By and large, these are being well looked after by those authorities although local conditions at times, are such as to develop local agitation for improvement. Your committee believes that it can say with confidence that the federal and provincial authorities have policies on these problems that insure reasonable safeguards up to the limits of the financial support that can be given within government budgets.

Your committee believes that the Institute is not in a position to function as a fact-finding or determining committee on these problems. Local or branch committees can help at local level and the Institute as a whole must depend upon such action by its members for any service it can render on these problems.

Your committee believes that the whole-hearted approval of the Institute should be given to all policies of the federal, provincial, and municipal governments designed to conserve the natural resources for the good of the community and recommends that the Institute go on record at the next annual meeting as giving its approval to the existing policies of the governments in their efforts to find ways and means by which the natural resources can be preserved, and that the Institute offer to responsible and governmental bodies all assistance in its power in the development of any conservation projects undertaken by them.

Engineers and the engineering profession are largely responsible for the development and exploitation of the natural resources. They plan the projects, both those designed to conserve and those designed to consume. A consciousness of the need of conservation, so that there will be maximum use with minimum waste, must be advanced within the profession as a whole. As suggested in the report to the Annual Meeting at Banff in 1948, your committee believes that this can be accomplished best by careful consideration and discussion of the conservation aspects in every technical paper presented to the Institute whether at a branch or annual meeting.

Your committee again recommends that each branch or district set up a local committee of members to work on problems related to conservation and protection of natural resources.

Alan E. Cameron, m.e.i.c.,
Chairman.

Canadian Chamber of Commerce

The activities of the Canadian Chamber of Commerce during the year 1948-1949 can best be described by listing some of the main headings of the report submitted by its President, Mr. Henry G. Birks, at the termination of his term, at the annual meeting held in Montreal, in October, 1949:

Year of progress
Business speaks to Government
Building support for free enterprise
International trade activities
Labour relations
Education
Chemurgy

Year of Progress

The Canadian Chamber of Commerce was formed 24 years ago by a group of leaders who recognized the necessity of making the voice of business heard at the national as well as at the Community level. The organization meeting, in Winnipeg, in 1925, was attended by 50 Boards of Trade while the Chamber now counts 633 Boards of Trade and Chambers of Commerce grouping 100,000 businessmen actively working for the betterment of their communities and of the nation. The Canadian Chamber consists of 2,000 Canadian companies employing 1,600,000 Canadians and representing every class of business: manufacturing, retailing, wholesaling, banking, importing, mining, fishing, lumbering, insurance, instruments, transportation, etc.

Business Speaks to Government

No one will deny that the officers of the Canadian Chamber are entitled to speak to the Federal Government in the name of business. As a matter of fact, it is the only way businessmen can hope to influence the action of the Government; they cannot match votes with the various pressure groups and their main asset rests in the weight of their considered and well informed opinion.

Following the Annual Meeting, the President of the Canadian Chamber, accompanied by the First Vice-President and other officers, presented the Policy Declarations to the Government and discussed their implementation and significance with the Prime Minister and with twelve members of his cabinet. Before the federal budget was brought down, the Chamber submitted to the Ministers of Finance its views on national fiscal policies. The main points of the Chamber's budget brief were the following:

Recommendations for reduction of income tax, sales tax, excise tax and other levies entering directly into the cost of production;

Recommendations for reduction in government spending and institution of an impartial body to analyse civil methods and operations;

Elimination of double taxation of corporate income;

Equal taxation of all business enterprises, whether privately, publicly, governmentally or co - operatively owned.

The Chamber also submitted a brief to the Royal Commission on Prices in which it pointed out that corporate profits were not the chief cause of inflation but that the inflationary trend to which people objected resulted directly from the war.

On the question of Immigration, the Chamber urged the establishment of a full-time Minister of Immigration, the adoption of a long-term immigration policy, and the appointment of a voluntary committee of leading citizens to advise the Government on immigration matters.

BUILDING SUPPORT FOR FREE ENTERPRISE

The Chamber's programme aiming at informing the public on freedom of enterprise increased in scope and vigour during the past year. Every available channel was used to set forth the case for liberty and initiative, and to explain how our free enterprise system works.

This programme included the operation of 200 National Affairs Committees formed to bring about a better understanding of the National problems among both the members of the Chamber and the public. The N.A.C. used radio broadcasts, public addresses, newspaper advertising, occasional pamphlets, newsletters, and an economic survey in their effort to educate the people of Canada on the advantages of private enterprise compared with state socialism and its end product the totalitarian state.

INTERNATIONAL TRADE ACTIVITIES

The Canadian Chamber has felt right along that it was important to take a major interest in international trade and so it participated in the congress of the International Chamber of Commerce held in Quebec, last June. It also cooperated in the arrangements for the International Trade Fair, at Toronto.

Canada's economic relations with the United States have been the special charge of the Chamber's Canada-United States Committee, which was formed some 15 years ago and has many accomplishments to its credit. Missions by Chamber's officers to Washington and to Ottawa aiming at the development of wider markets for the removal of invisible barriers, the interchange of national resources, Canadian supply for E.C.A., industrial mobilization of North American defence have all featured this Committee's work during the past year.

A new venture in the Chamber's trading relations with the United Kingdom was the formation, of the Chamber's Anglo-Canadian Trade Committee and its subsequent meeting with business men in the United Kingdom. Discouraging as the trading picture may seem the Chamber believes that we must trade to live, and that we must expand our trade to live better, and so the Chamber has been active in the past year in working for a solution to the all important trade problem.

LABOUR RELATIONS

In its educational programme this year, the Canadian Chamber emphasized the importance of improved understanding between employers and employees. In various public addresses the Chamber leaders pointed out that most employees gain their impression of the Canadian economic system from their association with the companies which employ them. For this reason management has a duty and an opportunity to place before employees the true facts about the companies for which they work and the system of democratic free enterprise under which they live.

A first step in the programme was the publication of a handbook for employers which outlined the ways in which management can tell its employees more about their own companies and more about various benefits which a firm might make available to its employees. The handbook entitled "How to make friends for your business" also dealt with general public relation methods for business.

Besides pointing out to employers what could be done to create good employee relations, it was felt that it was also important to find out what is being done in this direction by Canadian companies, so that a yardstick for each company would be available. To this end, 1309 companies in all the provinces replied to a questionnaire telling what they were doing in the way of employee welfare and in the way of informing their employees on the facts of the Canadian economy.

At the request of the Government, the Chamber participated in the conference of the International Labor Organization at Geneva, in June. Subjects discussed at that conference included industrial relations, vocational guidance, employment agencies, working conditions for seafarers, wages, and labour clauses in public contracts.

EDUCATION

Particular attention was devoted to problems of education during the year. Research on educational matters was continued, and a special programme, designed to develop closer liaison between educational authorities and the business community, was launched.

The Chamber continued its financial support and participation in the work of the Canadian Research Committee on Practical Education, which is engaged in a five-year research programme to ascertain how practical education in secondary school courses can best be adapted to the requirements of employment in Canada.

Following discussions with representative educational authorities, the Chamber is undertaking experimental programmes in six representative communities in different parts of the country to study methods of bringing about a greater understanding between businessmen and teachers. Results of this six-month "pilot programme" will be the basis for an education programme at the community level through member Boards of Trade and Chambers of Commerce.

CHEMURGY

With the prospect of mounting surpluses of agricultural products, the work of the Canadian Chamber's National Chemurgic Committee took on a new importance during the year. Through this Committee scientists from federal and provincial governments and scientists from private industry pool their knowledge to further the industrial use of farm products.

Among the scientific research projects in which the Committee is particularly interested are the production and improvement of Canadian edible oils; the utilization in the manufacture of paper of wheat straw not required to maintain soil fertility, and the improvement of techniques in the fermentation industries, such as the manufacture of alcohol and other industrial chemicals. The Committee is also stressing the importance of growing new crops, such as sunflower and rape seed, which might replace a considerable part of excess wheat acreage.

ANNUAL MEETING

The feature of the Annual dinner was an address by the Right Hon. Louis St. Laurent, in which he discussed the question of social security and free enterprise. He suggested that if people had to choose between social security and free enterprise that they would choose the former. The Prime Minister believed, however, that no such choice was necessary. He said that he preferred the term "social insurance" to the words "social security." He pointed out that all business men believe in the idea of insurance, not only against such disasters as fire, but also to protect the education of the young and similar social needs. "But", he said, "there is a danger we must avoid and it is this: Just as enterprise suffers when men of substance go too far in trying to secure their fortunes and their capital from all risks, so will the community suffer if social insurance is provided to the point where it weakens the incentive to produce."

At the annual meeting, in October, Mr. R. A. Bryce was elected President of the Chamber. Mr. Bryce is a consulting mining engineer of Toronto and the president of the Macassa Mines Limited. He is a member of the Board of Governors of the University of Toronto and a director of several companies including the Dominion Bank, the Confederation Life Association, the National Trust Company, and the Canadian General Electric Co.

Mr. Bryce has been active in the Canadian Chamber of Commerce for a number of years. He has served as Vice Chairman of the Executive and Chairman of the Ontario Regional Committee, as Vice-President for Ontario. Already he has done a good deal of travelling through Canada on Canadian Chamber work; among other trips, he visited the Boards and Chambers in the Maritimes and Newfoundland.

During the last year members of the Engineering Institute of Canada have continued to take an important part in the work of the Chamber. Some of them have dropped out at the expiration of their term of office but they have been replaced by others who are just as active.

ARTHUR SURVEYER, M.E.I.C.

Member of the Executive Sub-committees on "Economic Development" and on "Public Finance and Taxation".

Prairie Water Problems

Your committee on Prairie Water Problems is widely scattered — with members in Montreal and Edmonton and points between. Consequently, it is difficult to hold plenary meetings and most of the work is done either by correspondence or by discussions between two or three members when they happen to meet.

As a number of the members of the committee planned to attend a meeting of the Western Canada Reclamation Association in Lethbridge, Alberta, on September 22nd last, an informal meeting of the committee was called for the evening of that day. Eight out of thirteen members were present. The functions of the Prairie Water Board set up by the Federal Government and the Governments of the Provinces of Alberta, Manitoba and Saskatchewan were discussed, but it was concluded that it was too early yet to arrive at a conclusion as to whether or not the Board is fulfilling the purpose for which it was appointed. The application of the United States for allotment of portions of the flow of the Belly and Waterton Rivers was also considered, and it was the opinion of the committee that a watchful eye should be kept on this matter and that everything within the committee's power should be done to see that Canada's interests are properly safeguarded.

The members present were most appreciative of the action taken by the Council of the Institute in making representations to the Federal Government regarding the personnel of the International Joint Commission. Both the Council and this committee have availed themselves of every opportunity to impress on the Prime Minister and his Cabinet the importance of at least one member of this Committee being a professional engineer with experience and skill in dealing with water problems. This was followed up by a further discussion and consideration of this matter at a Regional Meeting of the Council on November 5th last. In this connection, it is gratifying to note the recent appointment of General A. G. L. McNaughton as a member of the International Joint Commission.

While progress is being made in irrigation development on the prairies, it is the opinion of this committee that the importance of irrigation in the economic development of Canada as a whole is not appreciated and that education and publicity along this line are urgently needed.

G. A. Gaherty, M.E.I.C.,
Chairman.

Canadian Radio Technical Planning Board

The fifth annual meeting of the C.R.T.P.B. was held in Montreal on January 16, 1950. Reports were submitted and the previous executive officers were re-elected for an additional term as follows: R. A. Hackbush, president; G. W. Olive, vice-president; and S. D. Brownlee, secretary-treasurer.

The principal activity of the C.R.T.P.B. during 1949 was contributed by its Television Technical Advisory Committee. The chairman of this committee, J. A. Ouimet, M.E.I.C., presented a comprehensive report to the annual meeting which, if and when approved for publication, may prove worthy of consideration at length in the *Journal.*

A. B. Hunt, M.E.I.C.,
E.I.C. Representative on the Board.

Julian C. Smith Medals

Carrying out the instructions pertaining to the award of the Julian C. Smith Medal for 1949, the special committee consisting of past-presidents J. N. Finlayson, L. F. Grant and myself, has made two selections which have been submitted by letter ballot to all councillors.

As a result Julian C. Smith Medals for 1949 are being awarded to G. A. Gaherty, president, Montreal Engineering Company and Calgary Power Company, Montreal, and J. A. McCrory, president, Montreal Engineering Company Limited, Montreal.

J. E. Armstrong, M.E.I.C.,
Chairman.

Abstracts of Reports from Branches

Note — For Membership and Financial Statements see pages 102 and 103

Border Cities Branch

During the year the Border Cities Branch held eight executive and eight general meetings.

The following is a list of the general meetings held during the year. The attendance is noted in brackets.

Jan. 14—C. D. Rees of Gardner-Denver Co.—Films & Short Talk. (52)

Feb. 11—A. S. Malcolm, M.E.I.C., of the Hydro Electric Power Commission of Ontario, spoke on **Design and Construction Features of the Des Joachim Power Development.** Slides. (63)

Mar. 11—John Ness of The Imperial Oil Co. Ltd. spoke on the **Development of the Oil Industry in Canada.** Film. (50)

Apr. 8—Rupert Morse — Director of Chemical Section — Canadian Westinghouse Co. spoke on **Materials Testing & Safeguards for Electrical Products.** Slides. (52)

May 13—J. C. Knapp—Supt. Quality Control, Ford Motor Co. of Canada Ltd. spoke on **Practical Applications of Statistical Quality Control.** (35)

Oct. 7—Joint Meeting with Professional Engineers of Ontario. J. W. Reid, M.E.I.C., president of the Association of Professional Engineers of Ontario spoke on **Industrial Organization.** (79).

Nov. 14—Joint Meeting with the American Society of Tool Engineers. Lt.-Col. P. C. King, M.E.I.C., spoke on **Development of Canadian Army Vehicles.** Film. (40).

Dec. 16—Major P. K. Ketcheson of the Carling Conservation Club spoke on **Conservation of Our Natural Resources.** Film. (41).

Calgary Branch

The following summary gives the activities of the Calgary Branch for the period December 1, 1948 to December 1, 1949. The attendance at meetings is indicated in brackets.

The Executive Committee met seven times during this period, with an average attendance of six.

Among the highlights of the past year were the visits of President Finlayson (April 29-May 1) with the assistant general secretary, and President Armstrong (Oct. 29-30) with General Secretary Austin Wright.

Dec. 2—Two films: "The Manufacture of Plate Glass"—showing in detail, the progress and processes used in the manufacturing of plate glass, taken in the plant of the Pilkington Glass Company, at St. Helen's, England. The second film, "The Telephone Hour", by courtesy of the Calgary Public Library, showing the development of communication lines in conjunction with music of the Bell Telephone orchestra and the renowned pianist Joseph Hoffman. (63)

Dec. 16—**Western Canada Oil Industry** by C. O. Nickle, oil editor of the "Calgary Herald". The speaker dealt with the general development of oil and gas discoveries in Alberta from 1914 to the present time. (67)

Jan. 6—**Canadian Asbestos Mining Industry** — a paper given by D. W. M. Ross, M.C.I.M.M., local manager of Joy-Sullivan of Canada Ltd. (59)

Jan. 20—Symposium on the subject, **Operation of a Power Utility** by three members from Calgary Power Ltd., H. Randle, M.E.I.C., equipment and waterworks engineer; T. D. Stanley, M.E.I.C., production superintendent, and J. N. Ford, M.E.I.C., construction engineer. (74)

Jan. 29—Joint dinner meeting with the Association of Professional Engineers of Alberta; the Chemical Institute of Canada and the Canadian Institute of Mining and Metallurgy, at the Hotel Palliser. The speaker of the evening was Dr. F. G. Buchanan, superintendent of schools for Calgary.

Feb. 17—Colonel H. W. Love, director of works and accommodation (Army), gave an address on the subject, **The Past, Present and Future Activities and Intentions of the Corps of Royal Canadian Engineers.** A film, showing the work of the army engineers in wartime, was shown in conjunction. (44)

Feb. 26—The annual Ladies' Night was held at the Renfrew Club.

Dancing, bridge, refreshments and buffet supper were enjoyed. (155)

Mar. 3—**The Dip Meter and Photochrometer** — a paper by C. W. Bailey, branch manager, Schlumberger Well Surveying Corporation. (50)

Mar. 12—Annual meeting of the Branch. Presentation of reports and installation of officers.

Apr. 29—Branch reception and dinner for the president of the Institute, J. N. Finlayson, accompanied by the assistant general secretary, W. D. Laird. (78)

Oct. 13—**Oil Field Law,** by Mr. A. D. Bessemer, Legal Department, Imperial Oil Ltd., Calgary.

Oct. 29—Branch reception and dinner for the president of the Institute, J. E. Armstrong, and Mrs. Armstrong, accompanied by the general secretary, L. Austin Wright. (93)

Nov. 8—Two films: "Steam for Power" showing a brief historical background of the development of steam power, followed by modern methods of steam generation and superheating, together with the manufacture of steam pressure vessels and boiler tubes and the assembling of the unit upon delivery. This film was by courtesy of Babcock-Wilcox Ltd. The other film, in two parts, consisted of "The Steam Turbine", followed by "The Surface Condenser", by courtesy of Allis-Chalmers. (100)

Nov. 18—Joint dinner meeting with the Association of Professional Engineers of Alberta; the Chemical Institute of Canada and the Canadian Institute of Mining and Metallurgy at the Hotel Palliser. The speaker of the evening was the Hon. N. E. Tanner, provincial minister of mines and minerals.

Dec. 1—The film, "No Man Is an Island" depicting the operations and activities of the Consolidated Mining and Smelting Company of Canada, and its employees. An introduction to the film was given by R. S. Woodford, M.E.I.C., general superintendent of the Alberta nitrogen plant of the C.M. & S., followed by a question period after the showing.

In addition to the above general and special meetings, the Luncheon Club of the Branch met each Monday noon in the Club Cafe.

Cape Breton Branch

Feb. 10—**Town Planning** by Charles Morrison. Dinner Meeting. (34)

Apr. 11—**The Ruhr** by Major K. E. Gustafson, assistant chief mining engineer, Dominion Coal Company Limited. Dinner Meeting. (24)

Apr. 26—**Nova Scotia Research Foundation** by Dr. H. D. Smith, director. Dinner Meeting. (38)

May 26—**Present Day Trends in Canadian Industrial Management,** by B. Rossetti, engineer, Dominion Coal Company Limited. Dinner Meeting. (15)

June 17—Executive meeting to welcome C. E. Sisson.

Sept. 23—President's visit. At 8.00 a.m. President J. E. Armstrong and party were met by members at North Sydney and driven to Sydney. A council meeting took place at 10.00-12.00 a.m. After luncheon with 34 in attendance, the council meeting resumed. In the evening the President addressed a dinner meeting. (89)
On Sept. 24, the presidential party was driven to Keltic Lodge, Ingonish, and was driven back to Sydney the next day.

Oct. 20—**Steep Rock** by E. D. Brown, vice-president, National Gypsum Co. Canada Ltd. Dinner Meeting. (31)

Nov. 9—**Boiler Feed Water Treatment** by L. C. Blackhall, sales manager, Dearborn Chemical Company Limited. Dinner Meeting. (39)

Dec. 7—**Conservation and the Engineer** by Dr. Alan E. Cameron, president, Nova Scotia Technical College. Dinner Meeting. (46)

Central British Columbia Branch

The following is our report for the year 1949, the first year of operation for this Branch.

Six executive meetings were held during the year, in addition to three general meetings which are described below, with attendance shown in brackets.

Jan. 14—The inauguration meeting of the Branch, at Kamloops. Dean J. N. Finlayson, president of the Institute presented the new Charter. Election of officers of the new Branch was held. President Finlayson addressed the meeting, outlining the history of the Institute. (34)

Apr. 9—General dinner meeting, at Penticton. A. L. Carruthers, M.E.I.C., addressed the meeting, on the **Okanagan Flood Relief Project.** (38)

Oct. 31—General dinner meeting at Kamloops, in honour of visit of President J. E. Armstrong and party. The President addressed the meeting. Songs and slides of scenes in Kamloops District were provided by guests. (46)

Cornwall Branch

The following list gives the activities of the Cornwall Branch for the period January 1, 1949, to December 31, 1949. The attendance at meetings is indicated by bracketed figures.

The Executive Committee met eight times during this period, with an average attendance of six.

The following general meetings were held during the year.

Jan. 11—An interesting paper on the development of lubricants, with films explaining oil exploration and refining processes, was presented by Mr. Georges of Canadian Oil Companies. Members of the Chemical Institute were invited to join us at this meeting, which was held in Courtaulds' Assembly Room. (45)

Feb. 15—K. D. Sheldrick, manager of the Montreal Branch of the Bailey Meter Company, presented a paper complete with slides showing the principles and application of their boiler control apparatus. Local members of the Institute of Power Engineers were invited. (54)

Mar. 8—A joint meeting was held at the Cornwallis Hotel when we joined the Chemical Institute in hearing E. L. Davies, vice-director general of the Defence Resarch Board, relate some of Canada's advances in the field of science. (75)

Apr. 26—Two of our members, W. P. Nesbitt of Howard Smith Paper Mills Ltd., and R. H. Wallace of the Canada Starch Company, presented practical and helpful papers on **Maintenance Cost Control.** The lengthy question and discussion period following the talks were evidence of the interest of the members. (33)

Sept. 13—The first meeting following the summer recess was held at the Board Room of the Cornwall Street Railway Light and Power Co., Ltd., — the subject was **The Transition from Street Cars to Trolley Buses.** G. I. Bacon dealt with some economic aspects of the project, Mr. Fairweather with engineering details of designing the new system, and Mr. Seymour with the structural and maintenance details of the trolley bus. (25)

Oct. 27—Marking time until the exact date of our joint meeting with the Montreal Branch could be arranged, a set of films was shown at Courtaulds' Assembly Room. They dealt with Principles of Hydraulics, Extraction of Magnesium from Sea-water, Glass Manufacturing Processes Old and New, and the manifold uses that cotton fibres have attained through modern research. (10)

Nov. 19—About 115 members of the Montreal Branch of the Institute, including Head Office personnel, Past-President Grant and Vice-President Reid, were conducted on a tour of the new staple fibre plant of Courtaulds (Canada) Limited. Dinner was served at the Cornwallis, where they were joined by 35 Cornwall members and a very pleasant get-together was enjoyed. Mr. Wallace presided and short addresses were heard from Mr. Tait, Mr. Reid, Mr. Wright and Mr. Sisson.

Dec. 10—Annual dinner meeting, reports, election of officers, at Hotel Cornwallis. (45)

Edmonton Branch

The following report of Branch activities is submitted by the Edmonton Executive for the year 1949. Attendance figures are shown in brackets.

Jan. 19—**Urban Transportation,** by Norman D. Wilson, consulting engineer, Toronto, Ontario. (150)

Feb. 2—**The Underground Electrical Distribution Network for the City of Edmonton,** by Stanley Hampton and C. Z. Monaghan, engineers with the City of Edmonton Electric Light Department.

Feb. 22—**Snow Research in the Canadian Rockies.** Talks and Films by Dr. de Quervain of the National Research Council. (95)

Mar. 10—**Synthetic Resins and Some of Their Applications,** by G. R. MacLean, consulting engineer. Edmonton. (40)

Apr. 25—Branch Annual Meeting. Highlights of year's activities, election of officers, concluding with smoker. (63)

May 14—Industrial Visit to Imperial Oil Refinery, Edmonton. (70)

Oct. 7—Industrial Visit to Northwest Brewery Limited Plant, Edmonton. 150)

Oct. 27—Western Visit of President Armstrong .Engineers' Annual Banquet and Ball at Macdonald Hotel. (470)

Oct. 28—Visit of presidential party and Edmonton executive to gasoline absorption plant, Leduc oilfield and the Town of Devon as guests of Imperial Oil Limited.

Nov. 23—**Water Treatment for the City of Edmonton—Softening and Purification,** by E. L. Smith, engineer in charge of City of Edmonton water supply.

Dec. 8—**Some Reflections on Metropolitan Planning,** by Noel Dant—recently appointed town planner for the City of Edmonton. Members of Edmonton Chapter — Alberta Association of Architects were special guests at this meeting. (130)

Halifax Branch

In carrying on the business of the Halifax Branch of the Institute for the past year the executive held six regular executive meetings and two special meetings — the first in July at which the late field secretary, Mr. C. E. Sisson, was present, the second in September to arrange a suitable programme for the official visit of the president of the Institute.

A summary of the activities of the Branch follows:

Jan. —The joint annual banquet. Guest speaker, Hon. L. D. Currie. (242)

Feb. —Dinner meeting. G. Lorne Wiggs discussed **Radiant Heating and Cooling.** (60)

Mar. —Dinner meeting. J. H. Rowlett —**Electronic Aids in Navigation.** (55).

Apr. —Dinner meeting. Dr. R. O. Jones — **Psychiatry in Industry.** (60)

Sept. —Official visit of the president of the Institute. (260)

Oct. —Students' meeting. Speakers were I. P. Macnab and R. Titus. (220)

Nov. 5—Inspection of a well-point drainage project at the naval magazine. (35)

Nov. 8—Dinner meeting. Byron Prugh spoke about **Well-point Installations.** (50)

Hamilton Branch

During the past year the Hamilton Branch held 9 meetings with an average attendance of 70. The meetings were as follows:

Jan. 13—Annual meeting at the Scottish Rite Club. The guest speaker, John Ness of the Imperial Oil Company, chose as his subject **Oil.** (62)

Feb. 17—**Arc Welding and Related Construction Design** by J. J. Kelly, Lincoln Electric Company. (40)

Mar. 24—The Annual "Students' and Juniors' Papers Night". The following papers were presented: **Rewinding Polyphase Induction Motors from 25 to 60 Cycles** by F. F. Dixon, Jr.E.I.C.; **An Electric Weighing Scale,** by L. C. Galloway, Jr.E.I.C.; **Cast Out-Of-Round Piston Rings,** by J. C. Buchanan, Jr.E.I.C. (44)

Apr. 21—**Organizing a New Plant,** by W. J. W. Reid, president of Otis Fensom Elevator Co. This was a joint meeting with the Association of Professional Engineers of the Province of Ontario. (79)

Apr. 22—Joint meeting with the Toronto Section of the A.I.E.E., and Hamilton Sub-Section of the A.I.E.E. **Distribution Systems** by J. E. Barkle, Central Station Sales, Westinghouse Electric Corp. (130)

Oct. 14—The "President's Visit". The president spoke, and presented prizes to students' and juniors' papers winners. (52)

Oct. 27—**Aluminium in the Construction Industry,** by C. O. P. Klotz, Aluminum Company of Canada. (46)

Nov. 17—Annual ladies night and dinner at Galt, followed by a tour of Dominion Woolens & Worsteds, Hespeler. (89)

Dec. 8—**Machines Without Men** by E. W. Leaver, Electric Association Ltd., Toronto. Joint meeting with A.I.E.E. - Hamilton Sub-Section. (83)

Kingston Branch

During the calendar year the Branch held meetings as reviewed below:

Jan. 25—Films. "Rail Steel in the World of Today"— Burlington Steel Co. "Romance of the Gyroscope"; and "Song of the Skis".

Feb. 22—Student Papers Night—A joint meeting with the Engineering Society of Queen's University. Guest speaker was Dr. J. J. Green, chief research aeronautical engineer, Air Transport Board. Student speakers were H. L. Armstrong, A. D. Kaill and R. H. Rehder.

Mar. 15—**Gas Turbine Engines with Special Reference to the Avro Canada Chinook** — D. H. Parker, assistant designer, A. V. Roe (Canada) Limited. Illustrated with slides and film as well as various actual engine parts.

May 3—**Palestine During the Latter Days of the British Mandate** — Lt. Col. P. G. F. Young, O.B.E., British Army Directing Staff, Army Staff College, Kingston. (30)

June 20—Annual Dinner Meeting. R. H. Saunders, chairman, Hydro-Electric Power Commission of Ontario, was the guest speaker. (100)

Oct. 1—Field trip to Des Joachims power development of the Hydro-Electric Power Commission of Ontario.

Oct. 25—W. J. W. Reid, M.E.I.C., guest speaker — **People Are More Than Things.**
Inspection tour of McLaughlin Hall, Queen's University, Kingston.

Nov. 15—Tour of Royal Military College. Guest speakers were Dr. W. R. Sawyer, director of studies, **College Activities;** and Dr. J. Reekie, physics head — **The Application of Physics to Undersea Warfare.**

Dec. 7—Joint dinner meeting with Chemical Institute of Canada and Junior Chamber of Commerce. Guest speaker, Mr. Hall, Bell Telephone Company of Canada — **The Journey of a Word** —(Illustrated).

Kitchener Branch

The Kitchener Branch was inaugurated formally in October, 1949, when Chairman M. A. Montgomery received the Branch Charter from President John E. Armstrong.

The new branch has been active, and subsequent meetings were as follows:

Nov. 18—Dr. A. E. Berry, director of sanitary engineering, Department of Health, of Ontario, discussed **Water Pollution.** (30)

Dec. 9—Edgar Cross, Toronto consulting engineer, spoke of the **History of Early Engineers.**

Meetings were held at the Officers Mess at Knallwool Park in Kitchener. Executive meetings were held monthly, with complete attendance reported.

Kootenay Branch

The following report of activities is submitted by the executive of the Kootenay Branch for the year 1949. Attendance is shown in brackets for each meeting.

The executive held eight meetings during the year. General meetings were as follows:

Jan. 14—General business. Annual reports were read. Nominating Committee was appointed. Film entitled "Head Work." S. C. Montgomery reported on items from Council minutes. (23)

Feb. 22—Annual meeting and election of officers was held. Guest speaker Dr. Goresky who spoke on **Applied Psychology.** (26)

Mar. 30—Luncheon meeting. Discussed the forthcoming visit of our president and assistant general secretary. H. L. Lang of Ford, Bacon and Davis, consulting engineers, spoke briefly on projects of general interest. A film entitled "John Bull's Island" was shown. (30)

Apr. 26—A luncheon meeting was held

in honour of Dean Finlayson and Douglas Laird when general Branch business was discussed. (33)

Apr. 26—A banquet in honour of Dean Finlayson, president of the Institute and Douglas Laird, assistant general secretary, was enjoyed by some 150 members and guests.

May 27—A dinner meeting was held at which Chairman A. H. W. Busby spoke briefly of his visit to the Annual General Meeting in Quebec and Dr. M. R. Basted of the C. S. Williams Clinic, Trail, spoke on the history of medicine during the past 50 years. (22)

June 29—A general business meeting was held featuring reports of delegates to the Annual Meeting and tentative arrangements made for the visit of President J. E. Armstrong and party in November. (11)

June 29—A combined meeting under the auspices of the Committee of Technical Societies, sponsored by the Kootenay Branch E.I.C., at which three films entitled "Materials Handling" were shown in the high school auditorium. (200)

Oct. 4—A dinner meeting was held at which general business was discussed and committee formed to make final arrangements for the president's visit on November 7, 8, and 9 (22). After the Branch meeting, the members adjourned to attend a lecture by H. A. Parker, supervising engineer in charge of irrigation, U.S. Dept. of the Interior, Bureau of Reclamation, Coulee Dam, Washington, U.S.A., who spoke on **Irrigation Features of the Coulee Dam.** This was a Committee of Technical Societies meeting sponsored by the Kootenay Branch E.I.C. (100)

Nov. 30—A luncheon meeting was held at which Dr. R. F. Mehl, director of metals research and head of the department of metallurgy at the Carnegie Institute of Technology spoke on **Research Organization.** (26)

Dec. 16—A luncheon meeting was held to discuss and approve the proposed by-laws, also general business. (24)

Lakehead Branch

The following meetings were held by the Lakehead Branch during the year, with the attendance shown in brackets:

Jan. 12—A meeting was held at the West Fort William Public Library. There was a discussion on the forthcoming dinner and dance. A. Paoli of the John Inglis Company gave a short talk on **Refrigeration** as applied to skating rinks. (27)

Feb 16—The annual dinner and dance took place in the Norman Room of the Royal Edward Hotel, in Fort William. A 5-piece orchestra was in attendance. (65 couples)

Mar. 17—A dinner meeting was held in the Orpheum Grill, Port Arthur. H. B. MacConnell, M.E.I.C., spoke on **General Estimating in the Building Trade.** A co-operative agreement between the Engineering Institute of Canada and the Association of Professional Engineers of Ontario was unanimously endorsed. (52)

Apr. 25—There was a general meeting held at the Lakehead Technical Institute, Port Arthur. Mr. W. H. Small reported on the meetings of Council and of the Ontario Division held in Hamilton on March 19. Mr. M. N. Vuchnich, president of the Lincoln Electric of Canada, gave an informative talk on welding which was illustrated by two films. (35)

May 5—A general dinner meeting took place at the Port Arthur Country Club. Honoured guests of the evening were the president of the E.I.C. Dean J. N. Finlayson, and W. D. Laird, assistant general secretary. Each gave an informative speech. Joachim Antonisson moved a vote of thanks to the guests. James A. Vance of Woodstock also was present and spoke briefly.

June 22—The annual dinner meeting was held in the Norman Room of the Royal Edward Hotel. The heads of the various committees gave their reports: A. D. Norton reported on the year's programme; J. N. McNeil gave the year's financial report; A. J. Michelson gave the report of the membership committee; C. L. Emery reported on the activities of the Student Guidance Committee and S. E. Flook read the slate of officers for the coming year. Representatives from the Law, Dental, and Medical Societies were present as guests for the evening and each spoke briefly and brought greetings from their respective societies. (60)

Sept. 10—The fall term opened with a tour of the H.E.P.C. of Ontario power development at Pine Portage. L. J. Gallagher, construction superintendent, and D. I. Natress, regional manager of the H.E.P.C., were introduced to the gathering, at the dinner afterwards, by H. M. Olsson, Branch chairman. (106)

Oct. 19—A general dinner meeting with the ladies was held at the Royal Edward Hotel, Norman Room. The guests of honour, J. E. Armstrong, president of the E.I.C., and the general secretary, L. Austin Wright, both gave informative talks. Mrs. Armstrong was introduced to the gathering by Mr. Olsson. Mr. Antonisson moved an able vote of thanks. (68)

Nov. 5—A tour of the sawmill of the Great Lakes Lumber and Shipping Company, Fort William, was held. The ingenious machinery at this plant impressed everyone present. Refreshments were served by the Company after the tour. (30)

Dec. 7—A general dinner meeting was held at the Orpheum Grill, Port Arthur. Students in engineering, the principal, and two lecturers of the Lakehead Technical Institute were present as guests. T. C. Anderson gave a talk on the aims and history of the Engineering Institute. C. L. Emery led a discussion on proposed E.I.C. sponsored scholarships for students entering the Lakehead's Junior University. There was some discussion regarding the forthcoming ladies' night. (38)

Lethbridge Branch

Meetings of the Lethbridge Branch during the year 1949 were as follows. Attendance at these events is noted in brackets.

Jan. 15—A. D. Palmer discussed **Manufacture and Distribution of Liquefied Petroleum Gas in Alberta.** (25)

Feb. 19—Ladies Night. H. G. Long told of **The Early History and Economics of Southern Alberta Irrigation.** (63)

Mar. 19—A. J. Cullen discussed **The Engineering Profession Act.** (34)

Apr. 28—A special meeting and field tour marked the visit of the president. Speakers were President J. N. Finlayson, W. D. Laird, the assistant general secretary of the Institute, and K. F. Vernon. (65)

Oct. 15—**Fundamentals of Effective Speaking** was the subject of a talk by Walter C. Lewis.

Nov. 19—The speaker was Philip H. Godsell, and his topic was **Arctic Trails.** (61)

Dec. 17—A meeting consisting of a musical programme and films. (35)

Six Executive meetings were held during the year with an average attendance of 7.

London Branch

The executive of the London Branch is pleased to report eight regular and special meetings as follows:

Jan. 31—Annual Meeting. Reports and installation of new officers. Guest speaker was Gordon R. Henderson, chief engineer, Polymer Corporation Ltd., Sarnia, who spoke on **Polymer — the Development of an Industrial Area.**

Feb. 22—Wilfred Jury, curator of the Western Ontario Museum, spoke on **Digging Into the Past.**

Mar. 22—V. A. McKillop, M.E.I.C., of the London Public Utilities Commission, gave some information on recent proceedings of Council. J. A. Vance, M.E.I.C., of Woodstock, Ont., vice-president, spoke on Institute affairs. E. V. Buchanan, M.E.I.C., general manager of London Public Utilities Commission, also spoke on Institute matters. There was also a general discussion on Institute affairs.

Apr. 26—Dinner Meeting. Major-General Norman Elliot Rodger, C.B.E., quartermaster-general of the Canadian Army, spoke on **Logistics and the Engineer.**

May 19—A. Malcolm, of the Hydro Electric Power Commission of Ontario, spoke and showed films on the **Des Joachims Development of H.E.P.C.**

Sept. 13—C. E. Sisson, field secretary of The Engineering Institute of Canada, spoke on Institute affairs in general.

Oct. 15—Members travelled to Kitchener to attend the inaugural meeting of the Kitchener Branch.

Nov. 15—Brig. J. A. W. Bennett, C.B.E., area commander of Western Ontario Area, spoke briefly on organization and operation of the Reserve Army. Col. H. W. Love, O.B.E., chief engineer, Canadian Army, spoke on military engineering and on the Northwest Highway.

The Branch executive met eight times during the year.

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Moncton Branch

Seven meetings of the executive were held during the year. There were six branch meetings, at which technical subjects were discussed and business transacted as follows:

Feb. 21—A meeting was held in Reid's Photographic Centre. G. Lorne Wiggs, consulting engineer, Montreal, delivered an illustrated address on **Radiant Heating and Cooling.**

Mar. 29—A meeting was held in Reid's Photographic Centre. Gordon Cape, methods and research engineer, Dominion Bridge Co., Lachine, Que., gave an illustrated address on **Welding Applications in a Structural Plant.**

May 27—A meeting was held for the purpose of nominating branch officers for the year 1949-50.

June 3—The annual meeting was held on this date.

Sept. 26—A dinner meeting was held at the Moncton Curling Club, attended by Branch members and their ladies. The guest speaker was J. E. Armstrong, president of the Engineering Institute of Canada.

Nov. 28—A meeting was held in Reid's Photographic Centre. The film "The Drama of Portland Cement" was shown.

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Montreal Branch

The following papers were presented in 1949. Attendance is shown in brackets.

Jan. 13—**Stainless Clad Sheet and Plate,** by L. C. Grimshaw. (90)

Jan. 20—**Development of Atomic Power Plants,** by B. R. Prentice (Joint Meeting with A.I.E.E.). (200)

Jan. 27—Branch Annual Meeting. (67)

Feb. 3—**A Symposium on Community Planning;** Aime Cousineau, Real Belanger, Adrien Genest, C. E. Campeau. (150)

Feb. 11—Dance at Mount Royal Hotel. (534)

Feb. 17—**The Industrial Uses of Radioactivity,** by Dr. L. Yaffe. (100)

Feb. 24—Student evening. (80)

Mar. 3—**Human Relations,** by A. W. Entwistle. (110)

Mar. 10—**Planning Telephone Facilities for a Metropolitan Area,** by G. E. Inglis (Joint Meeting with I.R.E.). (175)

Mar. 17—**Economics and the Engineer,** by P. C. Armstrong. (100)

Mar. 24—**Jet Engine Development in Canada,** by Winnet Boyd. (180)

Mar. 31—**Electrical Distribution Economics in Industrial Plants,** by H. B. Thacker (Joint Meeting with A.I.E.E.) (120)

Apr. 7—**The New Powell Wharf at Port Alfred, Quebec,** by W. L. Pugh and R. E. Chadwick. (180)

Sept. 29—Opening Meeting, Cardy Hall, Mount Royal Hotel. (189)

Oct. 6—**Anti-Friction Bearings,** by P. B. French. (80)

Oct. 13—**Problems of Industrial Relations Today,** by Prof. H. D. Woods. (75)

Oct. 20—**Frequency Conversion,** by H. H. Leeming. (145)

Oct. 27—**Inspection and Testing Procedures,** by J. M. Fairbairn. (125)

Nov. 3—**Catalytic Cracking of Petroleum,** by Dr. R. Simard. (100)

Nov. 10—**A Report on Television,** by J. A. Ouimet (Joint Meeting with I.R.E.). (140)

Nov. 17—**The Role of the Engineer in Civil Aviation,** by Rear Admiral Paul A. Smith. (35)

Nov. 24—**A New Heat Treating Furnace,** by Peter Jacobsen. (40)

Dec. 1—**Electrical Control of Ships,** by J. A. Wasmund (Joint Meeting with A.I.E.E.). (85)

Dec. 8—**Foundation Engineering,** by Dean R. M. Hardy. (220)

Plant Visits were arranged during the year, as follows:

Apr. 27—Northern Electric Co.'s New Wire & Cable Plant. (250)

Nov. 5—Longue Pointe Ordnance Depot. (35)

Nov. 19—Courtaulds Limited, Cornwall, Ontario. (107)

Junior Section

The year 1949 saw an enthusiastic participation in the varied activities undertaken by the Branch junior engineers. Members came out to hear speakers talk about Canadian science and Canadian industry; and found interest in what was happening in Labrador, gas turbine research, and the functioning of Montreal's Stock Exchange. They listened to a laughable debate on family allowances, made the annual dance a sell-out affair, then at the second oyster party showed that they are truly hearty citizens. Some of them even competed for honours in our first golf tournament.

Some of our members are at work under the direction of George Morrison and Joe Galli to improve their ability to speak effectively. Study groups are attacking the problems of financing a new business, selling and sales-management, building and decorating your own home, and machines and methods for controlling organizations and production. Finally we have one group looking into the possibilities of conducting a radio programme to "Share the Story" of engineering thought and achievement.

The following meetings were held in 1949:

Jan. 17—Elections and films.

Jan. 31—Debate of the Public Speaking Group.

Feb. 14—Film night.

Feb. 28—**Building Materials for the Modern Home,** by Paul H. Lalonde, Architect.

Mar. 14—Forum on the Professional Engineer, by Messrs. J. A. Lalonde, I. Brouillet, J. B. Sterling, and H. C. Nourse.

Mar. 28—**Functions of a Stock Exchange,** by L. G. Beaubien.

Apr. 11—**The Beauharnois Project,** by Yvon deGuise.

Sept. 24—Golf Tournament.

Oct. 3—**Television — A Top Canadian Industry?** by K. R. Patrick.

Oct. 17—**Canadian Unions and the Transportation Industry,** by S. M. Gossage.

Nov. 4—Annual dance.

Nov. 7—**Gas Turbine Development in Canada,** by Prof. D. L. Mordell.

Nov. 21—**Developments in Labrador,** by Dr. A. E. Moss.

Dec. 2—Oyster Party.

Dec. 12—Ladies Film Night.

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Newfoundland Branch

On September 17, 1949, the Newfoundland Branch of the E.I.C. was officially inaugurated, when at a dinner meeting Mr. J. E. Armstrong, President of the E.I.C., presented the new branch with its charter.

Previous to the formation of a branch in Newfoundland members of the Institute residing in this Province were attached to the Sydney Branch. This was not an ideal arrangement as the members in Newfoundland rarely had an opportunity to participate in Institute activities, even to the extent of attending meetings in Sydney. Therefore a number of members in Newfoundland petitioned Headquarters to form a branch here, and upon being approved by Council the branch was duly formed this year.

In August Dr. L. Austin Wright, general secretary, visited us here and during his visit several meetings were held and the following provisional slate of officers was selected: E. L. Baillie, chairman; G. Desbarats, vice-chairman; J. M. Hopkins, secretary-treasurer. A programme was arranged for the visit to St. John's, Grand Falls and Corner Brook of President Armstrong and his party, an account of which appeared in November issue of the *Journal*. We of the Newfoundland Branch would like to express our appreciation to President Armstrong, Dr. L. Austin Wright, general secretary, and other members of the party for having arranged their tour so as to be with us on this occasion of our inauguration.

In November a Section of the Branch was formed in Corner Brook, and following officers were elected: E. Hinton, chairman; G. Tibbo, vice-chairman; M. Green, secretary-treasurer. Several meetings have been held in Corner Brook, one of which was a technical meeting at which Mr. Geo. Hobbs, assistant chief engineer (Electrical), Bowater's Newfoundland Pulp & Paper Mills Limited, presented a very interesting paper on **The Effect of Abrupt Load Changes on Power Systems.**

Membership of the Newfoundland Branch now totals some fifty members. It is hoped the number will be increased considerably this coming year.

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BRANCHES	Border Cities	Calgary	Cape Breton	Central British Columbia	Cornwall	Edmonton	Halifax	Hamilton	Kingston	Kitchener	Kootenay	Lakehead	Lethbridge	London
MEMBERSHIP														
Resident														
Hon. Members	..	..	..	1	..	..	1	..	2	..	..	..	..	..
Members	66	154	37	17	20	144	196	100	43	19	25	47	19	53
Juniors	39	35	11	8	2	78	36	68	17	13	8	17	6	28
Students	24	66	12	12	9	179	125	51	98	9	13	25	8	25
Affiliates	1	2	1	1	1	2	1	1	..	..	..	6	..	2
Total	130	257	61	39	32	403	359	220	160	41	46	95	33	108
Non-Resident														
Hon. Members	..	..	..	..	..	..	1	..	..	..	..	..	..	—
Members	13	17	8	1	7	19	77	31	6	..	7	16	16	11
Juniors	12	7	1	1	2	4	20	24	2	..	5	15	2	4
Students	6	16	7	1	3	24	24	11	5	3	12	13	11	14
Affiliates	..	..	..	1	..	..	..	..	..	..	..	..	..	—
Total	31	40	16	4	12	47	122	66	13	3	24	44	29	29
Grand Total Dec. 31st, 1949	161	297	77	43	44	450	481	286	173	44	70	139	62	137
" Dec. 31st, 1948	135	230	113	..	43	277	439	307	150	..	65	121	58	109
Branch Affiliates, Dec. 31st, 1949	..	49	..	..	8	2	..	11	1	..	..	5	25	1
FINANCIAL STATEMENT														
Balance as of December 31st, 1948	736.95	353 32	966.34	..	108.68	486.90	601.34	230.06	243.40		111 67	369 75	122.63	255 87
Income														
Rebates from E.I.C. Hq.	361.20	156.96	28 10	100.00	141.00	142.40	722.20	471.25	266.70		159 30	295.20	33.00	270 40
Payments by Prof. Assns	..	463.06	147.00	..	..	454.90	129.24	..	..		..	..	103.75	..
Branch Affiliate Dues	7.00	168.50	80 00	7.00	28.00	..	..	30.00	..		..	35.00	135 00	3 00
Interest	11.27	30.02	..		..	..	3.28	48 67	1 26		..	3.00	..	3.00
Miscellaneous	180 00	23.86	510.50		322.76	978.40	184.39	..	..		278.56	47.00	73.85	102.55
Total Income	559.47	842.40	765 60	107.00	491.76	1,575.70	1,039.11	549.92	267.96		437.86	380.20	345 60	378.95
Disbursements														
Printing, Notices, Postage (1)	57.84	253 67	48 78	18.06	15.99	223.77	182.14	233.32	72.19		39 13	98 92	62 43	65.15
General Meeting Expense (2)	288.65	176.25	..	56.29	9.71	1,167.15	232.50	..	208 13		..	..	89.42	90.28
Special Meeting Expense (3)	25.00	370.94	1,038 20	..	365 00	92 00	392.98	324 48	..		287 81	304.99	90 67	136 28
Honorarium for Secretary	..	..	..	..	..	75.00	100.00	..	..		..	8 15	25.00	..
Stenographic Services	20.00	..	3.00	8 00	5.00	17 00	110 00	50 00	..		..	..	..	..
Travelling Expenses (4)	..	..	..	..	..	..	..	..	..		12.50	..	..	..
Subs. to other organizations	..	..	..	..	2 00	..	..	..	..		5.00	..	..	..
Subs. to *The Journal*	2.00	24 00	..	2 00	4 00	..	..	4 15	..		..	10 30	8 45	2 00
Special Expenses	26.00	16 70	250 00	..	..	79 75	95.00	50.00	31 00		..	..	53 00	20 00
Miscellaneous	.35	142.68	..	7 08	..	14.70	59.78	85.79	..		21.65	2.13	3.44	.84
Total Disbursements	419.84	984.24	1,339.98	91.43	401.70	1,669.37	1,172.40	747.74	311.32		366.09	424.49	332.41	314.57
Surplus or *Deficit*	139.63	*141.84*	*574.38*	15.57	90.06	*93.67*	*133.29*	*197.82*	*43.36*		71.77	*44.29*	13.19	64 45
Balance as of Dec. 31st, 1949	876.58	211.48	391.96	15.57	198.74	393.23	468.05	32.24	200.04		183.44	325.46	135.82	320 20

(1) Includes general printing, meeting notices, postage, telegraph, telephone and stationery.

(2) Includes rental of rooms, lanterns, operators, lantern slides and other expenses.

(3) Includes dinners, entertainments, social functions, and so forth.

(4) Includes speakers, councillors or branch officers.

of the Branches as at December 31, 1949

Moncton	Montreal	Newfoundland	Niagara Peninsula	Ottawa	Peterborough	Quebec	Saguenay	Saint John	St. Maurice Valley	Sarnia	Saskatchewan	Sault Ste. Marie	Toronto	Vancouver	Victoria	Winnipeg
..	2	..	..	2	..	..	..	..	..	..	..	1	2	..	..	..
62	1,391	13	100	343	41	138	65	70	84	52	143	22	477	248	65	189
14	633	11	30	117	24	81	32	13	59	26	27	7	189	88	20	86
31	879	2	68	107	15	169	17	24	29	14	228	5	319	442	21	281
..	25	1	1	11	..	2	1	2	1	..	..	1	6	5	..	4
107	2,930	27	199	580	80	390	115	109	173	92	398	36	993	783	106	560
..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..
24	98	10	4	53	32	21	10	66	7	2	64	54	21	30	20	23
15	99	6	1	17	17	17	4	18	9	..	18	50	5	17	6	22
27	57	5	2	14	17	19	2	121	1	1	..	32	30	41	18	30
1	..	..	..	..	..	1	..	..	..	..	..	..	1	3	..	..
67	254	21	7	84	66	58	16	205	17	3	82	137	57	92	44	75
174	3,184	48	206	664	146	447	131	314	190	95	480	173	1,050	875	150	635
156	3,029	..	159	630	138	318	123	308	164	84	357	148	1,277	795	127	486
3	11	..	1	16	12	..	..	16	1	..	..	11	13	..	1	18

*For voting purposes only, there should be added to Montreal Branch, an additional 449 members, 279 resident in the United States, 97 in British possessions and 73 in foreign countries.

435.33	4,835.68	..	424.37	973.22	214.40	475.35	390.45	426.79	370.23	238.21	54.61	549.64	1,060.20	613.77	82.03	1,851.45
170.40	4,875.20	100.00	459.90	1,002.40	294.00	537.75	364.80	207.00	444.60	258.00	36.25	332.70	1,708.20	662.15	255.90	812.50
114.00	..	..	..	..	..	..	..	212.00	..	..	655.39	..	..	..	..	..
15.00	75.00	..	..	24.00	20.00	..	..	117.00	6.50	..	..	24.00	..	..	3.00	95.00
5.16	60.00	..	14.33	62.40	1.04	..	..	..	1.72	..	..	12.00	25.56	5.82	..	43.50
123.75	1,719.63	824.55	..	55.74	54.33	76.38	138.00	..	358.65	654.90	..	299.75	1,097.25	505.00	278.00	280.18
428.31	6,729.83	924.55	474.23	1,144.54	369.37	614.13	502.80	536.00	811.47	912.90	691.64	668.45	2,831.01	1,172.97	536.90	1,231.18
28.07	2,342.24	15.50	104.99	310.26	113.06	82.38	30.63	91.60	102.28	51.30	123.68	37.05	769.27	335.12	51.63	503.31
47.50	138.50	..	125.14	60.00	112.55	16.50	54.50	3.60	26.63	879.17	237.87	150.20	209.52	105.00	35.18	18.05
213.96	2,259.40	835.24	32.53	471.51	64.05	143.82	298.98	319.20	531.23	..	..	..	461.95	593.87	385.97	468.83
25.00	533.33	..	75.03	..	..	100.00	40.00	60.00	50.00	..	120.00	..	250.00	50.00	35.00	75.00
10.00	235.00	..	15.00	100.00	..	25.00	..	16.00	10.00	..	..	12.00	45.00	20.00	..	..
..	..	..	..	..	..	..	..	..	51.25	..	155.60	..	32.60	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3.00
6.15	20.00	..	..	..	12.00	..	..	34.12	2.00	..	..	12.00	..	..	..	36.00
..	75.16	..	10.16	257.01	..	..	..	..	179.07	..	..	61.05	..	107.45	..	30.00
16.75	159.86	1.11	..	77.64	32.19	35.38	..	10.25	.98	..	18.24	10.65	289.00	24.38	..	69.99
347.43	5,763.49	851.85	362.85	1,276.42	333.85	403.08	424.11	534.77	953.44	930.47	655.39	282.95	2,057.34	1,235.82	507.78	1,204.18
80.88	966.34	72.70	111.38	*131.88*	35.52	211.05	78.69	1.23	*141.97*	*17.57*	36.25	385.50	773.67	*62.85*	29.12	27.00
516.21	5,802.02	72.70	535.75	841.34	249.92	686.40	469.14	428.02	228.26	220.64	90.86	935.14	1,833.87	550.92	111.15	1,878.45

Niagara Peninsula Branch

The executive of the Niagara Peninsula Branch of the Engineering Institute of Canada respectfully submit the following report for the year 1949.

The following general meetings were arranged and conducted by the Programme Committee.

Feb. 3—A dinner meeting was held at the Welland House, St. Catharines. Mr. E. N. Davis, personnel manager, Campbell Soup Co. Ltd. and member of the Ontario Labour Relations Board, spoke on **Industrial Economics and Engineering.** The address was followed by a lively period of questions.

Mar. 3—A joint meeting with members of the Association of Professional Engineers of Ontario, was held at the Red Casque Inn. W. J. W. Reid, president, and Col. T. M. Medland, secretary, of the Association, were present. Pres. Reid spoke briefly on matters of joint interest to the Association and to the Institute. The speaker of the evening was Professor G. B. Langford, professor of mining geology, University of Toronto, whose subject was **Shore Erosion of Lake Ontario.** A buffet luncheon was served after the meeting.

Mar. 24—Members of the Niagara Peninsula Branch visited the nickel refining plant on the International Nickel Co. in Port Colborne, where they were conducted on a tour through the plant. Following the tour through the plant, members met at the Barclay Hotel in Welland for dinner. Mr. R. C. McQuire, general superintendent of the International Nickel Plant, gave a short history of the refining of nickel.

Apr. 21—A dinner meeting was held in the Barclay Hotel, Welland. Mr. J. A. Whittaker, sales engineer of the Joseph Stokes Rubber Co., Welland, spoke on the subject of **Plastics and Hard Rubber Products as Applied in Industry Today.**

May 27—A dinner meeting was held at the Red Casque Inn. Mr. E. G. Tallman, project engineer of the Hydro-Electric Power Commission of Ontario, gave an interesting discourse entitled, **The Agausabon Power Development.** The address was extensively illustrated with slides.

Nov. 9—Mr. R. A. Saunders, K.C., O.B.E., chairman of the Hydro Electric Power Commission, spoke to the members of the Branch, with particular reference to future development of the Niagara River. This meeting was open to the Public, because of the importance of the subject.

Dec. 8—An illustrated talk was given by Mr. W. H. Paterson, chief engineer of the Toronto Transportation Commission, on the new rapid transit system in Toronto.

Ottawa Branch

The following is the report of the Proceedings Committee for 1949:

Conservation of natural resources in Canada has been the theme for the year.

The policy of meeting at lunchtime has continued as it appeared to be the most favoured method in Ottawa. However, there were also occasional evening events, and a field trip.

Co-operation with other institutions was also a policy for the year. Joint meetings were held with the Canadian Institute of Mining and Metallurgy, the Board of Trade and the Engineers' Wives Association. The local branches of other engineering societies were also sent notices of our meetings at which their members were welcomed.

The two dances reported were organized and run by the Engineers' Wives Association. The E.I.C. is grateful for their interest, support and the shouldering of what might be its own social obligations.

Jan. 6—Annual Business Meeting, with a lecture, demonstration and movie on the seal industry and "A Visit to the Pribilofs" held in the evening at Carleton College.

Feb. 10—Luncheon meeting at Chateau Laurier, **Construction in Canada** by Allan C. Ross, president, Canadian Construction Association. (98)

Feb. 12—Engineers' Wives Association dance at Lansdowne Park. (220)

Feb. 24—Luncheon Meeting Chateau Laurier. Dr. O. M. Solandt, O.B.E., chairman, Defence Research Board, spoke on his organization and its role. (126)

Mar. 10—Luncheon Meeting Chateau Laurier. Bell Telephone Company films "Trouble in Spots", Telephone Screen Review No. 3, and "Western Crossing" were shown. Maj.-Gen. R. Holley Keefler, assistant to the president of the Company, was a guest. (90)

Mar. 24—Luncheon Meeting Chateau Laurier — also attended by Board of Trade Conservation Committee — **Forestry and Its Possibilities** by Maj.-Gen. Howard Kennedy, C. B. E., M.C., consulting engineer. (120)

Apr. 21—Joint luncheon meeting with Robert H. Saunders, C.B.E., K.C., chairman, the Hydro Electric Power Commission of Ontario, spoke on **Power Development and Conservation in Ontario.** (136)

May 5—Luncheon Meeting, Chateau Laurier. **Relations of Engineering to Fisheries,** by Milo Bell, chief engineer of the International Pacific Salmon Fisheries Commission. A coloured film showed Hell's Gate before and after construction of the fish ladders. (100)

May 26—Executive luncheon, Cafe Henri Burger, Hull, Quebec, for Walter L. Saunders who was leaving Ottawa, and Dean J. N. Finlayson, the retiring president of the E.I.C.

May 28—Joint Field Trip with C.I.M.M. to the Des Joachims Power Development. (110)

July 29—Joint Luncheon with C.I.M.M., Chateau Laurier. **Research in Great Britain,** by Sir Charles Goodeve, O.B.E. (129)

Oct. 13—Joint Luncheon with C.I.M.M., Chateau Laurier. **The Invitation of the West,** by J. R. White, vice-president of Imperial Oil Limited. (209)

Nov. 4—Engineers' Wives Association Dance, Lansdowne Park. (240)

Nov. 10—Luncheon Meeting, Chateau Laurier, **Civil Defence in Canada** in which were posed many questions for the engineer, by Maj.-Gen. F. F. Worthington, C.B., M.C., M.M., civil defence coordinator, Department of National Defence. (98)

Dec. 1—Joint Luncheon with Board of Trade Conservation Committee, Chateau Laurier. Dr. George B. Langford, F.R.S.C., Department of Mining Geology, University of Toronto, gave a thought provoking address on **Conservation** in Canada. (117)

Dec. 8—Joint Luncheon with the Engineers' Wives Association at the Chateau Laurier. A most interesting address about Canada and Canadians for Canadians was given by John Fisher, CBC wandering commentator. (257)

Jan. 5—Annual Business Meeting at the Chateau Laurier. Vice-President William J. W. Reid entertained the executive at dinner and was a guest later at the meeting which was followed by a smoker and buffet supper.

Peterborough Branch

Seven executive meetings were held with an average attendance of eight. The following summarizes the nine branch meetings held during the year with attendance figures in brackets. Average attendance was 51.

Feb. 24—Affairs of the **Ontario Association of Professional Engineers,** by Col. T. M. Medland. (39)

Apr. 21—**Jet Aircraft Engines,** by J. T. Purvis, of A. V. Roe Canada Ltd. (75)

May 5—**Design Features of the Des Joachims Development,** by A. L. Malcolm of the Hydro Electric Power Commission of Ontario. (65)

May 19—**Properties of Radioactive Isotopes and Their Industrial Application,** by F. Bainbridge of National Research Council. (85)

June 18—Annual Picnic. (38)

Sept. 24—Fall Outing — Trip to Des Joachims Power Development, as guests of the Hydro Electric Power Commission of Ontario. (34)

Oct. 20—**Hydro Electric Power Development in Brazil,** by F. T. Simson and A. E. Wilson, of Canadian Brazilian Services Limited. (32)

Nov. 17—**The Ontario Provincial Police FM Radio Network,** by J. Partridge, Canadian General Electric Co. Ltd. (35)

Dec. 8—**Frequency Conversion,** by W. R. Harmer of the Hydro Electric Power Commission of Ontario. (62)

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Quebec Branch

The Executive Committee of the Branch held six meetings with an average attendance of nine members for the transaction of Branch business.

The local committee of the 1949 Annual General and Professional Meeting of the Institute held several meetings dealing with the general organization of the Convention.

The activities of the Branch were varied and well attended.

The programme of activities was as follows. Attendance is given in brackets.

Jan. 17—**Conversion of frequency, 25 cycles to 60 cycles, in Ontario,** by A. M. Doyle, manager of Industrial Apparatus Division, Canadian General Electric, Toronto. (75)

Jan. 26 to Mar. 2—Lecture: **Vue d'ensemble sur la Theorie de la relativite,** at Laval University, Faculty of Science, by Dr. R. de Vogelacee and Professor A. Matte. (50)

Feb. 28—Paper: **Office de l'electrification rurale,** by R. B. Brosseau, assistant chief engineer, Rural Electrification Bureau, Quebec. (45)

Apr. 28—The Ritual of the Calling of an Engineer. (45)

Apr. 28—Paper: **Hydrology — Theory and Applications,** by A. O. Bourgeois, The International Water Supply Co. (60)

May 11—Annual General and Professional Meeting of the Institute at the Chateau Frontenac. (1,039)

June 17—Annual Meeting of the Branch. (30)

Aug. 25—Reception in honour of Maurice Bourget, M.P. for Levis. (50)

Sept. 8—Annual Golf Tournament of the Branch. (66)

Oct. 10—Panel — **The New Coliseum at Quebec.** (450)
"General Outline" by Caron & Rinfret, architects of Quebec City.
"General Nature of Thin-shell Concrete Construction" by Robert Zaborowski, engineer in charge of Roberts & Schaefer, New York City.
"Engineering Design of the New Coliseum", by H. Fleischer, engineer of the firm Roberts & Schaefer, New York City.
"Testing and Soil Resistance", by Guillaume Piette, M.E.I.C., consulting engineer, Quebec City.
"Franki Compressed Piles", by Leon A. Fraikin, manager & director of the Franki Compressed Piles Co., Montreal.
"Construction of the New Coliseum", by Reginald Kirkpatrick, resident engineer for the firm Roberts & Schaefer.

Nov. 25—Paper: **Egout Collecteur et Usine de Pompage de la cite de Quebec",** by J. G. Chenevert, M.E.I.C., of Surveyer, Neniger & Chenevert of Montreal. (50)

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Saguenay Branch

During the year the Branch held a total of nine general meetings:

Jan. 28—**Economics of the Tennessee Valley Authority (TVA),** by Dr. Huet Massue, economist and statistical engineer, Shawinigan Water and Power Co. Ltd.

Feb. 15—**Development of the Saguenay System,** by F. H. Duffy, system protection and acting electrical engineer, Aluminum Company of Canada, Limited, Shipshaw, and E. W. McKernan, superintendent of Saguenay Power Company, Isle Maligne, and F. A. Brown, assistant chief operator, Power Department, Arvida Works.

Mar. 22—**Lubricating Oils, their Manufacture and Uses,** by M. E. Wight, director of Technical Service Division, McColl Frontenac Oil Company Limited.

Mar. 29—Films Meeting—showing "Deep Horizon", "Masters of Molecules" and "New Frontiers".

Apr. 29—**A Fast a-c System of Supervisory Control,** by K. R. Stock of R. H. Nichools Limited, Ottawa and Toronto.

May 17—**The New Powell Wharf at Port Alfred, P.Q.,** by W. L. Pugh, chief engineer of the Aluminum Company of Canada.

Sept. 16—Annual Business Meeting of the Saguenay Branch. Presentation of financial statement and report of activities for the past year. Installation of the new Branch executive.

Oct. 6—Annual dinner meeting held in the Assembly Room of the Saguenay Inn. National officers present were J. E. Armstrong, president, and W. D. Laird, assistant general secretary. (75)

Nov. 29—**The Economic Mineral Resources of the Province of Quebec with Special Reference to the New Developments of Ungava and Allard Lake,** by Jean Paul Drolet, chief of technical information, Department of Mines, Province of Quebec.

Junior Section

The Junior Section held a series of nine meetings as follows:

Feb. 7—**Ships and Their Engines,** by Roland V. Smith, mechanical supervisor, Aluminum Company of Canada, Limited.

Mar. 15—**Manufacture of Phosgene,** by C. B. Shipton, supervisor cryolite recovery plant, Aluminum Company of Canada, Limited.

Apr. 6—**Town Planning, Its Nature and Origin,** by R. A. Lemieux, city manager and engineer, City of Arvida.

Apr. 22—**The Science of Music,** by F. A. Coleman, Aluminum Company of Canada, Limited, Montreal.

June 1—**Weather Forecasting,** by R. H. Wood, Aluminum Co. of Canada, Limited, Shipshaw.

Sept. 19—**Purchasing for a Large Industry,** by G. S. Kinnear of Aluminum Company of Canada, Montreal.

Oct. 18—Election of Officers. Three films, "No Man Is An Island"; "Clean Waters"; "It's Fun to Sing".

Nov. 21—**Economic Developments in India,** by Dr. K. G. Hrishikesan of Indian Aluminum Company, Alwaye and Muri Junction, India.

Dec. 13—Symposium on **Model Aircraft,** by C. J. Tanner, Lloyd Laventure and A. R. Miller of Aluminum Company of Canada, Arvida.

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Saint John Branch

The following meetings were held by the Saint John Branch during the year 1949. Attendance figures are shown in brackets.

This year for the first time in the history of the Branch, a regular dinner meeting was held in Fredericton, N.B. It is hoped that the meeting will be the first of many successful meetings in Fredericton.

Jan. 27—Joint Dinner Meeting with N.B. Association of Professional Engineers. Speaker: T. C. Macnabb, M.E.I.C., of Saint John, **Let's Build a Railroad.** A floor show was also presented. (93)

Feb. 17—Ladies Night. Speaker: Vice-President Ira P. Macnab of Halifax, N.S. The talk was followed by the showing of films supplied by the Nova Scotia Bureau of Information. (46)

Mar. 31—Dinner Meeting. Gordon Cape, M.E.I.C., of Dominion Bridge Co., Ltd., presented a paper on **Welding Applications in a Structural Plant.** (41)

Sept. 27—Dinner Meeting in honour of President J. E. Armstrong and his party. President Armstrong was the principal speaker. Ladies Night. (95)

Oct. 21—Dinner Meeting in Fredericton. Speaker: J. N. Flood, M.E.I.C., of Saint John, who showed slides taken on his recent trip to Europe. (127)

Nov. 24—Dinner Meeting with the showing of Canadian Ingersol-Rand Co., Ltd., films: "Driving a 13 Mile Tunnel", and "Blackjack". (43)

There were nine meetings of the Branch Executive with an average attendance of seven members.

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St. Maurice Valley Branch

Following is a list of meetings held during the year 1949. Our meetings on the whole were well attended, and a successful year is reported. Our total membership has increased by 36 members since the end of 1948.

Jan. 20—Lecture meeting held at the Cascade Inn, Shawinigan Falls. R. Dorion, M.E.I.C., city manager, spoke on **Municipal Administration.** E. A. Delisle, M.E.I.C., city engineer, spoke on **City Planning in Shawinigan Falls.**

Feb. 22—Lecture meeting held at the Cascade Inn, Shawinigan Falls. Dr. A. H. Heatley, M.E.I.C., director of the patents department, Shawinigan Chemicals Ltd., Spoke on **Patents.**

Mar. 23—Held at the Chateau de Blois, Trois-Rivieres. W. H. Durrell, general manager of Labrador Mining & Exploration Co. Ltd., spoke on **The New Quebec-Labrador Iron Ore Development.**

Apr. 6—"Junior Night", held at Cascade Inn, Shawinigan Falls. Following were the topics by Junior Members: **Drying of Solids,** D. G. Demianiw, Jr.E.I.C., Shawinigan Chemicals Limited; **Radiant Heating By Hot Water,** A. E. A. Love, Jr.E.I.C., Consolidated Paper Corporation Ltd.; **Distribution System Voltage Conversion with Particular Reference to Shawinigan Falls,** W. R. MacKay, Jr.E.I.C., Shawinigan Water & Power Co.; **Some Features of Modern Transformer Design,** W. G. Seline, Jr.E.I.C., Shawinigan Water & Power Co.; **Statistics — A Tool For The Engineer,** W. H. T. Wilson, Jr. E.I.C., Canadian Industries Limited. Chairman of this meeting was W. R. Ford, Jr.E.I.C. Winners of prizes for the papers were Mr. Love and Mr. Seline.

Apr. 29—Annual Meeting held at Hotel St. Maurice, Trois-Rivieres. Speaker for the evening was J. T. Thwaites, M.E.I.C., electronics engineer of Canadian Westinghouse Company. Subject, **Science and Living.** Prizes were presented for papers given at "Junior Night" meeting. The results of Branch elections were announced and new officers introduced.

Sept. 8—Dinner Meeting opening the fall season, held at Cascade Inn, Shawinigan Falls. Dr. J. T. Rettaliata discussed **Recent Developments in Gas Turbines and Jet Propulsion.** Dr. Rettaliata is dean of the Illinois Institute of Technology. Valley members of the Chemical Institute of Canada and the American Institute of Electrical Engineering were invited. (90)

Oct. 1—Golf Tournament at Ki-8-Eb Golf Course or Industrial Visit to Canadian International Paper Mills plant at Trois-Rivieres. Supper was held in the evening at the golf club. Emile Jean, managing director of "Le Nouvelliste" newspaper, gave an informal talk. Golf prizes were presented. (75)

Dec. 13—Lecture meeting held at the Cascade Inn, Shawinigan Falls. Speaker was R. H. Hall, M.E.I.C. of the Bell Telephone Company, Montreal. Subject was **The Journey of a Word.** This was a very well illustrated talk. (55)

Trois-Rivieres Junior Section

This section, not active in the 1948-49 season, became active again in the fall of 1949.

Nov. 2—Meeting for organization of officers. Informal discussion re by-laws and future events. (30)

Nov. 29—Lecture meeting. Speaker, Dr. Conrad Godin, dentist, of Trois-Rivieres Chamber of Commerce, spoke on **The St. Maurice Valley — Past, Present and Future.** (22)

Shawinigan Falls Junior Section

Jan. 31—Lecture meeting. W. D. Mosher, works manager, Belgo Division, Consolidated Paper Corporation, spoke on **Engineering and Natural Resources.** (28)

Mar. 10—Lecture meeting. W. D. Davies, works manager, C.I.L., "Cellophane" Division, spoke on **Nylon.** (32)

May 6—Annual Dance, held at the Cascade Inn. (78)

June 20—Annual Meeting, held at Cascade Inn. (36)

Oct. 11—Lecture meeting. W. J. Whitehead, managing director of Wabasso Cottons, spoke on **Share of Production Pay Plan.** (34)

Oct. 22—Plant visit to No. 3 Power House of the Shawinigan Water and Power Company, Shawinigan Falls. (24)

Nov. 15—Lecture meeting. H. D. Ross, superintendent of the Chemical Division, Shawinigan Chemicals Limited, spoke on **Impressions of European Industry Today.** (28)

Sarnia Branch

During the year of 1949 the Sarnia Branch of the Institute held eight general meetings, eight executive meetings, and one social meeting. Average attendance at dinner meetings was 67 and at smokers 28. A brief description of the general meetings follows:

Jan. 20—Dinner meeting at Polymer Cafeteria. K. H. Braithwaite, vice-president of Fiberglas Canada Limited, spoke on the manufacture of glass fibres. This was followed by an inspection trip through the Fiberglas plant.

Feb. 23—Dinner meeting at the Lutheran Church, wtih the members of the Sarnia Section of the Chemical Institute of Canada as our guests. John Ness, of Imperial Oil Limited, spoke on **Western Oil Developments** and showed an Imperial Oil film "A Mile Beneath the Wheat".

May 5—Dinner meeting at the Mirwin Hotel, Wallaceburg, followed by trip through the plant of the Dominion Glass Company Limited. All details of this meeting were looked after by the Junior Members.

June 2—Dinner meeting at the Sarnia Riding Club. Dr. G. B. Langford, head of the Department of Geological Sciences of the University of Toronto, spoke on **Shoreline Erosion.** As a special feature, the four candidates for the Lambton West riding in the Federal election addressed the meeting briefly on their general views, and on some particular questions concerning the Engineering Profession.

Aug. 25—A cruise down the St. Clair River on *M.V. Miss Chevrolet* was enjoyed by the members and their ladies. A buffet luncheon was served on board.

Sept. 27—A smoker at the Colonial Hotel. Messrs. J. Guthrie, M.E.I.C., and S. R. Steinbock, both of Imperial Oil's Engineering and Development Division, spoke on **An Evaluation of Spare and Standby Utility Capacity.**

Nov. 1—Dinner meeting at the Island View Manor, Corunna. Mr. H. T. Ross, Jr., manager of the Sarnia Branch of the Royal Bank of Canada, spoke on **The Services of a Bank.**

Nov. 29—Evening meeting at the Lutheran Church. Mr. A. M. Dix, customer relations representative of the Bell Telephone Company of Canada, discussed recent advances in telephone equipment. A Bell Telephone Company film, "The Journey of a World", was shown.

Dec. 13—Annual Meeting at the Sarnia Riding Club. Smoker followed by buffet lunch.

Saskatchewan Branch

All meetings of the Saskatchewan Branch were held jointly with the Association of Professional Engineers. The programmes were as follows:

Jan. 22—**Some Aspects of Water Supply as It Affects the Prairie Provinces,** by G. N. Munro, M.E.I.C.

Feb. 4—**Picking the Right Induction Motor for the Job,** by G. E. Creed, Canadian Westinghouse Company (Lecture Meeting).

Feb. 18—Annual Meeting followed by dinner addressed by the Hon. W. S. Lloyd, Minister of Education (Sask.).

Mar. 18—**Mineral and Oil Resources of the Province and Their Industrial Potentiality,** by W. J. Bichan, director, and A. J. Williams, in charge of Industrial Development, Department of Natural Resources of Saskatchewan.

Mar. 28—**The Inductive Co-ordination of Power & Communication Facilities,** by D. G. Geiger, transmission engineer, Bell Telephone Co., Toronto.

Apr. 21—**The Power Situation in Saskatchewan,** by H. I. Nicholl, Superintendent Power Department, Regina, W. B. Clipsham, Saskatchewan Power Commission, and A. G. Teskey, Canadian Westinghouse Company, Regina.

May 2—President's visit. Addresses by Dean Finlayson, president, and W. D. Laird, ass't general secretary, E.I.C.

Oct. 22—President's Visit addressed by J. E. Armstrong, president, and L. Austin Wright, general secretary, E.I.C.

Dec. 16—**Inside India To-day,** by Nelson Abraham, M.A. (Indore).

Sault Ste. Marie Branch

In 1949 there has been a considerable increase in membership and activities of the branch. The flow of members to and from the branch has been considerable this year, particularly among the younger members.

This year the branch suffered a great loss in the death of one of the charter members, A. E. Pickering who up to the time of his illness, was an active member and willing worker.

The executive held three meetings during the year. The branch held three general meetings with outside speakers as guests.

Mar. 4—**The Purposes and Activities of the Canadian Welding Bureau,** by Ralph W. Stickney. The Algoma Welding Society attended this meeting as guests.

Sept. 27—The visit of the president of the Institute, J. E. Armstrong, chief engineer of the Canadian Pacific Railway.

Nov. 25—**Welding Applications in a Structural Plant,** by Mr. Gordon Cape, research engineer of Dominion Bridge Company.

We regret that due to unfavourable weather conditions which prevented the aeroplane in which he was riding from landing, we were unable to entertain the former president of the Institute, Mr. John N. Finlayson, M.E.I.C., on May 6, 1949.

Toronto Branch

The executive held eleven meetings with an average attendance of ten.

General and special meetings of the Branch are listed below.

The wide range of subjects discussed and the reputation and experience of the speakers in their respective spheres of engineering attracted attention to the meetings. The discussion period at technical sessions brought a free exchange of views, and created and maintained an interest in the meetings. The average attendance at the general meetings was higher than that of 1948.

The Branch by-laws were amended, as of January 1st, 1949, providing for the Annual Meeting in January and thereby bringing its fiscal year in line with that of Headquarters.

Jan. 31—Annual Students' Night (Joint with Student Section). (50)

Feb. 12—Ladies' Night. (120)

Feb. 24—**Modern Welding Practice** — R. M. Gooderham, general manager, Canadian Welding Bureau. Ramsay Moon, formerly director of the British Welding Association, now associated with Welding Consultants. Gordon Cape, Dominion Bridge Co. (125)

Mar. 24—**The Railway in War and Peace** — S. W. Fairweather, vice-president research and development, Canadian National Railways. (150)

Apr. 14—Joint with A.S.M.E. **Power Generation** — Professor A. G. Christie, Johns Hopkins' University, Baltimore. (200)

Sept. 13—Golf tournament and dinner — St. Andrew's Golf Club. (21)

Oct. 20—**What Price Engineers** — Dean K. F. Tupper, Faculty of Applied Science & Engineering, University of Toronto. (204)

Nov. 3—**Engineering Features of the New Bank of Nova Scotia Building, King & Bay St., Toronto.** C. D. Carruthers, associate, Gordon L. Wallace; Dr. Karel Rybka, consulting engineer; C. E. Parrish, J. L. E. Price & Co., Contractors. (245)

Nov. 5—Visit to the Bank of Nova Scotia site, King & Bay Sts., Toronto. (100)

Dec. 1—**This Business of Engineering** — Joseph M. Breen, president and general manager, Canada Cement Co. Ltd. (97)

Junior Section

Increased activity was the keynote for 1949 and the membership became more representative of the different branches of engineering. This new condition required diversified programming of the Section's activities and it was found desirable to encourage fellowship.

A number of meetings were held jointly with the Senior Section. The Junior engineers undertook to sponsor the speaker for one meeting of the Engineering Society at the University of Toronto. This activity was linked with a drive for new student members.

Jan. 18—Discussion panel with: L. D. McKenna, placement officer of The Technical Service Council; K. Bradford, director of the University of Toronto Placement Service; T. M. Medland, executive director of the Association of Professional Engineers of Ontario.

Feb. 21—**The Professions and Their Relations to Everyday Life,** by Dr. R. W. I. Urquhart and Prof. E. A. Allcut.

Mar. 29—A Salami Soiree was enjoyed for 50 members.

Apr. 27—**Mathematical Analogies Useful in Business,** by M. J. C. Lazier. The results of the preferential ballot were announced and these gave the chairmanship to T. H. Ivory for the coming year.

Four executive meetings were held during the summer season, which enabled the new executive to plan the fall activities.

Sept. 13—About 21 members of the Senior and Junior Sections spent the afternoon digging up the green at St. Andrew's Golf Club.

Nov. 17—For 80 members and their guests this evening was the occasion for an educational field trip to the tire plant of the Goodyear Tire and Rubber Co. in New Toronto.

Vancouver Branch

Jan. 20—Harry Minshall, M.E.I.C., on **Emergency Bridges.**

Feb. 2—Field Trip to Jericho Workshop.

Feb. 16—Students' Night, with John McPhail of the Student Branch presiding. The three speakers were Martin Dayton who spoke on **Sewage Disposal for Kamloops, B.C.;** Ivan Sorensen who discussed **Construction of Henriette Lake Dam, B.C.;** and Cyril White who spoke about **Construction and Manufacture of Wire Rope.**

Mar. 16—Wing Commander Somerville, on **Physiological Aspects of High Power Flight.**

Apr. 6—MacMillan Industries Field Trip.

Apr. 22—Official Visit of President J. N. Finlayson, who was accompanied by Assistant General Secretary W. D. Laird.

June 15—F. W. Guernsey on **Utilization of Wood Waste.**

July 14—American Can Company Field Trip.

Sept. 21—Annual Ladies' Night. Cocktails, films, and refreshments were enjoyed by 150 members and their wives.

Oct. 4—H.M.C.A. *Ontario* field trip. A.I.E.E. Vancouver Branch membership was invited to join the E.I.C. on this tour.

Oct. 19—Dr. George W. Volkoff on **Atomic Energy.** He discussed problems of international control and prospects of industrial application of atomic power.

Nov. 4—Annual presidential dinner meeting. President Armstrong and General Secretary L. Austin Wright, addressed the Branch on Institute policy and business.

Nov. 19—Annual Branch business meeting. Dr. Schrum discussed **Atomic Power and Its Place in Industry.**

The programme for the year presented a variety of most interesting meetings and field trips. The average attendance at technical meetings was 70, at business meetings 81, and at field trips 60, giving an overall average attendance of 70.

Victoria Branch

During the year there were three meetings of the executive committee, 5 general meetings, one of which was a field trip to a power development, and 2 presidential visit dinners.

The general meetings were as follows:

Jan. 21—Address by Lt.-Col. G. S. Andrews, air surveys engineer for British Columbia: **Aspects of the Mapping Problem in British Columbia.**

Feb. 18—Address by A. L. Carruthers, member of Okanagan Engineering Board. **Okanagan Flood Control.**

Mar. 18—Address by E. G. Oldham, chief of B.C. Parks Division: **Recreation in British Columbia.**

Apr. 10—Field inspection visit by branch members to the new Campbell River Power Developments.

Apr. 20—Presidential visit to Victoria of President Finlayson, dean of engineering, University of British Columbia.

Nov. 1—Presidential visit to Victoria of President Armstrong, chief engineer of the C.P.R.

Nov. 18—Address by R. E. Potter, executive assistant to the Dominion Provincial Board, Fraser River Basin: **Fraser River Basin Board.**

Winnipeg Branch

During the year 1949 the Executive Committee of the Branch held 13 meetings, the average attendance being 10.

The following general meetings of the Branch were held, with the attendance figures shown in brackets:

Jan. 13—Annual meeting of the Branch — addressed by F. G. Kerry, manager of the development and Engineering Department, Canadian Liquid Air Co., Montreal, on the subject of **Tonnage Oxygen.** (71)

Feb. 17—**Air-Entrainment in Concrete,** by D. O. Robinson, chief engineer, Department of Sales, Canada Cement Co., Toronto. (99)

Mar. 31—**The Red River Valley Flood Problem,** by W. D. Hurst, city engineer, Winnipeg. (147)

Apr. 28—**An Engineer Assesses the Considerable Power Possibilities of the Winnipeg River,** by H. L. Briggs, assistant general manager, City of Winnipeg Hydro Electric System. (157)

May 2—**Modern Practices in Arc Welding,** by H. Thomasson, director of the Metallurgical Section, Research & Development Laboratories, Canadian Westinghouse Co., Hamilton. (150)

May 3—Luncheon meeting with President J. N. Finlayson. (67)

Sept. 29—Two series of films were shown at this meeting—"Steam for Power" by Babcock-Wilcox & Goldie-McCulloch Ltd. "Magic of Steam" by Canadian Allis-Chalmers Ltd.

Oct. 8—Inspection trip by members and ladies to Manitoba Paper Co. mill and Manitoba Government power project at Pine Falls. (200)

Oct. 13—**Frequency Conversion and the Interconnection of the Various Transmission System Zones in Ontario,** by A. H. Frampton, general manager, English Electric Co. of Canada Ltd. (82)

Oct. 21—Luncheon meeting with President J. E. Armstrong. (82)

Nov. 10—Inspection tour of City of Winnipeg incinerator. (110)

Nov. 17—**District Heating of the Downtown Section of Winnipeg,** by R. A. Stewart, City of Winnipeg Hydro Electric System. (94)

Dec. 15—**The Interprovincial Pipe Line as a Need to Production of Canadian Oil,** by T. S. Johnston, vice-president, Interprovincial Pipe Line Co. (90)

Student Section

The following general meetings of the Student Section of the Winnipeg Branch were held during the year 1949, with the attendance shown in brackets:

Jan. 17—Film programme by Prof. O. Marantz. (40)

Feb. 15—Address by D. O. Robinson, Canada Cement Company. (54)

Feb. 24—Membership campaign meeting. (50)

Mar. 1—Section annual meeting and programme of films. (70)

Mar. 4—Membership campaign meeting. (138)

Mar. 14—Address by Dr. E. P. Fetherstonhaugh. (122)

Oct. 27—Address by J. L. Gray, National Research Council, Chalk River. (70)

Nov. 24—Address by J. R. Rettie, Manitoba Department of Mines & Natural Resources. (30)

Electrical Section

The following is a list of general meetings held by the Electrical Section in 1949.

Jan. 6—**Watts in Glass,** a film and demonstration. Speaker, P. Sweeney. (37)

Feb. 3—Annual Meeting. **Choosing the Right Induction Motor for the Job,** by G. E. Creed. (57)

Mar. 3—**The North Star Aircraft Electrical System,** by C. Glenn. (38)

Apr. 7—**Light as Radiant Energy,** by W. Trott. (41)

May 5—**Fuse Co-ordination in Rural Lines,** by Paul Shane. (39)

Nov. 24—**Inductive Co-ordination of Telephone Lines,** by G. A. Muir. (73)

Dec. 8—**The Designer's Approach to a Transformer Enquiry,** by A. M. Tallman. (46)

Pipe for Alberta Oil

(See Cover)

This month's cover illustration shows the operation of cutting, facing, and bevelling a section of the 16-inch diameter welded steel pipe for the Edmonton-Lake Superior oil pipeline. The first trainload of Canadian-made pipe for the 1150-mile line has arrived in Manitoba from the new Page Hersey mill at Welland, Ontario.

Some of the world's most modern equipment is being used to produce the pipe. High-strength plate, 40 to 50 feet long, 50¼ inches wide and 5/16 inch thick enters at one end of the 750 ft. mill and emerges in 10 to 15 minutes as finished pipe. The plate is formed into pipe by nine heaving rolls and the seam is continuously welded electrically by a current of 3000 amperes. The photo on this page shows a section of the pipe passing under the huge copper wheel which forms both electrodes of the welder.

After cutting, facing, and bevelling, the pipe sections are cold-expanded to 5/16 inch greater diameter by water under a pressure of 2300 pounds per square inch. In this process, a 40 ft. length of pipe shrinks 5½ inches in length and its strength is increased by the cold working. Finally, the sections are tested for leaks at 1530 p.s.i., inspected, gauged for size, and loaded for shipment to Western Canada.

From Month To Month

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

General McNaughton's Appointment

January 19th, 1950

The Right Hon. L. S. St. Laurent, K.C.
Prime Minister of Canada,
Ottawa, Ont.

Dear Mr. Prime Minister,

At a regular meeting of the Council of The Engineering Institute of Canada held in Montreal on January 14th, 1950, a resolution was passed unanimously recording Council's pleasure and satisfaction with the appointment of General The Hon. A. G. L. McNaughton to the International Joint Commission.

Council instructed the general secretary to transmit this information to you and to the members of your Cabinet. It is a great personal pleasure to comply with these instructions.

Beyond a doubt engineers everywhere will be pleased with the announcement. General McNaughton is well known and highly respected by the profession. The government is to be congratulated on its splendid selection.

Yours sincerely,

L. Austin Wright,
General Secretary

Engineers in Non-engineering Work

Without knowing the exact terms of reference under which the Manpower Committee of the American Society for Engineering Education operates one would suspect from its annual report*, that one of its tasks is to keep a watchful eye on the prospects for employment of engineers, particularly of those students about to graduate or who are now in college.

Of late there have been signs that the bull market of the post-war years for recent engineering graduates has passed its peak, and that hereafter such graduates will have to invest considerable money in shoe leather and postage before they find the job for which they are fitted. Indeed, it is not unlikely that some of them may decide that their most promising opportunities lie quite outside the technical engineering field.

Although the Committee is primarily concerned with conditions in the United States, some of its remarks and conclusions are equally applicable to Canada, and ought to interest our engineering students and those in our preparatory schools who are looking forward to engineering careers. There is not much the engineering student can do about the matter; he will have to accept conditions as he finds them when he graduates. Let us hope, however, that an appreciation of what these conditions may be, will inspire him to plan to meet them as well prepared as possible.

The boy in preparatory school is in a different position. He is not yet firmly committed to any particular course of college training, and, though he may have been aiming at one, his education has been general enough that he can shift his aim to another with little loss. Some boys in this group have what our clerical friends refer to as "the call" to engineering so strongly that they will be little influenced by prospective employment conditions. They want to be engineers and engineers they will be. Let them remember that the superior graduate, superior in natural ability and in qualities of personality, has always been in demand, even during periods of relative business inactivity. Doubtless most of this group of boys fall into the superior class.

However, we venture to guess that most of the boys who are thinking more or less seriously of studying engineering are urged by no such call. They are impelled by various motives, ranging from the mistaken idea that the engineer's work is a variety of well paid picnics, to more interest in engineering than in any other calling, but no overwhelming urge to study and practise it. This group will contain many who will change their plans if they think that engineering employment may not be too easy to get.

Among other things the Manpower Committee's report says:

* Annual Report of Manpower Committee; *Jour. Eng. Education;* Sept., 1949; vol. 40, No. 1; pp. 39-42.

"Engineering education has long been recognized as having great value as general education and as a good foundation for work in many professions other than engineering. The engineer's training in careful, thorough, accurate work, and in the scientific method of thought has been found useful in dealing with problems of human relations as well as with problems of utilizing the materials and forces of nature, and it is our belief that boys graduating in engineering during the next few years can expect to find employment, if not in strictly engineering work, at least in some activity in which their scientific training will not be wasted. As long as there is adequate attention to a sound general education, and as long as the occupational or professional education is accompanied by adequate guidance and counselling, the likelihood of any serious overproduction of college preparation seems remote . . . the situation calls imperatively for increased emphasis on adequate programs of selection and guidance of engineering college students, so that they may understand the requirements of the profession, the employment opportunities in it, and the possibilities of utilizing an engineering education as a foundation for non-engineering activities."

With these statements the Institute is quite in accord and has already shown that accord in at least one way, by giving increasing attention to guidance programmes. In addition, many members are individually and personally active in the guidance field.

New Appointment at Ottawa

It was announced some time ago that the federal Departments of Mines & Resources and Reconstruction & Supply were to be combined and reorganized into three new departments; Mines & Technical Surveys, Citizenship & Immigration, and Resources & Development.

Marc Boyer, M.E.I.C., who was appointed last year to be deputy minister of reconstruction & supply has now been appointed deputy minister of the new Mines & Technical Surveys' Departments.

"Get your blueprint, folks—can't tell what they're doing without a blueprint."

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Mr. Boyer's first federal appointment was enthusiastically endorsed by those who know his abilities and it will be generally agreed

N.F.B. Photo.
Marc Boyer, M.E.I.C.

that this new appointment is even more satisfactory since his record includes more than twenty years' experience in mining, metallurgy, geology and mapping. In 1928 he graduated as gold medallist in civil engineering from Ecole Polytechnique in Montreal and studied mining and geology for an additional year at McGill University. He joined the Quebec Department of Mines in 1930 where he was associated with mining and mapping activities for a period of thirteen years. In the years from 1943 to 1949 as registrar of The Corporation of Professional Engineers of Quebec he travelled extensively throughout that province and in northern mining areas.

The Institute extends its congratulations to Mr. Boyer, and its hopes for his success and personal satisfaction in this new appointment.

Ontario Association Officers for 1950

The Association of Professional Engineers of Ontario held its annual meeting at the Royal York Hotel, Toronto, on January 28.

The new executive for 1950 includes E. V. Buchanan, M.E.I.C., of London, president; W. H. M.

Photo by Norfolk, London.

E. V. Buchanan, M.E.I.C.

Laughlin, M.E.I.C., of Toronto, first vice-president; O. D. Johnson, Toronto, second vice-president. Councillors, civil branch, are H. E. Barnett, M.E.I.C., Niagara Falls; J. L. Lang, M.E.I.C., Sault Ste. Marie; W L. Sagar, M.E.I.C., Toronto. Councillors in the chemical and metallurgical branch are J. E. Buchan, Toronto; C. K. Fraser, Peterborough; and R. M. P. Hamilton, Toronto. Councillors, electrical branch, are H. J. Chambers, Toronto; W. J. Gilson, Toronto; and O. W. Titus, M.E.I.C., Leaside. Mechanical and industrial branch councillors are: O. W. Ellis, M.E.I.C., Toronto; G. R. Lord, M.E.I.C., Toronto; and J. R. Montague, M.E.I.C., Toronto. Councillors in the mining branch are J. W. Baker, Virginiatown; A. E. Cave, Geraldton; and M. W. Hotchkin, Kirkland Lake.

Like his predecessor, W. J. W. Reid of Hamilton, Mr. Buchanan has a long record of active support of the Institute and the Ontario Association, and this augurs well for continued close co-operation between the two organizations.

Born in Scotland, Mr. Buchanan obtained his engineering education at the Royal Technical College, Glasgow, and came to Canada in 1910. He joined the engineering department of the city of London, Ont., and in 1915, was appointed general manager of that city's Public Utilities Commission, which position he presently holds.

He has been vice-president of the Institute for Ontario, first vice-president of the Ontario Association, and chairman of the Canadian Section of the American Water Works Association. In 1938 he represented the Institute at the International Engineering Congress in Glasgow and in 1948 was awarded the George Warren Fuller Memorial Award of the Canadian Section, A.W.W.A.

Canadian Construction Association Convention Highlights

All previous records were shattered for attendance at the 32nd Annual Convention of the Canadian Construction Association held at the Mount Royal Hotel, Montreal, January 16th to 18th. Total membership now stands at 753, an increase of 74 over the previous year.

The first morning session was taken up with Committee reports. Considerable improvement was reported in the availability of building materials by Vice-President Robert Drummond, chairman, Materials Committee, particularly in cement, brick, gypsum, lath, steel pipe and fittings, bathtubs, structural steel, wire nails and spikes, with some declines in gypsum wallboard, non-metallic sheathed cables, soil pipe and sawn lumber. Cement production for 1950, he said, would reach 16.7 million barrels, with structural steel supplies adequate. Early preparation of an equipment rental schedule for general and road contractors and prospective clients was urged by Chairman F. G. Rutley of the Equipment Rental Schedule Committee.

General Manager R. G. Johnson reported the establishment of a joint Ontario Quebec Commission of Management, Labour and Apprenticeship Officials to deal with apprenticeship, following a study of the building trades apprenticeship system in Quebec during the year. He also stated that the 1951 Convention would be held in Quebec city in January, 1951.

At the first luncheon meeting the members were welcomed to the City by Mayor Camillien Houde. Following this, President Allan C. Ross, in his annual address, reported that continued efforts by the industry have brought about a levelling off of costs, chiefly due to improvements in materials supply in 1950. Stabilization of labour costs in 1950 will be a necessity if construction costs are to be maintained at present levels. Any ill-advised increases in the wage structure would stop or delay many projects and unemployment and disruption would follow.

At the Annual Banquet, Prime Minister Louis St. Laurent, the guest speaker, told the Association that though he saw bright prospects ahead for private construction in 1950, the government would go on maintaining a backlog of postponable projects to be available as a "floor" wherever required. He warned that the Construction Industry alone cannot be an adequate instrument to stabilize the whole economy.

"Canadians can best develop our resources and build up our national economy by giving the widest possible scope to private endeavour", the Prime Minister said. He was "more convinced than ever that the skill, ingenuity and foresight of Canadians as individuals will bring the most rapid and the most effective development of this country". Although the nation's postwar housing programme could well stand international comparison, Mr. St. Laurent commented that the nation's greatest need "is still for low-priced houses, or houses which can be obtained for a low rental". By using material in new ways and by constantly seeking for better methods of construction, he felt that costs, always the big thing for prospective owners, could be kept within manageable proportions."

Second day speakers included Ernest Gohier, chief engineer, Quebec Department of Highways, who described Quebec's recent highway improvements, and stated the province had spent some $30 millions on the Trans-Canada Highway to date, and would spend an equal amount to complete it. D. B. Mansur, president of the Central Mortgage and Housing Corporation, the second speaker, warned that we have probably reached a point where effective demand will be the limitation on the nation's housing programme, rather than the availability of labour and materials.

After many years experience in the publicly assisted housing field, Mr. Mansur stated he was quite convinced that a long term programme can only be accomplished by the joint efforts and participation of all three levels of government, federal, provincial and municipal. Tendering for C.M.H.C. housing projects has become increasingly competitive within the past year, he pointed out. Whereas in 1948 only one or two bids would be received, last year the number of tenders ran from eight to ten on each project.

The luncheon speaker was D. Leo Dolan, director of the Canadian Government Travel Bureau. Pointing out that the tourist industry made a major contribution to our national income, he expressed the view that no money spent by governments, federal or provincial, has been a finer investment to the whole people than the funds in highways. A Trans-Canada Highway, he felt, built to modern specifications, would be a most important factor in building the tourist business for this country. Following upon it proper feeder roads will become a necessity to increase tourist revenues in areas not yet served by roads.

Speakers at the third day sessions were Past President Albert Deschamps, O.B.E., Gabriel Rousseau, technical adviser on apprenticeship, Province of Quebec, and John N. Flood of Saint John, N.B. Mr. Flood reported on his attendance as delegate to the I.L.O. Building, Civil Engineering and Public Works Committee Conference in Rome 1949, while Mr. Deschamps gave a report on his attendance at the I.L.O. General Conference in Geneva during the same year. Mr. Rousseau described the organization and development of the Quebec system of apprenticeship training, outlining the results achieved to date and plans for the future.

The third luncheon speaker was James S. Duncan, chairman of the Dollar-Sterling Trade Board and president of the Massey-Harris Co. Ltd., who expressed the view that restoration of the ratio of building material purchases from the United Kingdom and the United States to the 1939 level would go a long way towards solving some of Canada's present day currency problems. Today, he said, the construction industry is bringing about 8 times as much materials from the United States as they are from Britain. The industry could add $50 millions of purchases annually to our present imports from the United Kingdom without injurious affects. Any damage therefrom would be more than compensated by the overall advantages of improved exports to that country, with the resultant buoyancy of our economy. The example would be quickly emulated by other industries.

At the termination of the luncheon, the incoming president, Robert Drummond of Toronto, and new officers of the Association were installed for the ensuing year. These included P. G. Wilmut of Montreal, as national vice-president, and J. H. Holden also of Montreal, as Quebec vice-president. R. A. Seasons of Ottawa, as honorary secretary, and T. N. Carter, Toronto, as honorary treasurer.

Entertainment included a reception and buffet supper on January 17th at the Hall of Honor, City Hall, at which the membership were guests of His Worship Mayor Camillien Houde, and a buffet supper, dancing and floor show at the Normandic Roof, on January 17th.

Ontario Provincial Division

Executive Meeting

The executive of the Ontario Provincial Division met in Hamilton on January 12, 1950, with the chairman J. R. Dunbar presiding.

The secretary reported on the Division's activities during 1949 and, after approval of the report, he announced that the Committee on Shoreline Erosion had been constituted with the following branch representatives: C. W. Holman, Peterborough; C. G. Russell Armstrong, Border Cities; W. E. Bonn, Toronto; P. E. Buss, Niagara Peninsula; W. D. Adams, Sault Ste. Marie; J. W. MacDonald, Sarnia; F. W. Paulin, Hamilton; J. F. Runge, Kitchener. Mr. Buss was elected chairman of the Committee.

The meeting considered a suggestion by J. G. G. Kerry, M.E.I.C., Port Hope, that a committee should be formed to study the St. Lawrence Waterway. E. A. Cross, was delegated to study the suggestion further.

It was reported that a mutual desire for co-operation appeared to exist among officers of the Institute and the Ontario Association of Professional Engineers but a formal co-operative agreement does not seem possible at this time. There was further discussion to further increase co-operation between the two organizations.

The nominating committee proposed as officers for 1950: W. L. Saunders, Ottawa, chairman; W. A. T. Gilmour, Hamilton, vice-chairman; L. C. Sentance, Hamilton, secretary; Maj. Gen. G. R. Turner, Ottawa, treasurer. This slate was elected by acclamation and the meeting further moved that E. A. Cross, Toronto; F. R. Pope, Peterborough; and C. P. Warkentin, Sarnia; should continue as members of the Board of Management of the Division.

The meeting adjourned at 4.00 p.m.

Shoreline Erosion Committee

The Committee met in Hamilton on January 12, 1950 with P. E. Buss, chairman, presiding.

Mr. Buss summarized the main points of a report by Dr. G. B. Langford consultant to the Ontario Government on shoreline erosion. There followed a full discussion of ways and means by which the committee could interest itself constructively in this important question. Several members cited examples of preventive works in Canada or in other parts of the world.

The Committee then agreed that Dr. Langford should be asked for suggestions as to how the Committee could assist him and the interested government agencies.

The meeting was adjourned at 5.15 p.m.

News of Other Societies

The western spring conference of the **Canadian Electrical Association** (704 Tramways Bldg., Montreal) will be held at Vancouver, B.C., March 27-29, 1950.

The Institute of Aeronautical Sciences, New York, has elected as its president for 1950 James Howard "Dutch" Kindelberger, chairman of the board, and chief executive officer of North American Aviation, Inc.

The **Society for the Advancement of Management,** Montreal Chapter (1411 Crescent St., Room 405) announces an Industrial Engineering Conference to take place at the Mount Royal Hotel, Montreal, March 24, 1950.

The **Society of Automotive Engineers,** New York, at its annual meeting in January, elected to the presidency for 1950 Mr. James C. Zeder, chairman of the engineering board of Chrysler Corporation.

The **Canadian Section of the American Water Works Association** has arranged the next convention to take place at Niagara Falls, Ont., April 3-5, 1950. Convention headquarters will be at the General Brock Hotel.

Personals

Notes of the Personal Activities of Members of the Institute

E. D. Gray-Donald, M.E.I.C., **R. H. Mather,** M.E.I.C., and **A. C. Abbott,** M.E.I.C., figured in recent appointments in the Shawinigan Water and Power Company.

Mr. Gray-Donald, heretofore chief engineer of Quebec Power Company, moves to Shawinigan as vice-president and chief engineer. He is a graduate of McGill University, Montreal (B.Sc., 1926), and Laval University, Quebec City (M.S., 1934). He joined the Quebec Power Company and Quebec Railway, Light & Power Company in 1926. He was made chief engineer of the organization in 1942.

Mr. Gray-Donald is councillor of the Institute representing the Quebec Branch. He was elected president of the Canadian Electrical Association at the annual meeting of that body in August last.

Mr. Mather, becomes assistant to the vice-president and chief engineer. His position, previously, was manager of the commercial and distribution department

He joined the Shawinigan Engineering Company, Montreal, in 1919, and was subsequently appointed to the staff of the Shawinigan Water and Power Company, Montreal, as an electrical engineer. He was later connected with the power sales department, and was appointed sales engineer in 1925. He graduated from McGill University in 1913, and before going to the Shawinigan organization, worked on the electrical engineering staff of McGill University, in the cable engineering department of Northern Electric Company, Montreal and with the Sir W. G. Armstrong Whitworth Company Limited, Elswick Works Newcastle-on-Tyne, England.

Mr. Abbott, succeeds Mr. Mather as manager of the commercial and distribution department.

Mr. Abbott has been with the Company since his graduation from McGill University in 1926.

F. H. Palmer, M.E.I.C., has gone to the Philippines to open a Canadian Consulate at Manila.

Mr. Palmer has served as the Canadian Government Trade Commissioner in Sweden, Holland, Italy, Norway, Denmark, Finland, Great Britain and Australia, and he was appointed chargé d'affaires at the Canadian legation in Stockholm, when it was instituted in 1947.

Grant R. Jack, M.E.I.C., has been appointed chairman of the Public Utilities Commission of Newfoundland. Mr. Jack went as city engineer to St. John's, Newfoundland in 1944, from Toronto, where he was commissioner of works for East York Township, Ont.

Lt.-Col. E. W. Henselwood, M.E.I.C., is command engineer officer, Central Command, R.C.E., with headquarters at Oakville, Ont. He was re-appointed to the Canadian Army Active Force, in December, 1948, when he took over that position.

Lt.-Col. Henselwood graduated from the University of Manitoba in 1937 in electrical engineering, entering the Canadian General Electric test course that year. He was with C.G.E. until 1939 at which time he enlisted as lieutenant in the R.C.E. He served for six and half years, and was transferred to the Reserve Force in 1946 with the rank of lieutenant-colonel. He rejoined the C.G.E. company at that time and was employed in the generator division of the Apparatus Department of the Company in Toronto, until 1948 when he rejoined the Service.

H. M. Black, M.E.I.C., is now assistant manager of the Industrial Division of Dominion Engineering Company Limited, Montreal. He has been with the Company since 1940, and has been manager of its Ontario Division, in Toronto, since 1945.

Mr. Black graduated from McGill University in 1923 with the degree of B.Sc. in mechanical engineering and subsequently joined the staff of the Allis-Chalmers Company, Milwaukee. From 1927 he was associated with the English Electric Company of Canada Limited for 13 years before joining Dominion Engineering as manager of its Longueuil Ordnance Plant.

Hugh F. McLachlin, M.E.I.C., has been appointed manager of the newly formed Apparatus Order Service Division of the Canadian Westinghouse Company, Hamilton, Ont.

Mr. McLachlin, a graduate of Royal Military College in 1930, joined the Canadian Westinghouse Graduate Apprenticeship Course and worked through the various divisions until 1940 when he joined the Royal Canadian Engineers on Active Service.

In 1945 he retired with the rank of major and took up his former duties in the Correspondence Division, handling the co-ordination of information on negotiation service and orders for major customers.

Sidney Hogg, M.E.I.C., has been elected chairman of the Vancouver Branch of the Institute. He is the general manager of Western Bridge Steel Fabricators Ltd., Vancouver, B.C.

Mr. Hogg was born and educated in Scotland. He obtained the degree of Naval Architect in 1922 from Dundee Technical College. He worked with the Dundee Shipping Co. Ltd., for a time, but came to Canada in 1923 and joined Canadian Vickers Ltd. He transferred to Canadian Bridge Co. Ltd., and was later with the Saint John Dry Dock and Shipbuilding Co. Ltd., where he was in charge of the structural design department at Saint John, N.B. In 1940, after 12 years with the company he was placed in charge of the company's ship construction contracts. While he was in Saint John he was active in the Engineering Institute, serving as chairman and councillor for the Branch.

Steffens-Colmer Studios.

Sidney Hogg, M.E.I.C.

He went to Vancouver in 1944 as chief engineer and sales manager of Western Bridge and Steel Fabricators Limited receiving the appointment to his present position in 1947. Mr. Hogg is also general manager of West Coast Shipyards Co., Ltd. and was in charge of the Dominion Rustproofing Co., Ltd. which is now part of Western Bridge and Steel Fabricators.

A. C. Ross, M.E.I.C., has been elected chairman of the Ottawa Branch of the Institute. He is president of Ross & Meagher Limited, Ottawa.

Mr. Ross, who was born at Ottawa received his B.Sc. degree in electrical engineering from McGill University in 1911, and did railway work for a time with the Canadian Northern Railway and the Canadian Pacific Railway. From 1912 to 1915 he was engineer and inspector for the mechanical department of the National Transcontinental Railway, on all plants and structures from Moncton, N.B. to Winnipeg. He served in the Canadian Army from 1915 to 1918. On his return he became president and engineer of Ross, Meagher Limited, Ottawa, and he still heads this contracting and engineering firm.

Mr. Ross has been active in the Canadian Construction Association, and after several years on the executive, was elected president of this body in 1948.

J. G. Hoba, M.E.I.C., has been elected chairman of the Border Cities Branch, of the Institute.

Mr. Hoba, who was born at Thorold, Ont., graduated from Queen's University with a degree of B.Sc. in mechanical engineering in 1940. He was for a time a field construction engineer for Brunner Mond Co. Ltd., at Amherstburg, Ont. In 1941 he joined the Kelsey Wheel Co. Ltd. working on time study, production routing, cost estimating, and in 1944 he became an industrial engineer for the Company. He joined the Ford Motor Co. of Canada, at Windsor, Ont., in 1949.

J. G. Hoba, M.E.I.C.

G. G. M. Eastwood, M.E.I.C., who was secretary-treasurer of the Cornwall Branch of the Institute in 1947-1948, was elected chairman of the Branch, at its annual meeting in December.

Mr. Eastwood is plant engineer at Courtaulds (Canada) Limited, at Cornwall. He was born in Cornwall, and studied engineering at the University of Toronto, completing this course in 1937. In 1940, he joined Canadian Westinghouse Co. Ltd., following the engineers' apprenticeship course. He worked as a draughtsman on switchboard layout until 1942. Then for several years he did technical liaison work between the engineering and sales departments. He joined Courtaulds (Canada) Limited in 1945.

D. O. Turnbull, M.E.I.C., has been elected chairman of the Saint John Branch of the Institute. Mr. Turnbull has been in private practice as a consulting engineer in Saint John, N.B. since 1945, specializing in the design and supervision of municipal and industrial engineering works. He had been with the R.C.A.F. from 1940 to 1945, attaining the rank of squadron leader.

Mr. Turnbull, who was born at Rothesay, N.B., is a graduate of the Royal Military College, Kingston, Ont., class of 1929. In 1930 he joined the Foundation Company of Canada Ltd. and was a field engineer on many of the firm's projects. In 1934 he was appointed office engineer of the Company at Montreal. From 1935 to 1939 he was job engineer and construction superintendent for the Foundation Company.

L. C. Sentance, M.E.I.C., has been elected chairman of the Hamilton Branch of the Institute. He is assistant manager of works, of the Canadian Westinghouse Co. Ltd., Hamilton, Ont.

Mr. Sentance, who is from Melville, Sask., graduated in 1937 from the University of Saskatchewan with a degree of master of science in mechanical engineering, whereupon he enrolled in the Westinghouse engineering apprenticeship course. On completion of this course, 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.

Dr. B. B. Hillary, M.E.I.C., who was secretary-treasurer of the Sarnia Branch of the Institute in 1948 has been elected chairman of the Branch.

Dr. Hillary is from Vancouver, and is a graduate of the University of British Columbia, with the degrees of B.A. and M.A. in 1934 and 1936. He received the degree of Ph.D. from the University of Toronto in 1939, where he remained until 1941 to do research, teaching and consulting work in chemistry and engineering. In 1942, he joined the Polymer Corporation Limited, Sarnia, 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. He is now superintendent of the Company's styron plant at Sarnia.

Dr. B. B. Hillary, M.E.I.C.

Stewart A. Charters, M.E.I.C., has been appointed sales manager of Westeel Products Limited, Montreal Division.

Mr. Charters graduated in civil engineering from McGill University in 1936.

After spending six years with Watson Jack & Co. Limited, in Montreal as sales engineer, he served three years with the R.C.A. Discharged with the rank of captain, he joined Westeel in 1945.

A. L. Swanson, M.E.I.C., has operated a consulting engineering practice in Vancouver, B.C., since 1948, specializing in steam power plants, project engineering and plant layout, and in machine design. For about 25 years prior to that time, his engineering work included such positions as operating steam engineer, machinist, and draughtsman; and eleven years as executive engineer with several industrial firms. Among those organizations are: B.C. Pulp and Paper Co. Ltd., Port Alice, B.C.; the Inspection Board of the United Kingdom and Canada, at Montreal; Heaps Engineering (1940) Ltd., New Westminster, B.C.; International Plywoods Ltd., Gatineau, Que., and Alaska Pine Sales Ltd., Honeymoon Bay, B.C.

Donald B. Sutherland, M.E.I.C., has received the appointment as superintendent of new buildings of the Protestant Central School Board, Montreal.

Joining the staff of the Central Board as assistant superintendent of buildings in 1946, Mr. Sutherland was soon afterward appointed maintenance officer, supervising upkeep, rehabilitation and repair of the board's buildings. Before joining the Central Board he served in the R.C.N.V.R.

O. N. Mann, M.E.I.C., until recently manager of the Monarch Knitting Co. plant at Dunnville, Ont., is now in Halifax, N.S., to work with the Nova Scotia Research Foundation on the industrial development of Nova Scotia.

Mr. Mann graduated in 1935 from the Nova Scotia Technical College with the degree of B.Eng.

S. D. Levine, M.E.I.C., of Buffalo, N.Y., was joint participant in a paper presented at the annual meeting of the American Rocket Society in New York City. The paper, "Hydrogen Peroxide as a Rocket Propellant", presented a survey of the applications of high strength hydrogen peroxide to rocket propulsion. The Society meets annually at the national sessions of the A.S.M.E.

Claude P. Beaubien, M.E.I.C., of Aluminum Co. of Canada Ltd., Quebec City, has been transferred to Montreal.

He is a 1934 graduate of Massachusetts Institute of Technology with a degree of B.Sc. in Business and Engineering Administration.

Michel M. Elwood, M.E.I.C., has joined the sales personnel of Laurentide Equipment Company Limited, Montreal, as sales engineer.

Mr. Elwood graduated in mechanical engineering from the German University of Brunn, in 1931, after which he worked on aero-engines and aircraft controls and later in special and heavy vehicles for the Cirrus-Hermes Engine Company Limited, of London, England. He was also assistant to the general manager and chief of department of the Special Vehicle Division of the Skoda Works Ltd., in Pilsen, Czechoslovakia.

After the war, he was technical adviser to the U.S. Military Government in Bavaria, Germany, and with Sicard Inc., in Montreal, he was test and research engineer.

J. L. Simpson, M.E.I.C., who was with Engineered Buildings Ltd., Edmonton, Alta., is now at Calgary, Alta., with the Burns & Dutton Concrete and Construction Co. Ltd., contractors.

G. A. Bennett, JR.E.I.C., has been made superintendent of the Plymouth Cordage Co. at Welland, Ont. He graduated in 1945 from Nova Scotia Technical College, Halifax. He joined the Company in 1946 as assistant master mechanic.

W. L. Walker, JR.E.I.C., who is with William Kennedy & Sons Ltd., has been transferred from Owen Sound, Ont., to Montreal. He graduated from the University of Toronto in 1946 with a degree of B.A.Sc.

E. B. A. LeMaister, JR.E.I.C., is with H. G. Acres and Company in Niagara Falls, Ont.

Mr. LeMaister graduated in mechanical engineering in 1948 from McGill University. Previous to his recent change, he was with Canadian Refractories Ltd., Montreal, as a junior engineer.

Fernand Lareau, JR.E.I.C., is now with Lareau and Dupuis, Limited, engineers and builders, Montreal.

Mr. Lareau is a graduate of McGill University, class of 1944. Before his recent change he was an estimator for C. E. Champagne Ltd.

Marston Cameron, JR.E.I.C., is now with the Engineering Branch of the Department Public Works of Canada at St. John's, Nfld. He was previously with the Topographical Survey Division of the Department of Mines and Resources at Ottawa, Ont.

He graduated from Nova Scotia Technical College in 1948 with a degree of B.Eng.

C. A. N. Baker, JR.E.I.C., is employed by L'Air Liquide Society, Montreal, as a design engineer. Previously, he was with the Norton Company at Chippawa, Ont., as a junior chemical engineer in the research and development section.

He received the degree of M.Sc. from Queen's University in 1946 in chemical engineering.

L. B. Rose, JR.E.I.C., graduate of the 1947 civil engineering class of University of Toronto, is now with the Woods Department of the Abitibi Power & Paper Co. Ltd., Iroquois Falls, Ontario.

F/L Foster W. New, S.E.I.C., of Windsor, Ont., was appointed, in May, 1949, to a commission as flight lieutenant in the Technical List of the R.C.A.F., and is presently stationed at R.C.A.F. Headquarters in Ottawa. He graduated in mechanical engineering from Queen's University in May, 1949.

G. L. Smith, S.E.I.C., is now with the Hydrographic Service, of the Department of Mines and Resources of Canada, Ottawa, Ont. He graduated from the University of New Brunswick in 1949, in civil engineering.

R. E. Winter, S.E.I.C., is employed in the Maritimes by Kilborn Engineering Co. Ltd., of Toronto. The Company is working for the Department of Agriculture on a proposed dam at Albert County, N.B. He graduated from the University of Toronto in 1949, with a degree of B.A.Sc. in civil engineering.

W. T. Windeler, S.E.I.C., is now with the head office of the Canadian General Electric Company in Toronto. He graduated in electrical engineering in 1949 from Nova Scotia Technical College, Halifax.

S. A. Reeves, S.E.I.C., has left the Hydro-electric Power Commission of Ontario to accept a position with Superline Oils Limited in Halifax, N.S. He graduated in 1949 in civil engineering from Nova Scotia Technical College, Halifax.

D. J. MacQuarrie, S.E.I.C., is resident engineer with the Department of Highways and Public Works, Halifax, N.S. He graduated in civil engineering in 1949 from Nova Scotia Technical College, Halifax.

B. T. Burke, S.E.I.C., who received his degree in civil engineering from N.S. T.C., Halifax, in 1949, is now a 2nd lieutenant in the Royal Canadian Engineers. He is at present stationed at the R.C.S.M.E. at Chilliwack, B.C.

J. E. Lane, S.E.I.C., graduate of the electrical engineering class of 1949 at N.S.T.C., Halifax, is employed as a demonstrator in the department of electrical engineering at the University of Toronto.

I. R. Warr, S.E.I.C., who graduated in 1949 from N.S.T.C., Halifax, is employed as a supervisor with Canadian Industries Limited, Hamilton, Ontario.

P. P. Russell, S.E.I.C., has been with Job Bras & Co., St. John's, Newfoundland, since his graduation in 1949 from Nova Scotia Technical College, Halifax.

P. T. Duff, S.E.I.C., of the mining engineering class of 1949 at N.S.T.C., Halifax, is a student engineer with the Transit & Storage Co., Wayne, Michigan.

F. G. Vivian, S.E.I.C., is a junior civil engineer with the Hydro-Electric Power Commission of Ontario at Toronto, Ont. He graduated in 1949 from N.S.T.C., Halifax.

A. G. Morris, S.E.I.C., has gone to Winnipeg, Man., to work for Vulcan Iron & Engineering Ltd. He was formerly with E. F. Drew & Company, Ltd., Montreal. He graduated from McGill University, Montreal, in 1949, with a degree in chemical engineering.

Visitors to Headquarters

H. R. Wright, JR.E.I.C., Quebec City, January 10, 1950.

L. H. Burpee, M.E.I.C., Vancouver.

W. R. Hughson, M.E.I.C., Cornerbrook, Nfld., Jan. 23.

John S. Galbraith, M.E.I.C., Toronto, Jan. 23.

T. Lindsay Crossley, M.E.I.C., Toronto, Jan. 25.

W. F. MacCulloch, M.E.I.C., January 25.

ERRATUM

A *Journal* "Personal" in the December issue, page 843, treated of the formation of the engineering firm of McCubbin, Brisco & Todgham, at Chatham, Ont.

We stated that **Mr. H. H. Todgham,** JR.E.I.C., had formerly been with C. G. R. Armstrong, consulting engineer, at Chatham, Ont., whereas Mr. Armstrong's organization is at Windsor, Ont.

Obituaries

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

Luman Sherwood, M.E.I.C., assistant chief engineer with the Department of Railways and Canals for 25 years until his retirement in 1936, died on January 20, 1950, at his residence, in Ottawa, following a lengthy illness.

His death ended a notable engineering career which included work on the Trent Canal construction in 1906 as principal assistant engineer.

Born at Napanee, Ont., in 1877, he received his early education there. He was a graduate of the Napanee Collegiate Institute and the Royal Military College, Kingston.

Following his graduation from R.M.C. in 1898, he served on the college staff as an assistant instructor in civil engineering for a one-year period.

During the next seven years, he held various engineering positions in such widespread points as British Columbia; Niagara Falls, Ont.; Toronto; Pueblo, Col.; East River tunnels, Long Island; and Denver, Col.

With completion of the Trent Canal, he came to Ottawa as assistant chief engineer with the Department of Railways and Canals in 1911, which position he occupied until his retirement.

He was a Life Member of the Engineering Institute of Canada, which he joined in 1900.

Lt.-Col. Lawrence T. Martin, M.E.I.C., of Ottawa died on December 11, 1949.

Mr. Martin was born in Arnprior, Ont., in 1884, and received his education at Renfrew Collegiate Institute. During World War I he directed the operations of the 7th C.R.T. Battalion, Canadian Railway Troops, in Belgium and France as officer commanding.

Early in his career, he had been employed by the Temiskaming and Northern Ontario Railway, engineering department. He relinquished this post in 1906 to form the railway construction firm of O'Brien & Martin, which carried out the construction of railways in Northern Quebec and Ontario and the Transcontinental Railway until 1914. He was then managing director of the Great Lakes Dredging & Contracting Company of Windsor, Ont., and managing director of the O'Brien Munitions Co., Renfrew, Ont.

On his return from overseas, he was appointed a commissioner on the Temiskaming & Northern Ontario Railway in 1921. He became vice-chairman in 1927, and relinquished this post in 1934, to form the contracting firm of Gleeson Martin Limited, which engaged in highway construction in Northern Ontario. In 1937, he became president and managing director of L. T. Martin Limited and carried on several defence projects during World War II.

For the past four years, he had been interested in several housing projects in the vicinity of Ottawa, Ont.

He was elected a Member of the Institute in 1921.

Fletcher Astels, M.E.I.C., construction superintendent of the Foundation Company, Montreal, died suddenly on January 4, 1950, at Pine Falls, Man., where he was engaged in work for his firm.

He was born at New Carlisle, Quebec, in 1888. After serving in World War I, he studied at Tri-State College, Indiana, U.S.A., graduating in 1924 with a degree of B.Sc. in civil engineering.

Mr. Astels had joined the Foundation Company in 1924, and worked as field or resident engineer and as construction superintendent on many of the Company's well known projects.

Mr. Astels was a member of the American Association of Engineers, and the Association of Professional Engineers of Quebec. He joined the Engineering Institute in 1937 as an Associate Member, transferring to Member in 1940.

Werner Bohraus, M.E.I.C., of Thorold, Ontario, died on November 12, 1949. He was designing electrical engineer of the Ontario Paper Company Ltd., at Thorold.

Mr. Bohraus was born at Zurich, Switzerland in 1898. He graduated from The Swiss Federal Institute of Technology, Zurich in 1924, as an electrical engineer whereupon he joined Brown Boveri & Co., Baden, Switzerland. In Canada in 1927, he joined the Canadian Comstock Co., where he worked on electrical draughting and designing of much of the firm's construction work, for example, the Gatineau paper mill; Royal York Hotel, Toronto; Sun Life Assurance Building, Montreal. From 1931 to 1935 his engineering career included work as an electrical designer for Wilson & Kearns, Montreal, on the Montreal terminal station; for Canadian Copper Refiners, Montreal East, on the selenium recovery plant; for Canadian Industries Ltd., on the design of their Cornwall plant; for Howard Smith Paper Mills Ltd., on the rewiring of their Beauharnois plant; and for the Aluminum Co. of Canada at Arvida for their Bayer Process plant.

He went to the Ontario Paper Company in 1936, as designing electrical engineer on original construction of the mill at Baie Comeau, Quebec, and he was given responsibility for all electrical construction in the Company's operations in Quebec and Ontario.

He joined the Institute as a Member in 1945.

Headquarters Records

Each time the *Journal* or other Institute mail is dispatched we are advised of undeliverable items due to incorrect addresses. Our records staff must follow up these changes and the regular service to members suffers thereby. *Please* advise headquarters when your address or occupation changes. The form below can be completed, clipped, and mailed to headquarters in a few minutes.

Please Print

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(Check address to be used for Institute mail.)

Product or Service ....

Position or Title ....

Degree, Year & College ....

Advise Headquarters Promptly of Changes

NEWS of the BRANCHES

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

Central British Columbia

M. L. Zirul, M.E.I.C.
Secretary-Treasurer

The annual general meeting of the Central British Columbia Branch of the Institute was held at the Central Hotel, Kamloops, January 20, 1950. Present were 12 members of the Branch and three guest engineers. Dinner was served, and the meeting convened at 8 p.m., with William Ramsay in the chair.

The annual report of the Branch, as submitted to Headquarters, was read by the secretary-treasurer. A résumé of correspondence leading up to advice that General MacNaughton had been appointed to the vacancy on the International Joint Commission was also given. The results of the election for the 1950 branch executive was read by the secretary.

Other matters of Branch business were discussed, after which H. L. Hayne the new chairman, gave a very interesting talk on the new Hope-Princeton Highway.

Mr. Hayne's discussion touched upon the following points: history of the Hope-Princeton Highway, originating in the old Dewdney Trail; surveys and estimates; letting of contracts; summary of construction quantities and costs; summary of materials supplied by the Department, with costs; adjustment of contracts due to rising costs imposed on contractors; notes on final location.

Mr. F. McCallum proposed a vote of thanks to Mr. Hayne.

Mr. Hatfield favoured the meeting with some very interesting remarks on construction difficulties, encountered during severe winter conditions, in replacing piers of the Canadian Pacific Railway Bridge across the Elk River near Elko.

Cornwall

L. H. Snelgrove, Jr.E.I.C.
Secretary-Treasurer

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

The January meeting of the Cornwall Branch was held in Courtaulds' assembly room on January 24. Members heard with interest an address on **Diesel-Electric Locomotives,** delivered by W. A. Parker, of the Montreal office of Canadian General Electric.

Mr Parker stated that through almost 100 years of railroading the steam locomotive has reigned supreme. Since 1900, however, the electric locomotive has been a rival in dense traffic areas. Elsewhere, high carrying charges make it uneconomical. Diesel-electric power has been used for almost 25 years, and increasingly since 1935, retarded during the war years, but expanding in use since 1946.

Mentioning that the operator's comfort and visibility are kept in mind to ensure safe operation, Mr. Parker also pointed out other advantages of the diesel such as elimination of smoke and noise, length of service without maintenance, and reduction of fuel cost. By transmitting the diesel's energy to the traction motors through an electric generator, the constant torque at the wheel rim can result in a tangential force up to 30 per cent of the weight on the wheel. A steam locomotive's pulsating torque results in a figure of only 25 per cent. Hence the diesel-electric shows up well in starting trains. By automatic control, an infinite number of transmission steps take place smoothly as the train speeds up. Wheel slippage and wear are minimized by proper load distribution and by equalizing the trucks.

On the question of economy — Mr. Parker further stated that a diesel-electric requires one tank car of fuel oil to perform the same work done by a steam locomotive using 12 hopper cars of coal. The steam unit is available for service about 60 per cent of the time, against a figure of 95 per cent for the diesel-electric. Even the early diesel-electrics, purchased at approximately $200 per horsepower due to low volume, proved good investments. By 1937, costs were reduced to $60 to $70 per horsepower.

Paralleling the rise in diesel-electrics has been a development in scientific application of motive power. By studying a track layout, allowance can be made for grade and curve resistance, and for wind resistance. Journal friction can be determined from experimentation and curves. Thus the weight of the locomotive and horsepower required can be established. In addition, through detailed calculations for each change in track profile or resistance, hauling time between two points can be found for a certain tonnage train.

A film, showing how Union Freight Railways in Boston converted from steam to diesel-electric, concluded the programme.

G. M. Eastwood, branch chairman, presided. The speaker was introduced by P. H. Nasmyth and thanked by H W. Nickerson.

Hamilton

I. M. Macdonald, M.E.I.C.
Secretary-Treasurer

The first technical meeting of the Hamilton Branch was held October 27, 1949, at the Steel Company of Canada auditorium with 46 members and guests in attendance. C. O. P. Klotz, the speaker, was introduced by vice-chairman L. C. Sentance as a graduate of Queen's University, Kingston. Mr. Klotz has been with the Aluminum Co. of Canada for several years, working at first in construction in Kingston and Arvida, and later in sales development.

He commenced his discussion of aluminum in the construction industry with a brief history of the development of aluminum, continuing with the description of present-day uses of aluminum and its many advantages. This material is of course used where lightweight construction is desired and also where an enduring decorative finish is required. One interesting construction is an all aluminum arch bridge now nearing completion at Arvida. Aluminum is being used widely in construction in such things as roofing, flashing, siding, etc., and it is a major component of prefabricated housing.

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The annual Ladies Night of the Hamilton Branch on November 17, took the form of a dinner at the Iroquois Hotel, Galt, and a tour of the Dominion Woolens & Worsteds plant, Hespeler. Eighty-nine members of the Hamilton and Kitchener Branches attended the dinner, and were joined by several others for the plant visit.

Mr. A. C. McNab, chief engineer of Dominion Woolens & Worsteds gave a brief discussion of his company's activities and showed a very interesting colour film taken in the plant. Following the very interesting tour, the visitors enjoyed a lunch supplied by Dominion Woolens & Worsteds in their cafeteria.

Lethbridge

D. Cramer, M.E.I.C.
Secretary-Treasurer

J. T. Dokken, Jr.E.I.C.
Branch News Editor

The regular meeting of the Lethbridge Branch of the Institute was held at the Marquis Hotel on December 17. Chairman R. D. Livingstone presided, and 35 members and affiliates were in attendance.

Vocal solos by Miss Laverne Cunning and Mr. Edgar Rannard accompanied on the piano by Mrs. Katherine Brown, and

Montreal Junior Section Oyster Party

community singing led by R. S. Laurence were enjoyed by all.

A. Donaldson gave a report on the council meeting of the Institute held at Vancouver on November 5, 1949.

R. McKenzie introduced Mr. Dean Burnside of the McColl-Frontenac Oil Co. who showed two very interesting and informative films. The first film, "Atomic Power," outlined the progress of the allies in making the atomic bomb, from the first theories extended by Professor Einstein up to the final test of the weapon at Hiroshima. The second film, "A Story of Saudi Arabian Oil," depicted the change in the struggling, nomadic way of life of the Arabians after oil was discovered a decade ago. In 1933 the Americans were invited into the country for exploration and in 1938 the first successful well was struck. Since that time the Arabians have attained a steadier, more secure existance due to the wealth that oil has brought. Today the vast desert is covered with pipe lines, oil wells, truck caravans and American-like towns and the people are enjoying a prosperity which they have never had before.

G. C. Millar expressed a unanimous vote of thanks to Mr. Burnside and to the McColl-Frontenac Oil Company for the very timely pictures.

Montreal

R. B. Wotherspoon, M.E.I.C.
Secretary-Treasurer

Junior Section

G. Fernand Noiseux, Jr.E.I.C.
Secretary

Friday night, December 2nd, the Junior Section at Montreal held their second successful oyster party. About eighty engineers attended.

Bill Smith, with the capable aid of the Junior Section Executive, managed to have more refreshments than there were engineers available to consume them, but the money lost in the affair was well invested in the grinning faces that left the Preston Hall at midnight.

Newfoundland

J. M. Hopkins, M.E.I.C.
Secretary-Treasurer

Corner Brook Section

Milton G. Green, S.E.I.C.
Secretary-Treasurer

On November 29, 1949, the Corner Brook Section held a meeting for the presentation of a technical paper by Mr. George Hobbs. His paper, **The Effects of Abrupt Load Changes on Power Systems,** was followed by a very interesting discussion and question period. Refreshments were served at the close of the evening and the whole affair was very successful. Plans were made to present another technical paper early in the new year.

Saguenay

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

On January 17, 1950, at 8.15 p.m., a meeting of Saguenay Branch of the Institute was held in the Assembly Hall of the Arvida High School. The chairman was W. F. Campbell, and the speakers were C. J. Pimenoff, M.E.I.C., design engineer for the Dominion Bridge Company Limited, Montreal and Fred Bowman, M.E.I.C., erection engineer for the Dominion Bridge Company Limited, Montreal. The topic was **The Design and Erection of the Aluminum Bridge at Arvida.**

Sixty members and friends of the Branch attended the meeting and great interest was shown in the excellent presentation by these two men.

With the assistance of slides Mr. Pimenoff, described the site and the conception of the new bridge. An arch type bridge had been chosen and its lines blend well with the rugged banks of the Saguenay river. Structural members were made in Alcan 26ST alloy rolled into plate or extruded into structural shapes at Kingston Works of the Aluminum Company of Canada. Members were fastened to one another by 16S rivets.

In discussing the erection Mr. Bowman pointed out that large sections were fabricated in the shops and shipped to the site. Because of the lightness of aluminum, these sections were erected with the use of comparatively light equipment. Slides illustrating the erection were shown.

Saskatchewan

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 Branch was held on Friday, January 20. It was held jointly with the United Services Institute of Regina in the Institute auditorium.

The Buffalo Pound Lake Project to supply Regina and Moose Jaw with water was discussed. Main speakers were Prof. C. R. Forsberg, chairman of a technical committee set up last spring to study the water supply situation, and Allan Shattuck, assistant city waterworks superintendent. Dr. E. A. McCusker, member of parliament for Regina, and Mayor Garnet N. Menzies gave impromptu comments on the proposed water project.

The scheme on which they spoke would bring water from the South Saskatchewan river to the two cities. It would be pumped over a height of land to the Qu'Appelle valley, flow down to Buffalo Pound lake and be piped through a filtration plant to Regina and Moose Jaw.

Prof. Forsberg, of the engineering department of the University of Saskatchewan, advocated Moose Jaw getting into the proposed scheme from the beginning.

Figures cited by Prof. Forsberg indicated Moose Jaw presently is paying about $100,000 annually for its water supply, above capital cost. He estimated that Moose Jaw's comparable annual water cost under the new scheme, including provision of additional storage facilities, would be about $93,000.

In addition, current supply sources for Moose Jaw were providing just enough water to satisfy the demand and indications were that those could not be expanded appreciably, said Prof. Forsberg. "It appears that it would be desirable for Moose Jaw to get in on the Buffalo Pound Lake scheme from the beginning," he concluded.

Dealing with probable cost of the project, Prof. Forsberg said that if it supplied Regina alone, it would cost in the neighbourhood of $5,340,000. That was down from the technical committee's $5,690,000 estimate of last spring.

Looking further to the future, Prof. Forsberg believed cost of the scheme by 1980 would depend a great deal on whether the proposed South Saskatchewan river dam was constructed for irrigation purposes. If not, the cost would rise because equipment at the river would have to be made more permanent.

Mr. Shattuck concentrated his discussion on the bringing of water to Regina from Buffalo Pound Lake. Realizing that arrangements for financing and planning construction of the scheme would take considerable time, he said, the city has gone ahead with preliminary tests and surveys to reduce the time interval as much as possible.

He reviewed work of the past summer, when water tests were undertaken at Buffalo Pound Lake and surveys were made of proposed filtration plant and pipeline sites.

Current plans are that the project will provide Regina with 4,000,000 gallons of water daily until 1960, said Mr. Shattuck, with present sources supplying the remainder of the demand. Supply will be stepped up to 6,000,000 gallons per day until 1970, with current sources satisfying peak demands, and after 1970 the entire Regina supply will come from the Saskatchewan river.

Estimating daily water demands of Regina cited by Mr. Shattuck were 7,160,000 in 1960, 10,420,000 in 1980 and 14,800,000 in 2000. Average daily demand in 1949 was 5,495,000.

Dr. McCusker described an assured water supply as "vital" to Regina. He said he has pressed the federal government to undertake construction of the portion of the project from the river to Buffalo Pound Lake, with the city and two senior governments responsible for the remainder.

The financial difficulties involved in the project were mentioned by Mayor Menzies. He pointed out that a joint city-provincial brief was expected to be forwarded to the federal government in the near future.

Saskatchewan

D. W. Houston, M.E.I.C.
Secretary-Treasurer

Saskatoon Section

W. R. Staples, M.E.I.C.
Secretary

On Thursday, January 19, the Saskatoon section held a dinner meeting in the Blue Room of the Elite Cafe. Forty-five members were in attendance.

Dr. H. G. Dion of the Soils Department of the College of Agriculture gave an illustrated talk on "Impressions of Bolivia". He had spent several months in Bolivia conducting a survey of the agricultural possibilities of the country with particular reference to the improvement of certain native crops. His talk, although it had an agricultural background, dealt with the people, living conditions, architecture, and engineering. Bolivia has a climate very similar to the prairies but due to the mountainous terrain cut by deep valleys, the great altitude, and frosts in the middle of the growing season, their agricultural problems are very different. Much improvement in the living conditions is greatly hindered by the widespread illiteracy. Government is poor and continually changing with numerous revolutions.

Dr. Dion's talk was very much enjoyed by all those present and he was thanked on behalf of the members by A. H. Douglas.

Toronto

G. H. Rogers, M.E.I.C.
Secretary-Treasurer

On Thursday, December 1, 1949, the Toronto Branch was favoured by a very interesting address by Joseph M. Breen, president and general manager of the Canada Cement Company, who spoke on **This Business of Engineering.** The audience of about 175 listened with rapt attention as Mr. Breen drew from his wealth of experience in the fields of engineering and business to present recommendations and predictions regarding the best courses of action for young engineers and the possibilities for the engineer in the future.

Mr. Breen's paper was divided into three parts. In the first he presented his own thoughts on the subject. In the second he compared other peoples' ideas with his own, and in the final part he submitted his analysis and predictions regarding the problems which lie ahead for engineers.

In his discussion of the subject matter Mr. Breen dealt at considerable length with the problems of engineers in industry and particularly those problems in labour-management relations which are frequently the responsibility of the engineer as the representative of management. His suggestions for the successful approach to such problems should prove of value to all who had an opportunity to hear him.

In summing up his own thought he listed the following points:

Engineering is the best possible preliminary training for general use. The opportunities for engineers are increasing rapidly. The rewards, while not huge, are fairly satisfactory and our status is improving. We may be proud to be engineers. Our service to the community and to the country is second to none.

In his conclusion Mr. Breen made a comparison of the past century which has been an era of material development due largely to engineers, and the coming century, which he predicts will be one of social development requiring men with the qualifications of engineers if it is to come about.

At the conclusion of the paper there was considerable discussion after which Mr. Edgar Cross moved a vote of thanks to Mr. Breen.

Vancouver

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

Stuart S. Lefeaux
Branch News Editor

The January meeting of the Vancouver Branch was held in the Medical

Dental Auditorium on Wednesday, January 18. Dr. R. H. Wright of the B.C. Research Council addressed the branch on **By-Products Derived from Coal.**

Dr. Wright graduated from University of British Columbia in 1928 and received his masters degree and doctorate from McGill University in 1930 and 1931. After fifteen years on the staff of the University of New Brunswick Dr. Wright resigned to become head of the Chemical Division of the B.C. Research Council.

Dr. Wright opened his address with the statement that organic chemistry is a stepchild of engineering. The production of iron and steel, with the aid of coal, resulted in coal gas, coal tar and ammonium sulphate as by-products in coke production for blast furnace operations in the 18th and 19th centuries. The vast amount of coal tar produced led to experiments to find uses for the by-product.

The distillation of coal tar produces 25 or 30 primary products including benzene, pyridine, toluene, napthalene, phenol and anthracene. There are also 250 or 500 intermediate products of importance such as nitro benzene.

The development of dyes, drugs and plastics, etc. from coal tar intermediates has opened up another tremendous field for the organic chemist. In summary Dr. Wright listed the products and by-products from coal: 1. heat and power, 2. iron and steel, 3. gas, 4. building products, 5. oils, 6. smoke, 7. ashes, 8. chemicals — dyes, drugs, antiseptics, explosives, plastics, perfume, flavours, photo developers, etc.

Hugh Libbey, M.E.I.C., thanked Dr. Wright for his most interesting address and assured him that the branch members would now have a much greater respect for the lowly commodity made famous by John L. Lewis.

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Student Section

The high spot in the fall term was the visit to the campus of the national president of the Institute, Mr. J. E. Armstrong, and Dr. Austin Wright, general secretary. Both men delivered very interesting talks to engineering students during their visit. Mr. Armstrong gave an extremely pertinent speech on the professional obligations of the young engineer, and Dr. Wright spoke on the functions and benefits of the E.I.C. After the addresses, visitors and the campus executive attended an informal luncheon at the Faculty Club.

Two other speakers were brought to the campus during the fall term: H. N. McPherson, western vice-president, and W. N. Kelly, councillor for the Vancouver Branch. Both spoke on the various services, advantages and purposes of the Institute.

In addition to the different speakers, regular showings of technical and educational films were held in the new Engineering Building. Five films were shown and all were well attended.

Early in the term a successful membership drive resulted in the enrollment of over 175 new student members. As a result, increased interest and enthusiasm in all E.I.C. undertakings was evidenced.

Victoria Branch

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

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

The annual meeting of the Victoria Branch of the Engineering Institute of Canada was held at Prince Robert House on January 20, 1950. In the absence of the retiring chairman, R. Bowering, Mr. H. F. Bourne, the chairman-elect, presided.

Following the business meeting, the speaker for the evening, Dr. F. W. Gray, was introduced by the chairman. At the International Labour Office Conference held last September in Geneva, Switzerland Dr. Gray represented the employers of coal miners in Canada and he chose as his subject the proceedings of this conference.

Known as the Tripartite Conference, delegates representing government, employers, and workers groups met to "Draft a code of safety regulations" governing underground work in coal mines. A total of 15 countries were represented including Belgium, Canada, Chili, China, Czechoslovakia, France, India, Italy, Mexico, Netherlands, Norway, Poland, Turkey, United Kingdom, and the U.S.A.

Mr. A. M. Byran, chief inspector of mines for the United Kingdom, was elected chairman.

The discussions were limited to underground conditions but the delegates had difficulty at times in distinguishing between "underground" and "surface" operations.

From a standpoint of production per capita, Canada with 1.3 tons was far behind either the U.S.A. with 5 tons or the United Kingdom with 4. However, fatality rates are much lower in Britain than either Canada or the United States.

Dr. Gray stated that the hazards of coal mining are relative to the physical conditions of depth, seam inclinations and gaseous emissions. With safety regulations varying not only from country to country but in America from state to state the task of revision was a difficult one.

The speaker pointed out that while Britain, France and the Low Countries have one single national mining authority the Canadian and American control is decentralized through the provinces and states. The C.M.R. Acts of British Columbia, Alberta, Saskatchewan, New Brunswick and Nova Scotia all stem from the British act and only differ in details.

With all this varying legislation to study the main object of the I.L.O. was to design a code as a guide to future legislation. No binding documents were signed at the conference and the ratification by the delegates placed no obligation on any one. It is hoped, however, that the model regulations drawn up will "be of service to all who are working to reduce the heavy toll of accidents in the coal mines of the world."

One of the main problems discussed was electricity in coal mining which was introduced less than 50 years ago. In general, national practice varies between the extended use of electricity in the United States to the conservative attitude of the United Kingdom and the middle ground taken in Canada.

Again, in the problem of haulage, Britain uses only the Diesel locomotive while in the United States electric-trolley locomotive haulage is used on a large scale.

Finally the problem of dust control was discussed in the reduction of silicosis. This is so important that the chairman proposed a dust conference to deal with this problem alone.

On his return from Geneva, Dr. Gray visited England where complete ownership of coal resources in Britain by the Crown was secured early in 1940. To a visitor the most noticeable consequence of nationalization is open cut or strip mining of coal operating on a gigantic scale. These operations which are carried on 24 hours a day, 7 days a week are affecting large areas. The top soil is carefully preserved and replaced after the operations with many stripped areas now supporting farm crops. The coal recovered from the shallow seams, is in most cases loaded into trucks and taken directly to the consumer.

Other developments include the use of aerial ropeways to transport coal to central by-product coke ovens plants from which the cities are being supplied through long pipe lines with coal gas.

Following an interesting question period a vote of thanks was moved by Dr. Walker, and was heartily endorsed by all.

Winnipeg

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

Electrical Section

J. C. Pratt, M.E.I.C.
Secretary

G. A. Muir, special services engineer for the Manitoba Telephone System, addressed the Engineering Institute's Electrical Section in Winnipeg, on December 15th. His subject was **Inductive Co-ordination of Telephone Lines.**

G. A. Muir

The address covered the inductive problems arising from the joint use of right of way and poles with power systems together with steps taken to eliminate the difficulties arising from the close proximity of circuits. A working model simulating power and telephone circuits was used to illustrate the coupling between circuits.

A. M. Tallman, chief engineer for Pioneer Electric Ltd., recently addressed the Electrical Section of the Winnipeg Branch. His subject was **Transformer Design.**

A typical design problem was selected and carried through step by step to completion, with numerous charts to illustrate the various phases of design.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

February 20th, 1950

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

BUTLER—WILLIAM TWEED, of Sault Ste. Marie, Ont. Born at Calgary, Alta., Aug. 1, 1916. Educ.: B.Eng., (Chem.), McGill, 1940 with Howard Smith Paper Mills, Beauharnois, as follows: 1939-41, junior chemist, 1946, mill chemist i/c technical problems and control 1947 to date, supt. of control, i/c technical problems and process control, Abitibi Power & Paper Co., Ltd., Sault Ste. Marie, Ont.

References: R. W. Emery, T. F. Rahilly, G. B. Dewart, K. G. Ross, G. W. Holder, J. A. T. Butler.

CAIRNS—WILLIAM ALLAN, of Calgary, Alta. Born at Islay, Alta., July 23, 1914. Educ.: B.Sc., (Chem. Engrg.), Alberta, 1936; R.P.E., Alberta; with Consolidated Mining & Smelting Co. of Canada, as follows: 1937-40, assayer, 1940-41, research engr., 1941-45, chemical supvr., i/c of plant research and chemical control, recovery divn.; Alberta Nitrogen Products Ltd., Calgary (C.M. & S.), as follows: 1945-46, asst. supt., nitrate group, 1946-47, supt. of develop't., 1947-48, supt. nitrate group, 1949 to date, asst. general supt., Calgary, Alta.

References: R. S. Woodford, C. E. McNevin, R. F. Bailey, H. Randle, D. D. Morris, A. H. W. Busby.

CULLEN—FRANK MEREDITH, of Montreal, Que. Born at Toronto, Ont., Jan. 5, 1922. Educ.: B.A.Sc. (Ceramic Engrg.), Toronto, 1948; 1947 (summer), student engr., National Sewer Pipe Co.; 1948-49, engr., Canadian Allis Chalmers Co.; at present inspection engr., Canadian Underwriters Association, Montreal, Que.

References: M. W. Huggins, G. R. Lord, T. R. Loudon, W. L. Sagar, W. S. Wilson.

HENDERSON—HEDLEY V., of Montreal, Que. Born at West Bathurst, N.B., Sept. 6, 1922. Educ.: B.Sc., (Mech.), Queen's, 1948; 1939-42, meter repair and steam, clerical work, helper on high pressure boiler, genl. machine shop and mill, Bathurst Power & Paper Co., Ltd., Bathurst, N.B.; 1942-44, genl. machine shop, aircraft production, Otaco Ltd., Orillia, Ont.; 1947, genl. plant mtce., Aluminum Co. of Canada, Kingston, Ont.; Apr. 1948 to date, plant layout and develp't., telephone contract divn., Northern Electric Co., Ltd., Montreal, Que.

References: L. F. Grant, M. G. Saunders, A. Jackson, J. S. Campbell, H. G. Conn.

JOY—DOUGLAS GRAHAME, of Winnipeg, Man. Born at Barrie, Ont., Feb. 16, 1887. Educ.: S.P.S., Univ. of Toronto, 1906-1910; R.P.E., Manitoba; 1910-1921, H.E.P.C. of Ontario; 1922-28, engrg, contracting for self; with Department of Transport, as follows: 1930-49, Civil Aviation Branch, at present, District Controller of Air Services, Civil Aviation, Radio, Meteorological, and Airways Engrg. Divisions, Winnipeg, Man.

References: F. V. Seibert, T. R. Loudon, T. H. Hogg, D. Forgan, E. P. Muntz, J. A. Wilson.

KEARY—GEORGE DOUGLAS, of Guelph, Ont. Born at Toronto, Ont., June 16, 1922. Educ.: B.A.Sc., (Civil), Toronto, 1945; R.P.E., Ontario; 1942 and 1943, (summers), H.E.P.C. of Ontario; with G. L. Wallace, consultg. engr., Toronto, as follows: 1944, (summer), 1945-46, structl. designer; 1946-49, structl. designer, Wagner & Oliver, consultg. engrs., Hamilton; 1949 to date, sales engr., Armco Drainage & Metal Products of Canada, Ltd., Guelph, Ont.

References: N. Wagner, G. R. Chalmers, C. R. Young, C. F. Morrison, A. E. Berry.

KELLY—THOMAS MARTIN, of Toronto, Ont. Born at Ballina, Eire, October 21, 1919. Educ.: B.Eng., National Univ. of Ireland, Dublin, 1942; R.P.E., Ontario; 1942-44, asst. to town engr., supervision of road constrn., road mtce., costs in connection with same, Town of Ballina, Eire; 1944-47, jr. engr., extensive land surveys of potential sites for opencast mining and location, plotting of drill holes for same, 2 yrs. mainly engaged on opencast coal prodn., surveys and measurements of large scale excavations, etc., Ministry of Fuel and Power, Great Britain; 1947-48, engr., first 6 mos. consisted supervision and layout of concrete quay at Newcastle-on-Tyne, later at Port Talbot, Wales, setting out and supervision of roads, sewers and temporary bldgs. in connection with a 40 million dollar steel mill, Geo. Wimpey & Co., Ltd., London, Eng. engineers; at present, design engr., engaged on design of hydro projects and estimating costs, H.E.P. of Ontario, Toronto, Ont.

References: E. B. Hubbard, A. Malcolm, A. Grant, F. M. Near, E. G. Tallman.

LANE—LENOX THOMPSON, of Sudbury, Ont. Born at Sudbury, Ont., April 20, 1918. Educ.: B.Sc., (Civil), Queen's, 1943; R.P.E., Ontario; 1936-39, O.L.S. apprent., instruman., dftsman. field party chief, legal and engrg. surveys, F. C. Lane, P. E., Ontario Land Surveyor, Sudbury; 1942, (5 mos.), jr. dftsman., genl. engrg. office, International Nickel Co., Copper Cliff, Ont.; 1943-45, Lieut., R.C.E.; 1946 to date, partner, Lane & Lane, consultg. engrs. and land surveyors, Sudbury, Ont.

References: M. D. Stewart, F. A. Orange, E. R. Eaton, C. O. Maddock, P. G. Benjafield.

LOWLES—GEORGES ALBERT, of Toronto, Ont. Born at Montreal, Que., Oct. 13, 1913. Educ.: B.Eng., (Chem.), McGill, 1937; R.P.E., Ontario; 1937-41, with Canadian Industries Limited, as follows: chemist, Windsor Works; technical sales, Toronto; works supervisor, smokeless power plant; 1941-43, chemical engr., Bahrein Petroleum Corporation; 1943-44, tech. sales, Canadian Resins and Chemicals, Ltd.; 1944-47, asst. to dir. of res. & develop't., Dominion Rubber Co., Ltd.; 1947 to date, chemical engr., International Nickel Co. of Canada Limited, Toronto, Ont.

References: G. Cape, R. F. Shaw, J. Benoit, R. B. Wotherspoon.

NEILL—CHARLES ROBERT, of Montreal, Que. Born at Kilmalcolm, Scotland, June 9, 1926. Educ.: B.Sc. (Civil), Glasgow Univ., 1945; Student, I.C.E., London; 1945, Experimental Officer, Armament Design Dept., Ministry of Supply; 1946-48, engr., as an asst. under agreement in accordance with I.C.E. requirements, field and design office duties, Sir R. McAlpine & Sons (civil engrg. contractors); 1949 (4 mos.), engr. on constrn. of $3\frac{1}{2}$ miles deep tunnel sewers for City of Glasgow, surveying, lining and levelling of tunnelling operations, measurements of progress, etc., responsible for one section of contract, Kinnear, Moodie & Co., Glasgow; 1949 to date, job engr., construction of Mt. Royal H.S., responsible for laying out and levelling bldg., progressing measurements, estimating materials, costing, etc., Pentagon Construction Co., Montreal, Que.

References: C. H. Gordon, F. B. Rolph, H. R. Montgomery, E. H. Bateman (A.M., I.C.E.), S. W. Cox (M., I.C.E.), P. Murray (M., I.C.E.).

NEWMAN—RICHARD CARSON, of Hamilton, Ont. Born at Winnipeg, Man., Oct. 22, 1926. Educ.: B.Sc. (Elect.), Manitoba, 1948; 1943-4-5-6-7 (summers), groundsman, Manitoba Telephone System; journeyman's helper, Winnipeg Electric Co.; engrg. student, Ford Motor Co. of Canada, Windsor; 1948 to date, apprentice engr., Canadian Westinghouse Co., Ltd., Hamilton, Ont.

References: E. P. Fetherstonhaugh, C. P. Haltalin, A. E. Macdonald, L. M. Hovey, H. O. Peeling, A. A. Moline.

PRESCOTT—JOHN STANDISH, of New Westminster, B.C. Born at Alberni, B.C., October 20, 1916. Educ.: B.Sc., Oregon State College, 1942, R.P.E., British Columbia; 1942-46, Lieut. and finally Capt., R.C.E.; 1946, res. engr., Bloedel, Stewart & Welch Ltd.; 1947-49, forest engr., supt., forest and wild life management, Dept. Mines & Resources; 1949 to date, asst. field supt., Dominion Bridge Co., Ltd., Vancouver, B.C.

References: H. H. Minshall, W. O. Scott, J. E. Beamish, C. W. Buckle.

ROTHWELL—WILLIAM, of Valleyfield, Que. Born at Bradley Fold, Lancs., Eng., Sept. 1, 1911. Educ.: Higher National Diploma in Mech. Engr., 1933; B.Sc. (Eng.), London Univ., 1938 (External); A.M., I.M.E., London; D. Constantine & Sons Ltd., Bolton, Lancs., Eng., 1927-33 apprent., genl. engrg., engrg. dept. 1933-36, fitter; 1936-39, asst. to chief engr., Vantona Textiles Ltd., Manchester, Eng.; 1939-41, asst. to chief engr., Ferguson Bros., Ltd., Carlisle; 1941-42, chief engr., Edward Ripley & Son Ltd., Bradford, Eng.; 1942-45, Capt. R.E.M.E., British Army; 1945-47, chief engr., Beida Dyers, S.A.E., Alexandria, Egypt; 1947-49, works engr., Ferguson Bros., Ltd., Carlisle; at present asst. mech. supt., Montreal Cotton Ltd., Valleyfield, Que.

References: F. Myers (A.M., I.M.E.), A. Ridings (M., I.M.E.), L. J. Service (A.M., I.M.E.), R. Doyle (A.M., I.M.E.), F. Gardner (M., I.M.E.), G. H. Clare (A.M., I.M.E.).

SANGWINE—ELBERT HAROLD, of Arvida, Que. Born at Harris, Sask., Feb. 5, 1915. Educ.: B.Sc. (Chem. Engrg.), Saskatchewan, 1938; M., Chemical Institute of Canada; with Aluminum Co. of Canada, as follows: 1938-40, tech. asst., 1941-42, supervisor, 1943-46, asst. supt., 1947-49, supt., and at present, supt. of potrooms, the dept. carries on the electrolytic reduction of aluminum oxide to metallic aluminum — cell in which the reduction takes place is commonly called a pot, Arvida Works, Arvida, Que.

References: B. E. Bauman, J. F. Braun, F. T. Boutilier, F. E. Hogg, B. L. Davis.

STAIRS—COLIN MACKENZIE, of Peterborough, Ont. Born at Montreal, Que., March 26, 1925. Educ.: B.Eng. (Engrg. Physics), McGill, 1948; with Canadian General Electric, Peterborough, Ont., as follows: 1948-49, test course, 1949 to date, central station engr.

References: J. L. McKeever, G. R. Langley, A. R. T. Hailey, M. M. Uloth, H. R. Sills.

STEINBOCK—SAMUEL ROBERT, of Sarnia, Ont. Born at Jaroslaw, Jan. 27, 1920. Educ.: B.Sc. (Eng.), Univ. of London, 1942; Associate, City & Guilds Institute, London; A.M., I.E.E., London; Graduate, I.M.E., London; R.P.E., Ontario; with Brush Electrical Engrg. Co., Ltd., Loughborough, Eng., 1942-44, graduate apprent., 1944-45, design engr.; 1945-47, asst. to prod. mgr., Olympia Oil Mills, Selby, Eng.; 1948 to date, utilities engr., engrg. and develop't. division, Imperial Oil Limited, Sarnia, Ont.

References: D. S. Simmons, A. Russell, F. F. Dyer, J. W. Graeb, C. P. Sturdee, J. Guthrie.

STEPHENS—WALTER RANDOLPH, of Sarnia, Ont. Born at Toronto, Ont., Dec. 18, 1925. Educ.: B.A.Sc. (Elect.), 1948; 1945 (summer), generating station layouts, H.E.P.C. of Ontario; 1946 (summer), design and layout of heating, lighting, plumbing and ventilating systems, Thomas & Wardell, P.E.; 1948 (4 mos.), experimental work on radio-frequency sealing press, genl. lab work in electronics lab., R. H. Nichols, Electronic Devices; at present, asst. plant engr., genl. industrial engrg., Electric Auto-Lite Co., Ltd., Sarnia, Ont.

References: W. J. T. Wright, T. R. Loudon.

FOR TRANSFER FROM THE CLASS OF JUNIOR

ARMBRUSTER—ERHART, of Shawinigan Falls, Que. Born at Earl Grey, Sask., on Dec. 28, 1918 Educ.: B.Sc. (Civil)) Sask. 1941; 1939-40, instru'man on airports, Dept. of Transport; 1941-43, aircraft inspector, Dept. of Nat. Defence; 1943-46, Officer, R.C.E.; with Fraser-Brace Engineering Co. Ltd., as follows: 1946-47, field engr. on construction of townsite for Chalk River project, Ont.; 1947-48, field engr., Rod Mill & Caustic Plant, Arvida, Que.; 1948 to date, field engr., constrn. of bldgs., equipt. C.I.L., Shawinigan Falls (St. 1941. Jr. 1946).

References: C. R. Forsberg, A. H. Heatley, A. T. E. Smith, D. A. Killam, N. R. Fasken.

AULD—FRANK MANTLE of Winnipeg. Born at Regina on Jan. 3, 1918. Educ.: B.Sc. (Mech.) Univ. of Sask., 1942; 1942-43, tool designer and processor, Regina Industries Ltd.; 1943-46, Captain, R.C.E.M.E.; with Ford Motor Co. of Canada as follows: 1946-48, service organizer, Winnipeg division; at present, sales representative (St. 1942. Jr. 1944).

References: G. W. Parkinson, N. B. Hutcheon, R. A. Spencer, R. B. McKenzie, S. Young.

BACON—ROBERT HENRY of Port Dalhousie, Ont. Born at Moose Jaw, Sask., on May 5, 1922. Educ.: B.Sc. (Mech.) Univ. of Sask., 1947; R.P.E. Ont. with Foster Wheeler Ltd., as follows: 1946 (4 mos.) stoker fitter; 1947 (4 mos.) stoker dftsman at plant; 1947-49, erection and service engr. i/c installation work of five boilers in the field; installation completed in Peru, S.A.; past two years worked away from plant i/c particular jobs, consisting supervision of crew, sub-contractors, payrolls, purchasing (St. 1947. Jr. 1949).

References: I. M. Fraser, N. Hutcheon, W. Brownlee, K. W. Lorimer, A. D. Smith, J. E. Neilson.

BARCHYN—DONALD EDWARD of Montreal. Born at Edmonton on Jan. 3, 1921. Educ.: B.Sc. (Elect.) Alberta, 1941; with Canadian General Elec. Co. Ltd., as follows: 1941-42, test course; 1943, induction motors engrg. dept.; 1943, plant engrg. dept.; 1943-45, apparatus service engr. Toronto office; 1945-47, Halifax district; 1947-49, apparatus service engr. Montreal (St. 1942. Jr. 1946).

References: G. H. Gillett, A. M. Thompson, R. E. Edson, P. E. Rose, H. H. Creighton.

BROWNIE—JACK WILKINSON of Brantford, Ont. Born at Winnipeg on Feb. 18, 1926. Educ.: B.Sc. (Elect.) Univ. of Man. 1941; summers, 1938 & 39, rodman, instru'man, Manitoba Good Roads Board; summer 1940, elect. dftsman, Winnipeg Elec. Co.; 1941-45, shift foreman to group supt. D.I.L. Bouchard Works; 1945-47, general foreman of automatic operations, Continental Can. Co. Ltd., St. Laurent Works; with Massey Harris Co. Ltd., as follows: 1947-project engrl; 1947-48, asst. mech. supt.; 1948 to date, production control supt. (St. 1939. Jr. 1944).

References: S. M. Dunn, E. L. Johnson, M. D. Bleaken.

BUCHANAN—JAMES CHARLES, of Wentworth, Ont. Born at Saskatoon on Sept. 6, 1918. Educ.: B.Sc. (Mech.) Univ. of Sask. 1942; R.P.E Ont. with Cdn. Westinghouse Co. as follows: 1942-44, training course; 1944, tool engr., designing, dftg. jigs, fixtures for torpedo engines and air brake equipt.; 1944-45, R.C.E. M.E., Barriefield, Ont. 1945-49, Cdn. Westinghouse, experienc machine shop production, methods, changes in tool and product design; heat treating; inspection, testing metals, materials, arc and oxy-acetylene welding; foundry problems in cast iron, brass, malleable iron etc. testing design air brake equipt. and tools (St. 1941. Jr. 1944).

References: H. A. Cooch, E. M. Coles, G. A. Moline, L. C. Sentance, H. Thomasson, I. M. Fraser.

CHANDLER—RALPH WRIGHT, of Toronto. Born at Calgary, Alta., on Feb. 16, 1916. Educ.: B.Sc. (Civil), Queen's Univer. 1941; R.P.E. Ont.; with Ont. Hydro-Electric Power Commission as follows: 1941-43, Jr. engr.; 1943-45, design engr., estimating, concrete, steel design, investigations; 1946-47, asst. section head, supervising civil design for Stewartville Development; 1948-49, asst. project engr. on Des Joachims Dev'lpt., hydraulic studies, civil engr. on structures, generation dept. Toronto (St. 1940. Jr. 1943).

References: O. Holden, R. H. Findlay, E. A. Sudden, M. Huggins, J. R. Montague, J. J. Traill.

CHOQUET—GUY, of Montreal. Born at Montreal on Dec. 4, 1917. Educ.: B.A.Sc. (Civil), Ecole Poly., 1941; summers, 1939-40, instru'man on road constrn. contract; 1941-42, res. engr. contract Sherbrooke-Magog, i/c surveying party, constrn. paving, reports, estimates, Dept. of Roads, Que.; 1942- to date, engr., River St. Lawrence Ship Channel, Dept. of Transport; carrying out, supervising work mtce. improvement of ship channel between Mtl. and Father Point and the Saguenay River as far as Chicoutimi, compiling plans, computing surveys, bringing plans, charts up to date, preparing projects, etc., Mtl. (St.1939. Jr.1946).

References: F. S. Jones, P. L. Kurhring, H. Gaudefroy, A. Gratton, R. Boucher.

DAWSON—GEORGE ERNEST, of Toronto. Born at Medicine Hat, Alta., on April 15, 1912. Educ.: B.Sc. (Mech.), Univ. of Sask. 1941 with Dowty Equipment (Canada) Ltd., as follows: 1943-44, project designer; 1944-46, develop't. engr., i/c experimental and development work on aircraft undercarriages, hydraulics; 1947-49, project engr.; at present, dftsman, Massey Harris, Toronto. (St.1941. Jr.1946).

References: R. A. Spencer, I. M. Fraser, N. B. Hutcheon, J. H. Parkin.

FORRESTER—ROBERT ANDREW, of Mimico, Ont. Born at Toronto, July 4, 1915. Educ.: B.A.Sc. (Civil), Toronto, 1940; R.P.E. Ont.; summers, 1937 and 38, asst. engrg. office Matachewam Consolidated Gold Mines, Ont. 1939 Toronto Transportation Comm.; 1940, (May-Oct.) instru'man, asst. engr. on construction of Jarvis Bombing and Gunnery School, R.C.A.F. Dept. of National Defence; 1940-41, aircraft inspector at Malton, British Air Commission; 1941-46, Platoon Commander, R.C.E., overseas; 1946-49, Jr. engr., design, supervn., generation dept., Hydro Electric Power Comm.; at present, designing engr. and supervisor, generation dept. (St.1940, Jr.1946).

References: J. J. Traill, W. M. Hogg, O. E. Johnston, W. M. Walkinshaw, D. E. Kennedy, S. W. B. Black.

HAACKE—EWART M., of Toronto. Born at Toronto, on Oct. 12, 1920. Educ. B.Sc. (Elec.), Queen's, 1942; R.P.E. Ont. 1940, summer, electrician and junior elect. engr. Noranda Mines Ltd.; 1941-42, summer, instructing radio mechanics in basic radio theory for R.C.A.F., Queen's Univ.; 1941-42, part-time operating small commercial radio station CFRC, operating public address system; 1942 (1 mo.) elec. engr. Bell Telephone Co., Toronto; 1942, (1 mo.) courses and studies in administration and radar for R.C.A.F.; 1942 (Sept.-Jan.) 1944, Radar Officer and Specialist radio officer for R.C.A.F. for east coast of Canada on operations; Aug. 1944-Oct. 1944, Officer i/c electronic training at Radar School, Clinton, Ont.; 1944-45, radar technician, course in navigation, incl. eng. subjects such as dftg. map work tech. equip., also flying course in Tiger Moths; 1945, associate and technical editor, Electrical News and Engineering; Jan. 1946 to date, editor, Elec. News and Engrg. Hugh C. MacLean Publcaitions Ltd. (St.1941. Jr.1945).

References: D. G. Geiger, P. J. Croft, O. W. Titus, D. S. Young, M. W. Huggins, W. H. Paterson.

HAHN—HERMAN GUSTAV, of Montreal. Born at Belle Plaine, Sask. on July 11, 1916. Educ.: B.A. (geology), 1939, B.Sc. (Mining Engrg.) 1941, Queen's Univ.; R.P.E. Que.; summers, 1938, and 39, miners helper, Sheep Creek Gold Mines, B.C.; 1940, summer, miners helper, Buffalo Ankerite Gold Mines, South Porcupine, Ont.; 1941-43, chemist, D.I.L., Nobel, Ont.; with Cdn. Vickers Ltd., Mtl., as follows: 1944-46, test engr. i/c industrial radiography and mech. testing laboratory, 1947-49, welding engr. i/c welding procedure, radiography, heat treating, engrg. div. (Jr. 1944).

References: R. K. Thoman, S. Fromson, P. W. Gooch, R. C. Flitton, P. Stokes, G. Agar, T. R. McLagan.

HALMAN—WILLIAM MORRIS, of Dorval, Que. Born at Montreal on July 19, 1917. Educ.: B.Eng. (Mech.) McGill, 1941; R.P.E. Que. 1941-45, Lieut. E. RCNVR. (engine room watch keeping certificate obtained on cruiser, chief engr. on minesweeper and frigate); with Westeel Products Ltd., Mtl., as follows: 1945-47, asst. supt.; 1947 to date, chief engr. (St. 1941, Jr. 1946).

References: J. H. Holden, S. A. Charters, T. A. Harvie, D. L. Lindsay, W. C. Viner.

KEYFITZ—IRVING, of Toronto. Born at Montreal on Feb. 19, 1919. Educ.: B.Eng. (Mech.), McGill Univ., 1941; R.P.E. Ont.; 1940, summer, design dftsman, Cdn. Vickers Ltd., Aircraft Division; 1941-42, project engr. C.P.R. Air Service; 1942-44, asst. to chief engr. and sales mgr. Cdn Propellers Ltd.; 1944-45, design engr., Noorduyn Aviation Ltd.; at present, group leader (senior stress analyst), A. V. Roe Canada Ltd. (St. 1940, Jr. 1944).

References: C. M. McKergow, W. Czerwinski, W. I. Phemister, B. Roden, H. Oatway.

McDOWELL—CREIGHTON JOSEPH, of Montreal. Born at Windsor, Ont. on June 26, 1916. Educ.: B.Sc. (Mech.) Queen's Univ., 1941; summers, surveyor asst.; 1941, clerk and boiler fireman, Can. Industries Ltd., Windsor, Ont.; 1941-42, demonstrator, mech. engrg. dept., Queen's Univ., 1942-45, process engr. i/c tool and process design on ammunition tools, Defense Industries Ltd., Verdun; 1945-46, engr. i/c design, fire extinguishing equipt. for aircraft, various other products and equipt. shop layout and processing, Dominion Merchants Co. Ltd., Mtl.; 1946 to date, process engr., design of operations on manufactured parts, plant layout, Dominion Engineering Work Ltd. (St. 1941, Jr. 1946).

References: D. S. Ellis, A. Jackson, J. G. Notman, R. E. Smallwood, R. C. Purser.

MacKAY—WILLIAM RONALD, of Three Rivers, Que. Born at Pictou, N.S. on March 1, 1919. Educ.: B.Eng. (Elect.) McGill, 1941; 1938 (4 mos.) instru'man, Geological Survey, Nfld. Gov't. Dept. of Mines; 1941 (6 mos.) dftsman, design and layout work, Cdn. Comstock Co., Mtl.; 1941-43, field engr. elect. constrn., Arvida, and Shipshaw, Cdn. Comstock; 1944-49, engr. distribution engr's office, design, estimating, transmission lines, substations, Shawinigan Water & Power Co., Three Rivers (St. 1940, Jr. 1944).

References: A. W. Peters, A. D. Ross, A. C. Abbott, J. H. Fregeau, H. J. Walker, N. Groy, S. E. Williams.

McLAUGHLIN—GEORGE FREDERICK, of Perth, N.B. Born at Perth on Nov. 22, 1919. Educ.: B.Sc. (Civil) Univ. of N.B., 1941; R.P.E. N.B. 1936-41, general engr., highways, Armstrong Bros.; 1941, aircraft inspector, British Aircraft; 1941-46, Officer, R.C.E.; 1946, built and managed a small hotel; 1946-49, consulting engr., i/c construction, preparing estimates for buildings and highways, Armstrong Bros. (St. 1941, Jr. 1946).

References: E. O. Turner, B. H. Hagerman, W. J. Lawson, C. A. MacVey, G. W. Titus.

McLEAN—CLARENCE EDWARD, of Montreal. Born at Edmonton on Jan. 14, 1908. Educ. B.Sc. (Civil), Alberta, 1942; summers, 1940-41, engr. Sherritt Gordon Mines; 1942 (6 mos.) concrete inspector Aluminum Co. of Canada; 1942-43, asst. resident engr. Aluminum Co. of Canada; 1943-44, foreman, D.I.L.; 1944-46, asst. plant engr. Fry Cadbury's Ltd.; 1946-47, resident engr., Quebec North Shore Paper Co.; 1947-49, constrn. engr. Anglin Norcross Ltd.; at present, asst. town mgr., Town of Hampstead. (St. 1941, Jr. 1946).

References C. V. Vessot, W. Scott, G. A. Campbell, I. F. Morrison, M. S. Mitchell.

McROSTIE—GORDON CALLANDER, of Ottawa. Born at Ste. Anne de Bellevue, Que. on July 13, 1922. Educ.: B.A.Sc. (Civil) Univ. of Toronto, 1944; R.P.E. Ont. with N. B. MacRostie, Consulting Firm as follows: summers, 1936-44, dftsman, instru'man, field representative; 1944-46, jr. designer, resident engr. under direction; 1946-48, design engr., resident engr.; 1949 to date, directing work of 3 engrs. and field parties consulting practice on own responsibility with firm N. B. MacRostie. (St. 1942, Jr. 1946).

References: J. C. Elliott, J. H. Irvine, S. Hardcastel, R. F. Legget, D. E. Kennedy, N. B. MacRostie, J. W. Lucas, J. L. Shearer, G. R. Turner, C. G. Taylor, C. G. Biesenthal.

MINTY—GORDON ROBERT, of Verdun, Que. Born at Forward, Sask., on Jan. 23, 1918. Educ.: B.Sc. (Mech.) Univ. of Sask. 1941; R.P.E. Que.; with RCA Victor Co. as follows: 1941 (5 mos.) mechanical inspector, machine shop; 1941-43, dftsman; 1943-44, Engineer Officer, i/c machinery aboard H.M.C.S. "Dauphin" and H.M.C.S. "Long Branch", R.C.N.V.R.; 1944-45, with RCA Victor again, drawing checker, responsible for correctness of all production drawings released to manufacturing dept.; 1945 to present, mech. engr., layout, design, electronic apparatus, release and follow-up shop orders, liaison between manuftg. dept. and engr. dept. (St. 1941. Jr. 1946).

References: I. M. Fraser, R. A. Spencer, N. B. Hutcheon, K. R. Swinton.

MORISON—GEORGE ALFRED, of Montreal, Que. Born at Crandall, Man., on Mar. 1, 1918; Educ.: B.Sc. (Civil) Univ. of Manitoba 1943; R.P.E. Que.; summer 1942, instru'man and bldg. inspector, W. & B. Section, R.C.A.F.; 1943-45, Engr. Officer, R.C.E.; 1945-46, Lieut., Cdn. Inf. Corps; summer 1946, building inspector, Cdn. Pacific Railway, chief engrs. office; 1946-48, dftsman; 1948 to date, asst. engr. C.P.R. chief engr's office (St. 1942. Jr. 1945).

References: J. G. Sutherland, J. M. MacBride, G. E. Shaw, L. H. Laffoley, C. Neufeld, T. J. Boyle, E. R. Smallhorn.

NORTON—HOWARD WILLIAM, of Montreal. Born at Montreal on Jan. 9, 1919. Educ.: B.Eng. (Mech.) McGill, 1942; R.P.E. Que.; 1942-44, Technical Adjutant and Officer Commanding servicing squadron, R.C.E.F.; 1944-45, engr. four No. 3 training command hdqts, R.C.A.F.; 1946-49, engr., diesel division, Dominion Engrg. Works, designing, testing, calculating, installn. on customer's property, Lachine, Que. (St. 1942. Jr. 1944).

References: H. S. Van Patter, H. Ulmann, F. Williams, C. Craig, H. J. Chapman.

REMUS—FRANK RICHARD, of Paris, Ont. Born at Pembroke, Ont., on Sept. 21, 1918. Educ.: B.Sc. (Mech.), Queen's, 1941; R.P.E. Ont.; 1941, dftsman, Gerald Motors of Canada Ltd., Oshawa, Ont.; 1941-43, tool design, engrg. dept., Ottawa Car & Aircraft Ltd., Ottawa; with the R.C.E.M.E. as follows: 1944, engrg. training, Barriefield; 1945, Officer i/c "B" Vehicle School, Barriefield; 1945, Officer Commanding, Blackdown, England; 1945-46, Section Officer, TPS Workshop, Oldenburg, Germany; 1946-47, mech. engr., mtce. and constrn. work, Consolidated Paper Corp., Grand Mere, Que.; at present, production engr. i/c production and manufg. operations, J. D. Adams Ltd., Paris, Ont.—Road bldg., machinery. (St. 1941. Jr. 1946).

References: H. G. Conn, H. V. Jepsen, D. S. Ellis.

ROSSETTI—ANTHONY BRUCE, of Sydney, N.S. Born at Sydney on Dec. 13, 1918. Educ.: B.Eng. (Mech.) Nova Scotia Technical Col. 1942; with Defence Industries Ltd. as follows: 1942-43, tool design dftsman; 1943-44, process development eng., design, process development of small arms ammunition including operation of pilot plants, Verdun, Que.; 1944-47, mtce. scheduling engr., C.I.L., Shawinigan Falls, Que.; 1947-48, power engr. utilization, generation and distribution of power services; 1948-49, design engr. of surface and underground coal mining equipt., Dominion Coal Co. Ltd., Sydney, N.S.; at present on loan from Dominion Coal Co. Ltd., to Seaboard Power Corporation as resident engr. i/c of constrn of new steam generating station, Glace Bay, N.S. (St. 1941. Jr. 1946).

References: A. S. Holder, S. G. Naish, W. S. Wilson, J. A. Russell, M. L. Baker, O. N. Mann, N. A. Parlee.

STOLLERY—CHARLES A., of Calgary. Born at Edmonton on May 11, 1915. Educ.: B.Sc. (Civil) Alberta, 1941; R.P.E. Alta.; 1940-41, designing & field engr., city of Edmonton; 1941-42, Edmonton Power Plant; 1942-43, field engr. & designer, Aluminum Co. of Canada; 1943-45, Officer i/c hull repair work, Halifax Dockyard, R.C.N.; with Poole Construction Co. Ltd., as follows: 1945-46, engr. & field supt.; 1946-49, general mgr., Calgary. (St. 1941. Jr. 1945).

References: R. M. Hardy, J. F. Langston, I. F. Morrison, L. A. Thorssen, H. R. Younger, G. W. Webster, J. E. Poole.

TYERMAN—JOHN ALEXANDER, of Hamilton. Born at Prince Albert, Sask., on Feb. 24, 1920. Educ.: B.Sc. (mech.) Sask. 1942; R.P.E. Ont. with Cdn. Westinghouse Co. Ltd., as follows: 1942-44, apprentice course; 1944 to date, mech. engr., design of elect. apparatus with particular emphasis to the design of vertical water wheel generators (St. 1942. Jr. 1946).

References: A. A. Moline, L. C. Sentance, G. L. Vollmer, H. O. Peeling, I. M. Fraser.

WIGDOR—LEON, of Montreal. Born at Montreal on Dec. 25, 1919. Educ.: B.Eng. (Chem.) McGill, 1941; 1941-43, develop't chemist, D.I.L. Valleyfield, Que., and Winnipeg, control, research and development, acids, high explosives and raw materials; 1944-47, research chemical engr. i/c of synthetic resin develpt. paints, varnishes; 1947-48, chemical engr., yeast production and food products, Fred A. Lallemand Co. Ltd., Mtl.; 1948 to date, developt. engr., i/c brake lining testing and development asbestos products, Turner and Newall (Canada Ltd., Mtl.) St. 1941. Jr. 1946).

References: C. H. Jackson, S. M. Lyman, G. G. Singer, J. B. Phillips, A. Benjamen.

WILSON—RONALD S., of Longueuil, Que. Born at Edmonton, Alta., on May 6, 1920. Educ.: B.Eng. (Mech) Manitoba, 1943; R.P.E. Que.; summers, 1940, 41, surveying, C.N.R.; 1942, summer, factory experience, Cdn. Vickers; 1943-45, Engrg. Officer at Sea, R.C.N.V.R.; 1945-48, mech. engr., National Harbours Board, Mtl.; at present, mech. engr. i/c engrg. and sales, service, The Holden Co. Ltd. Mtl. (Jr. 1945).

References: H. Spark, J. M. Scott, C. McKergow, N. Watson, J. J. O'Neil.

FOR TRANSFER FROM THE CLASS OF STUDENT

McCUTCHEON—JOHN OLIVER, of Vancouver. Born at Vancouver on Oct. 16, 1920. Educ.: B.Eng. (Civil), McGill, 1949; R.P.E. Que.; 1941-42, Flying Instructor, R.C.A.F.; 1942-43, Ground Instructor, Theory of Flight, Aero-Engines, Navigation; 1947, summer, detailer, Dominion Bridge, Lachine; 1948, summer, designer, Plate and Boiler, Dom. Bridge; 1949 to date, Development and Promotion Engrg., H. R. MacMillan Export Co. Ltd., Vancouver (St. 1946).

References: R. E. Jamieson, A. M. Bain, A. E. Cameron, J. J. O'Neill, W. J. Dick, R. DeL. French.

Employment Service

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

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

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

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER required by large firm in Montreal. Preferably recent graduate willing to complete training period, position eventually will lead to sales. Apply to File No. 1348-V.

CHEMICAL ENGINEER required in Ontario. Some experience in industrial and control departments with somewhat a mechanical background desirable. Salary $300.00. Apply to File No. 1350-V.

CIVIL

CIVIL ENGINEER five to ten years experience in hydraulic testing to do turbine testing required by large public utility in the province of Quebec. Good future for the right man. Applicant should state age and experience. Salary open. Apply to File No. 1364-V.

ELECTRICAL

GRADUATE ELECTRICAL ENGINEER, required by firm in Montreal manufacturing electrical equipment. Applicant should have some experience in communication radio, telephone, etc. Salary open. Apply to File No. 1346-V.

ELECTRICAL ENGINEER with experience in the Public Utilities field, as engineer in the electric department of a public utility in a medium size Western Ontario city. Give details, reference and salary expected. Apply to File No. 1351-V.

ELECTRICAL ENGINEER required by textile firm located in Montreal. Excellent opportunity offered to the right man with ability. Salary open. Apply to File No. 1354-V.

ELECTRICAL DRAUGHTSMAN required in Montreal who is familiar with explosion proof installations. The work consists principally of wiring motors and lighting. Salary open. Apply to File No. 1363-V.

MECHANICAL

JUNIOR MECHANICAL ENGINEER required for training with large manufacturers of high quality fans. Suitable applicant would qualify for employment as technical sales engineer. State full details of training, etc. Apply to File No. 1349-V.

MECHANICAL ENGINEER required in Montreal with about five years experience in mechanical design. Work would involve all supervision in draughting office. Salary open. Apply to File No. 1355-V.

MECHANICAL ENGINEERS required in Ontario. The qualifications of the more senior of these positions are those of a person of considerable experience on machine design the special machines as found in the tool Engineering Department of the Automotive industry. The other positions require the qualifications of a body layout engineer. Salaries open. Apply to File No. 1359-V.

SENIOR MECHANICAL ENGINEER required in Ontario to assist in layout and design of petroleum refining equipment and facilities. Must be qualified in this field. Age 30-35 years. Salary open. Apply to File No. 1360-V.

MINING

MINING ENGINEER required in Quebec with eight to ten years experience, the work to consist of underground production and engineering work, using the block caving method of mining. Salary open. Apply to File No. 1352-V.

MISCELLANEOUS

GRADUATE ENGINEER required to act as City Manager located in Western Canada. Salary open. Apply to File No. 1345-V.

GRADUATE ENGINEER, with municipal experience to act as assistant to the city engineer. Location Western Canada. Salary based largely on experience and qualifications, minimum of $4,000.00 per annum. Apply to File No. 1347-V.

STRUCTURAL STEEL detailers and checkers required in Windsor, Ontario, by established fabricating firm. Salaries open. Apply to File No. 1357-V.

FIELD ENGINEERS required by Provincial Capitals and principal cities throughout Canada. Salary ranges from $3,840.00 to $6,300.00 per annum depending on experience and qualifications on highway and road construction. Apply to File No. 1358-V.

RUBBER CHEMIST required by large firm in Montreal. Must have minimum of five years experience in compounding, developing and factory processing. Salary according to qualifications. Apply to File No. 1361-V.

ELECTRICAL OR MECHANICAL ENGINEER required in Ontario with broad experience in design of electrical appliances and/or small fractional h.p. motors. A good knowledge of production and tooling practices in the appliance field desirable. This is a new position in an expanding program. Salary open. Apply to File No. 1365-V.

ESTABLISHED MANUFACTURER of domestic appliances requires two or more engineers for development of major household appliances, electric refrigerators, ranges and allied lines. Knowledge of manufacturing processes desirable. Will also consider one or two recent graduates. Personal and business history, salary requirements, etc., to be contained in first letter. Location Western Ontario. Apply to File No. 1366-V

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

CHEMICAL

CHEMICAL ENGINEER required to take charge of process development group. Applicant should have at least five years development and production experience in chemical industry. Position in Ontario. Salary open. Apply to File No. 1335-V.

CHEMICAL ENGINEER recent graduate is needed for production work by chemical manufacturing firm situated in the Province of Quebec. Some experience in chemical production or synthetic resin manufacture would be advantageous. Salary open. Apply to File No. 1336-V.

ELECTRICAL

GRADUATE ELECTRICAL ENGINEER. Immediate opening in Montreal with Canadian General Electric for graduate electrical engineer. Sales experience desirable but the essentials are some years experience in application of motor, control switchgear, etc., a definite liking for sales work and a desire to make this a long term arrangement. Reply stating background. Apply to File No. 1299-V.

ELECTRICAL ENGINEER with at least three years of post graduate professional experience in the field of radio engineering in very high frequencies telecommunication and/or radar. Location Montreal. Salary open. Apply to File No. 1314-V.

MECHANICAL

JUNIOR MECHANICAL ENGINEER required by an electrical manufacturing plant in Ontario to be in charge of their suggestion system plan. Applicant must have initiative and be capable of working with people. Salary open. Apply to File No. 1316-V.

MECHANICAL ENGINEER with sales ability and experience in markets and product development work required by a manufacturer located outside of Montreal. Preferably bilingual. Good opportunity for advancement to the position of sales manager. Salary open. Apply to File No. 1319-V.

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for ordinary collier plants screening equipment. Hoists, simple steel structures, etc. Salary open. Apply to File No. 1332-V.

MECHANICAL ENGINEER with experience mainly on hydraulic pumping equipment is required for test work in the field. Applicants should have a reasonably wide experience in handling different types. The work will involve travelling throughout southern Ontario. Please apply in writing, stating all relevant particulars. Salary open. Apply to File No. 1337-V.

MECHANICAL ENGINEER with experience in wood working or plywood industry. Experience in machine and fixture design would also be useful. Position is one of responsibility in a large growing concern. Work would be varied including everything from product design through manufacturing to sales. Age under thirty. Salary $225.00 to $275.00. Apply to File No. 1338-V.

MECHANICAL ENGINEER required by well established firm in Montreal to act as sales engineer. Age early 30's. Salary about $4,000. Apply to File No. 1340-V.

MECHANICAL ENGINEER required to act as field representative for large rubber firm establishing their main offices in Toronto. Preferably Montreal resident, bilingual, owning a car, age 28 to 35 years. Territory includes Quebec, Maritimes and Newfoundland. Salary open. Apply to File No. 1343-V.

METALLURGICAL

METALLURGICAL ENGINEER required for research laboratory in Montreal. Applicant must have some experience in steel industry with knowledge of gas and arc welding. Salary open. Apply to File No. 1326-V.

MISCELLANEOUS

RECENT GRADUATE in engineering required by national beverage company. Duties include general plant maintenance and production. Must be able to deal with personnel. Training period in Montreal eventually for Quebec City. Salary up to $3,000.00 to start. Apply to File No. 1069-V.

CIVIL OR SANITARY ENGINEER with a number of years experience required by a large intermunicipal corporation in Western Canada. Must be able to assume responsibility in design, detailing, estimating, preparing specifications to layout and supervise the construction, repairs and maintenance of sewage collection system and treatment plant. Salary $325.00 per month up. Apply to File No. 1144-V.

SALES ENGINEER, around 30 years of age, preferably electrical background and experience with a utility or an electrical contractor or consulting firm. Should be familiar with transmission and distribution practice. Working knowledge of French. Location Montreal. Salary open. Apply to File No. 1261-V.

GRADUATE ENGINEER with specialized training in trolley coach maintenance required by an Eastern Canadian Public Utility. State age, experience and qualifications in first letter. Salary open. Apply to File No. 1263-V.

RECENT GRADUATE wanted immediately for time study work with a large mining company in Quebec. Preference given to bilingual persons with experience in this type of work. Salary open. Apply to File No. 1266-V.

SALES ENGINEER required in Montreal with mechanical engineering training. Preferably applicant with some selling experience. The lines which he would have to handle would be contractors, road building and industrial equipment as well as pumps of various types. Age 30-35 years with working knowledge of French. Salary open. Apply to File No. 1267-V.

STRUCTURAL STEEL DRAUGHTSMAN and checkers, preferably graduate engineers are required for a steel fabricating company in Manitoba. Salaries open. Apply to File No. 1285-V.

CIVIL OR MECHANICAL ENGINEER required for position of assistant to general manager of a steel company in the Maritimes. Salary open. Company operates a steel foundry structural and machine shops and employs approximately 300 men. Intelligence and the ability to learn quickly are essential. Apply to File No. 1313-V.

SALES ENGINEER preferably civil with structural steel and sales experience required in Montreal. Age about 30 years to 35 years with a working knowledge of French. Salary open. Apply to File No. 1317-V.

RECENT GRADUATE in mechanical engineering required by a paper company in the Province of Quebec. Preferably bilingual. Salary open. Apply to File No. 1322-V.

PHYSICIST OR MECHANICAL ENGINEER wanted to act as head of Nuclear Engineering Branch by National Research Council. Applicant will be required to direct a group of physicist and engineers in applied research and engineering development related to design of atomic energy plants and plant equipment. Salary $5,000.00 to $6,300.00. Apply to File No. 1325-V.

GRADUATE ENGINEER required as sales representative for a manufacturer of industrial conveyors. Location Montreal and area. Age 30 to 40 years. Salary $500.00 per month including expenses. Apply to File No. 1329-V.

CHEMICAL OR MECHANICAL ENGINEER required for food industry located in Western Canada. 30 to 35 years of age. Some experience in labour relations and production methods required. Position offers excellent future. Salary open. Apply to File No. 1330-V.

CONSTRUCTION ENGINEER required by a large firm in Montreal, with 2 to 3 years experience in various pilings. Job to last approximately 1½ years, stationed in Montreal. Salary open. Apply to File No. 1342-V.

FIVE APPOINTMENTS for operational research on problems of defence at initial salaries of $2,580 to $6,300 dependent on qualifications. First appointment for one year, subsequently by three-year terms. Superannuation provisions. Applicants with post graduate training in applied mathematics and mathematical statistics, biology, physical science, economics or engineering may obtain further information from: Apply to File No. 1367-V.

Situations Wanted

EXECUTIVE AVAILABLE, M.E.I.C., University graduate, Engineering and Administration. Middle forties. Wide experience administration, planning, manufacturing, sales, engineering and comptroller functions. Presently Senior Officer, large Canadian company. Apply to File No. 185-W.

CIVIL ENGINEER, S.E.I.C., B.Sc. (Alberta '48), P.Eng. (Ontario). Age 28, married, veteran, desires position of responsibility with consulting firm or municipal corporation in town planning, municipal engineering or hydraulic engineering. Design or construction supervision. Prefer location in Western Canada. Presently employed as chief draftsman and staff engineer, including design of all municipal projects, etc. One year as reinforced concrete and structural steel designer. Apply to File No. 283-W.

CIVIL ENGINEERING GRADUATE, Jr. E.I.C., P.Eng., professional engineer and estimator with large Montreal construction company seeks sparetime work. Cost or quantity estimates, structural steel or reinforced concrete design, surveying problems, etc. Special opportunity for firms with no estimating department or firms with the occasional overloaded staff. Apply to File No. 286-W.

STRUCTURAL ENGINEER, M.E.I.C., R.P.E., presently employed as chief draughtsman, designer and estimator with company fabricating 4,000 tons of structural steel per year, desires position of responsibility and authority with a larger or more progressive company. Location no object. Apply to File No. 293-W.

CHEMICAL ENGINEERING GRADUATE, S.E.I.C., S.C.I.C., B.Sc. (Acadia '41), B.E. Chem. (N.S. Tech. '49), age 35, married, family. Experience, 3 years business (hardware, machinery), 1½ years chemist in control laboratory (explosives), 2½ years Naval Ordnance (inspection), 4 months pilot plant installation, 4 months asphalt inspection, in oil refinery, one month food processing. Available immediately. Will consider any reasonable offer. Preferable location Eastern Canada (except Quebec) or U.S. Apply to File No. 297-W.

MECHANICAL ENGINEER, M.E.I.C., P.Eng. Established in Vancouver as Consultant and Mechanical designer of wide experience, desires work on plant layout, machinery design, quantity surveying, preparation of complete industrial plans, reports, etc. Apply to File No. 304-W.

CIVIL AND MINING, Engineering Graduate, S.E.I.C., age 27, desires a part time position in Montreal with a consultant of reinforced concrete and structural steel or of mining engineering. Also interested in city engineering, in town planning and in building construction. Will be available evenings, week ends and afternoons. Apply to File No. 309-W.

CIVIL ENGINEER, M.E.I.C., B.Sc., P.Eng., age 44, married. Wide experience in municipal engineering, both with contractors and consultants, mainly on water supply and sewerage, also roads and buildings. Now employed by contractor as chief engineer of sewer and water department. Available on reasonable notice. Apply to File No. 312-W.

CIVIL ENGINEER, graduate, M.E.I.C., with wide municipal experience, engineering, administrative, financial. Now employed but desires suitable change. Available on reasonable notice. Apply to File No. 317-W.

MECHANICAL ENGINEER, '48, age 28. Desires part time work in Montreal, evenings and week-ends. Some experience in electrical and mechanical maintenance. Presently employed in heavy machinery design. Apply to File No. 345-W.

GRADUATE ENGINEER, S.E.I.C. Presently employed, is seeking employment on a part time basis. Has experience in survey and mining, field and office work and also in structural (steel and reinforced concrete) design. Also has a good knowledge of foundation soil mechanics. Apply to File No. 351-W.

MECHANICAL ENGINEER, S.E.I.C., graduating from University of British Columbia May 1950, desires permanent employment. Two years experience on bench work and machine tools. Practical knowledge of operation and maintenance of internal combustion engines. Summer jobs, estimating and inspection work with a construction company, and capital equipment inventory for a process industry. Apply to File No. 373-W.

GRADUATE CIVIL AND STRUCTURAL ENGINEER, S.E.I.C., B.Sc. (Eng.) Hons. 1949, University of London. Veteran, age 28, seeks interesting work with progressive firm in Montreal. Design, stress analysis, research, etc., preferred. Field work and design experience. Available on fortnight's notice. Apply to File No. 383-W.

ELECTRICAL ENGINEER, M.E.I.C., aged 35, English graduate B.Sc. (Eng.) 1st class honours, A.M.I.E.E., M.E.I.C., apprenticeship and three years construction experience with large electrical manufacturing company, 8 years experience in charge of the electrical departments of large industrial companies. Desires change, preferably in Ontario or B.C. Apply to File No. 391-W.

BILINGUAL MECHANICAL ENGINEER, graduate 1949, B.Sc. (Arts & Science) McGill 1947, age 24. Summer work includes 6 months in machine shops, and ten months as fitter's helper, mechanic & mechanic's helper. Business and selling experience. Would like engineering work where initiative and application will bring advancement. Apply to File No. 512-W.

PETROLEUM ENGINEER, S.E.I.C., University of Alberta, 3rd year undergraduate, age 26, married. Experience in surveying and operation of underground mining machinery. Desires connection with engineering concern in oil field development, control or production. Edmonton area preferred. Apply to File No. 543-W.

PROFESSIONAL ENGINEER wishes part time consulting work. Plans made for new jobs, alterations in existing layouts, Montreal area. 12 years experience in electrical and general projects. Apply to File No. 565-W.

CHEMICAL ENGINEER, S.E.I.C., graduating in May 1950, desires permanent position in which good prospects would reward initiative and hard work. Interested in production, sales or public relations. Age 22. Single, and willing to

TRANS-CANADA HIGHWAY PROJECT

AN OPPORTUNITY FOR FIELD ENGINEERS

Here is an opportunity for Field Engineers to provide for supervision and liaison work at field Headquarters to be established at Provincial Capitals and principal cities throughout Canada.

Salary ranges from $3,840 to $6,300 per annum depending on experience and qualifications on Highway and Road Construction.

Good working conditions, annual increases, holidays and sick leave with pay. It is anticipated that the Highway will be completed in seven years.

Address inquiries to the Director of Public Projects, Department of Reconstruction and Supply, Room 2131, Temp. Bldg. No. 3, Ottawa, outlining experience, age, education, marital status, etc., quote File No. 7-H-18-1.

go overseas. Experience includes three years in sales, administrative and public relations work. Now part-time overseas correspondent for British technical journal. Apply to File No. 582-W.

CIVIL ENGINEER, S.E.I.C., will graduate from N.S. Tech. in May 1950. Age 23. Single. Summer experience with the N.S. Dept. of Highways, an electric public utility, and office routine. Apply to File No. 583-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. (Alberta), age 41, married, wishes to consider change of employment with degree of permanency, Alberta or B.C., preferred. Wide experience asphalt and concrete pavement construction, soil compaction etc., also buildings, sewer and water lines etc. Presently employed as Resident Engineer in charge of Airport development, with ten years experience in this field. Apply to File No. 634-W.

SALES ENGINEER, Civil Engineering graduate, University of New Brunswick 1950, B.Sc., S.E.I.C. Age 32. Married. R.C.A.F. veteran. Experience: 5 years with Bank of Nova Scotia, 1 year on radar, 3 years in electrical machine shop, one summer as rodman on highway, one on hydrographic survey, and one as inspector on asphalt road. Available May 22 or shortly later. Apply to File No. 688-W.

ELECTRICAL ENGINEERING STUDENT, S.E.I.C., graduating in May 1950, from McGill University. Age 22. Single. Three summers with local electrical firm. Desires employment in power field. No objection to travel. Available after May 15, 1950. Apply to File 730-W.

GRADUATE CIVIL ENGINEER, Jr.E.I.C., B.Sc. (Civ.Eng.) (Edinburgh) 1949, ex-serviceman, age 27. Some experience in surveying, soil mechanics, organizations and setting out of engineering works and hydraulic models. Desires employment preferably in hydraulic or structural engineering field. Arriving Canada end of April. Will consider any type of work with reliable concern. Apply to File No. 746-W.

GRADUATE CIVIL ENGINEER and land-surveyor with proven ability to carry out responsibilities. Available on short notice. Over 23 years of wide experience on four continents. Experience includes design layout and field supervision of: roads, dams, buildings, drainage, irrigation works. Veteran CRE and EAE, married, bilingual. Situations held in Canada: chief of survey parties, resident engineer. Abroad: as district and assistant chief engineer for over 19 years in the British, Turkish, Iragi, Government Services. Apply to File No. 763-W.

ELECTRICAL ENGINEER, S.E.I.C. Sask. 1949. Age 26. Married. Experience includes: Operation and maintenance hydro electric plant, electrical repair and contracting, wireless and radar (R.C.A.F.), also very willing to learn and take an active interest in his work. Apply to File No. 775-W.

CIVIL AND MECHANICAL ENGINEER, M.E.I.C., P.Eng. Graduate 1929. Married, three children. Age 42. Past 14 years in pulp and paper industry. Experience covers construction, maintenance, plant engineering, purchasing, mill design and management. Employed in Ontario location. Available shortly. Apply to File No. 1384-V.

MECHANICAL GRADUATE, M.E.I.C., P.Eng. Ontario. Early forties. With experience in mechanical design and plant maintenance pulp and paper industry. Office administration and planning. Practical work in mining, machine shop and electrical installation. Presently fire prevention engineering. Desires position having variety and scope. Ontario location preferred. Apply to File No. 1543-W.

Senior Mechanical Engineer

30-35

To assist in layout and design of Petroleum Refining equipment and facilities. Must be qualified in this field. Apply to File No. 1360-V.

GRADUATE ENGINEER, M.E.I.C., 10 years experience, design, construction and maintenance in petroleum industry. Desires permanent position offering scope, hardwork and variety. Would prefer a smaller company, a consulting engineer or contractor, or to act as sales and service engineer for an equipment manufacturer. Location Western Canada or Ontario. Apply to File No. 1909-W.

EXECUTIVE AVAILABLE, University graduate, M.E.I.C., Professional Engineer. Wide experience in management, production, organization, purchasing, materials handling, expense control, construction, etc. Diplomatic and ability to get things done. Can be available on reasonably short notice. Apply to File No. 2216-W.

M.E.I.C., (Mechanical 20 years experience) visiting now in Britain has time free to act in consultative capacity. Apply to File No. 2642-W.

MECHANICAL ENGINEER, Jr.E.I.C., McGill 1946, P.E.Q., Jr.A.S.M.E., single, 25, presently employed. Past experience includes 18 months machine shop practice, in addition to time spent at tool proving, estimating, processing, and tool design. Desires position with a concern where these qualifications can be used to good advantage. Available on short notice. Apply to File No. 2707-W.

MECHANICAL AND CIVIL ENGINEER, M.E.I.C., Prof. Eng. Quebec. Polytechnique, U. of Montreal, 1941. Age 33, married, 2 children. Fluently bilingual. Experience includes maintenance and repairs of machinery and buildings as Plant Engineer in Pulp and Paper industry. Supervision of heavy concrete construction; plant layout, organization and production control; cost analysis; time and motion study; boiler house operation; electrical construction, maintenance, production and distribution. Interested in leading position in the industry, located preferably in or near province of Quebec. Available in one month's notice. Apply to File No. 2823-W.

CIVIL ENGINEER, M.E.I.C., McGill '44, P.E.Q., veteran R.C.E., single, 32, car available, reasonably bilingual. Four years experience in woodlands engineering work, for two large paper companies, including two years surveying and two years general work in connection with location design and estimation of roads, bridges, dams, conveyors, dept. buildings, etc. Past six months spent as resident engineer on job opening a new district, including construction of flume, wharf, houses, small powerhouse, roads and bridges, etc. Also have one year's experience in paper mill, three years in design and draughting of small tools, and two summers in a granite works. Will be available February 1st, 1950. Apply to File No. 2897-W.

EXECUTIVE ASSISTANT ENGINEER, M.E.I.C., P.Eng., age 31, married, engineering and business administration degrees, nine years experience in the electrical industry holding responsible positions in manufacturing engineering, sales management, and marketing research. A greater opportunity is desired to earn advancement in an aggressive organization. Apply to File No. 2946-W.

NOVA SCOTIAN desires employment in Nova Scotia. Professional Engineer (Electrical) but wide range of interests. Present salary $3,100 two years after graduating from Nova Scotia Technical College. Presently located in Montreal. Available beginning July or August 1950. Apply to File No. 3156-W.

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

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

ATTENTION EMPLOYERS!

The Employment Service of the Institute has available a list of student members who anticipate graduation, this spring, in all branches of engineering.

Interested employers are invited to advise the Institute as to the type of engineering graduate they wish to interview. Complete details will be furnished on receipt of your request.

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Additions to the Institute Library
Reviews — Book Notes — Abstracts

ABSTRACTS

Institution of Electrical Engineers. Papers: Solar Radiofrequency Radiation:

J. L. Pawsey.

Attempts to survey research on solar radiofrequency radiation, or solar noise, up to early 1948. An outline is given of known solar physics data relevant to the generation and propagation of radio waves in the solar atmosphere.

A Simplified Method for Checking the Optic Axis of Meter Jewels:

S. F. Knight.

Discusses a simple polarised light microscope which has been developed for checking the orientation of the optic axis of sapphire jewels as used in watthour meter bearings. The method is quick and accurate and little skill is required in its use.

Technical Considerations Affecting the Development and Design of Electrical Control Gear for Machine Tools:

A. R. H. Thorne.

Deals with some of the technical considerations of both the design and application of control gear to machine tools. Compares the application of electrical control to machine tools with other orthodox types of control gear, and discusses the choice of electrical control gear with particular reference to the frequency of operation. Speed control is treated with some regard to the application of electronics.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Basic Theories of Physics; Mechanics and Electrodynamics:

Peter Gabriel Bergman. New York, Prentice-Hall, 1949. 280 pp., illus., cloth.

Engineers' Dictionary; Spanish-English and English-Spanish, 2nd ed.:

Louis A. Robb. New York, Wilwy, c1949. 664 pp., cloth.

Giant Brains or Machines that Think:

Edmund Callis Berkeley. New York, Wiley, c1949. 270 pp., illus., cloth.

Heating, Ventilating and Air-Conditioning Fundamentals, 2nd ed.:

Williams H. Severns and Julian R. Fellows. New York, Wiley, c1949. 666 pp., illus., cloth.

How to Run a Lathe, 49th ed., Volume 1:

South Bend Lathe Works, South Bend, Indiano, c1949, 128 pp., illus., paper.

Machinery's Handbook for Machine Shop and Drafting Room, 14th ed.:

Erik Oberg and F. D. Jones. New York, Industrial Press, 1949, 1911 pp., illus., cloth.

Manufacturing Analysis:

Richard F. Kipers. New York, Toronto, McGraw-Hill, c1949. 452 pp., illus., cloth.

Mathematiques Générales, 4th ed.:

Maurice Denis-Papin. Paris, Dunod, 1950. 296 pp., illus., cloth.

Mécanique et Physique Générales, 4th ed.:

Maurice Denis-Papin. Paris, Dunod, 243 pp., illus., cloth.

Measure for Greatness. A Short Biography of Edward Weston:

David O. Woodbury. New York, Toronto, McGraw-Hill, 1949. 230 pp., illus., 1949.

Numerical Analysis of Heat Flow:

G. M. Dusinberre. New York, Toronto, McGraw-Hill, 1949. 228 pp., illus., cloth.

Physique Industrielle, 27th ed.:

Julien Izard. Paris, Dunod, 1950. 430 pp., illus., cloth.

Presentation of Technical Information:

Reginald O. Kapp. London, Constable, 1948. 147 pp., cloth.

Principles of Electroplating and Electroforming, 3rd ed.:

William Blum and George B. Hogaboom. New York, Toronto, McGraw-Hill, 1949. 455 pp., illus., cloth.

Proceedings of the Second International conference on soil Mechanics, Volume 7:

Rotterdam, The Conference, 1948. 184 pp., illus., cloth.

Progress of Rubber Technology, Annual Report, Volume 12:

T. J. Drakeley, ed. London, Heffer, 1948. 108 pp., illus., paper.

Statically Indeterminate Frameworks, 3rd ed.:

Thomas F. Hickerson. Chapel Hill, University of North Carolina Press, 1949. 202 pp., illus., cloth.

Structural Analysis by Moment Distribution:

S. Butterworth. London, New York, Toronto, Longmans, 1949. 119 pp., illus., cloth.

Television for Radiomen:

Edward M. Noll. New York, Toronto, MacMillan, 1949. 595 pp., illus., cloth.

Trolley Conveyors:

Sydney Reibel. New York, Toronto, McGraw-Hill, 1949. 265 pp., illus., cloth.

TECHNICAL BULLETINS, ETC.

American Society for Testing Materials. Technical Publications:

No. 56-E—1948 Supplement to the Bibliography and abstracts on Electrical Contacts. No. 87—Symposium on Deformation of Metals as Related to Forming and Service. No. 90—Metal Cleaning Bibliographical Abstracts

Bell Telephone System. Technical Publications: Monographs:

No. B-1653—Twenty-five Years of American Physics. No. B-1666—Reflections in Rectangular wave guides.

Institute of Metals. Reprints:

No. 1189—The New Factory of the Société Centrole des Alliages légers at Issoire (Puy-de-Dome) for the working of Light Alloys, Jean Matter et Marcel Lamourdedieu. No. 1190—Some Technical Problems Influencing Production Economy in the Rolling of Aluminium, W. J. Thomas and W. A. Fowler. No. 1191—Segregation and Liquation of Alloys and their Application to Non-Ferrous Metallurgy, Albert Portevin and Marc Dannenmuller. No. 1192—Organization and Work of the Department of Scientific and Industrial Research, Sir Edward Appleton. No. 1207—Recent French Investigations in the Field of Light Alloys, George Chaudron. No. 1208—Some Aspects of the Production and Heat-Treatment of Electrolytic Copper Powder, H. J. Tyrrell. No. 1210—Metallography of Copper Containing Small Amounts of Bismuth, L. E. Samuels.

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Short subject bibliographies will be compiled on request.

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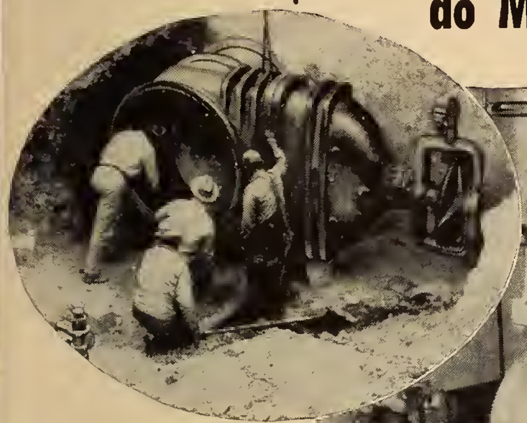

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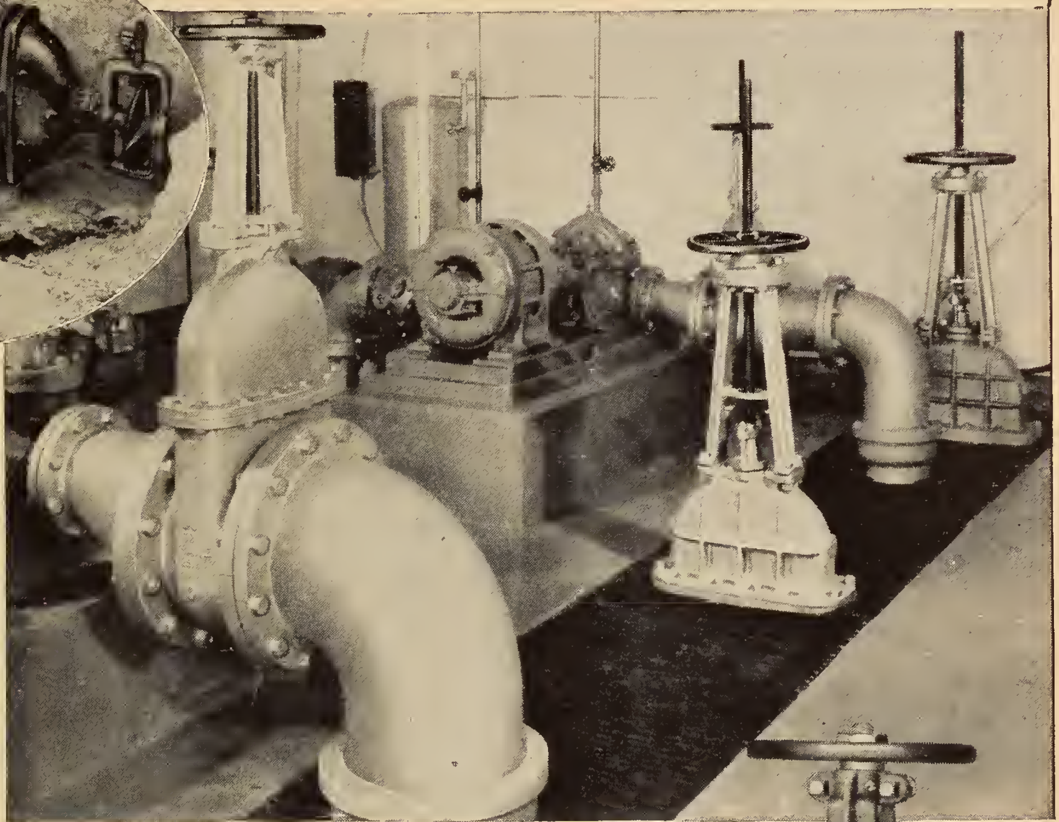

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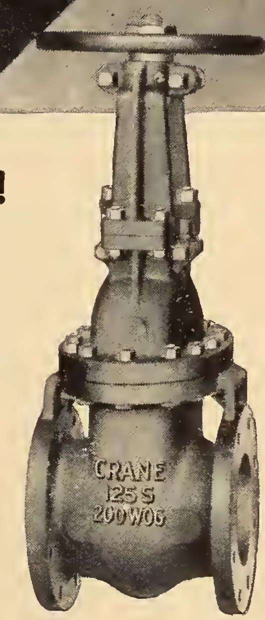

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Simplified Methods for checking the Orientation of the Optic Axis of meter Jewels, S. F. Knight.—Performance of the British Grid System in Thunderstorms, J. S. Forrest.—Development and Design of Electrical Control Gear for Machine Tools, A. R. Thorne.—Solar Radio-Frequency Radiation, J. L. Pawsey.

Institution of Mechanical Engineers. Papers:

Approximate Investigation of the off-Design Performance of a Turbo-Compressor Stage, W. Merchant.—Automobile Electrical Equipment for Passenger Cars, M. W. Kendall.—Furnace Design and Practice, R. J. Sarjant. Laminar Flow Aerofoil Theory and the Application of Analogous Methods to the Design of Kaplan Turbine Blades, S. P. Hutton.—Application of the Method of Characteristics to the Tronsient Flow of Gases, J. Kestin and J. S. Glass.—Provision of Technical Courses in Universities, Technical Colleges and National, Colleges, D. S. Anderson.—Single-Cycle Test Apparatus for Studying "Loop Scavenging" in a Two-Stroke Engine, H. Sammons.—World Energy Resources and Their Utilization, A. Parker.

Princeton University. Industrial Relations Section. Selected References:

No. 31—Layoff Policy and Procedure.

Southwestern Ontario Planning Conference. Proceedings:

Second Annual Conference, 1949.

S.U. Bureau of Standards. Circulars:

No. 482—Bibliography of Books and Published Reports on Gas Turbines, Jet Propulsion, and Rocket Power Plants.

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

No. 8-R—Thickness of Flexible Pavements.

Washington University Engineering Experiment Station. Reprints:

No. 20—Fatigue Under Combined Pulsating Stresses, H. Majors and others. No. 25—Function of the Engineering Experiment Station in a Graduate Progrom, F. B. Farquharson, No. 26—Study of Diffusion in Agar Gels by a Light Absorption Method. V. F. Felicetta and others. No. 27—Graphical Analysis of Tuned Coupled Circuits, A. E. Horrison and N. W. Mather.

PAMPHLETS, ETC.

Brief for Corporation Libraries: A Guide for their Operation and Management:

Alma Clarvoe Mitchell. New York, Special Libraries Association, 1949.

Conservation of Water Resources:

Board of the Black River Regulating District, Watertown, N.Y., 1949.

Lost Dimension or the True Principle of Relativity:

James Bain. Buenos Aires, Castro Co., c1946.

New Iron Developments in Northeastern Canada:

A. E. Moss. Paper presented before the Junior Section, Montreal Branch, Engineering Institute of Canada, November 21, 1949. (typewritten).

Preparation of Effective Lantern Slides:

L. S. Bonnell (in Chemical and Engineering News, v 27 n 37 Sept. 12, 1949, pp. 2600-2606).

Reports in Industrial Engineering:

Students of the Department of Industrial Engineering. New York, Columbia University, 1949.

Statistics and Quality Control in Engineering Courses:

Subcommittee on College Courses. New York, American Society for Quality Control, 1949.

Suburban Fringe Problems:

Gordon Culham. London, Ontario, Southwestern Ontario Planning Conference, 1949.

Urban and Suburban Zoning:

Lorne R. Cumming. London, Ontario, Southwestern Ontario Planning Conference, 1949.

Young Men of Science:

Carnegie Institute of Technology, Pittsburg, 1948.

BOOK NOTES

The Institute does not assume responsibility for any statement made; they are taken from the preface or the text of the books.

Prepared by the Library of The Engineering Institute of Canada

ACID MAKING IN THE SULPHITE PULP INDUSTRY:

A. H. Lundberg. Watertown, N.Y., G. D. Jenssen Company, Incorporated, 1949. 53 pp., diagrs., 11¼ x 8½ in., cloth, $6.00.

Consists of a series of articles previously published in Pulp and Paper. They describe the preparation of raw acid and cooking acid for sulphite pulp cooking, and provide a comprehensive review of various process arrangements for acid preparation in the sulphite pulp industry. Tables, charts and diagrams illustrate the various points presented.

ANALYTIC GEOMETRY AND CALCULUS:

Frederic H. Miller. N.Y., Wiley, London, Chapman, c1949. 658 pp., illus., 8½ x 5½ in., cloth, $5.00.

In this book the subjects of plane and solid analytic geometry, differential calculus, and integral calculus have been correlated as a single branch of mathematical analysis. Each chapter closes with a summary listing the principal concepts, definitions, theorems, and methods considered in the chapter. There are 3025 exercises for the student in addition to the numerous illustrative examples. This textbook was designed for teachers, especially of engineering and science, who need a unified treatment of the aforementioned subjects.

BALL AND ROLLER BEARINGS:

P. H. Billington. Manchester, Emmott, c1949. 161 pp., illus., 7½ x 5 in., paper, 4/6. Mechanical World Monograph No. 51.

In this work on roller bearings, the author has devoted chapters to materials and types, loads and their sources. Other chapters cover selection, installation, housing, and lubrication. The last part of the book deals with specific applications, and with the application of bearings to standard equipment.

BRITISH COMPRESSED AIR SOCIETY HANDBOOK OF PNEUMATIC EQUIPMENT; 2d ed.:

British Compressed Air Society. London, 1949. 194 pp., illus., 9 x 6 in., cloth, 20s.

The reason underlying the publication of this book, is to make available to traders and users of compressed air equipment, a publication which will enable them to recognize and appreciate the various types of air compressors, pneumatic tools and ancillary equipment available, and also to provide an adequate list of manufacturers capable of supplying the plant described. Photographs illustrate most types of machines.

NEW BRITISH STANDARDS

British Standards Institution, London, England.

B.S. 16: 1949—Telegraph Material (Insulators, Pole Fittings, etc.) 7/6.

Specifies dimensions and mechanical tests for galvanized bolts and nuts, arm bolts, stay-swivels, stay rods and tighteners, tie bolts, arm combiners, brackets, insulator and spindles.

B.S. 1546: 1949—Lighthouse Lamps (Electric). 3/–.

This schedule provides a range of eighteen types of lamps for single phase and D.C. supply, and three types for use with three-phase supply. It deals with bunch, cylinder, vertical grid, and cruciform filaments, effect of variation of voltage on lamp life, and dimensions of lamp caps.

B.S. 1559: 1949—Reels and Drums for Bare Wire. 2/–.

Particulars are given for the sizes and construction of wooden drums for bare wire, stranded conductors, trolley and contact wire; also given is the nomenclature of the various parts of the drum.

B.S. 1562: 1949—Mower Parts. 2/–.

This standard gives details of the construction and materials, and dimensions of knife sections, knife backs, fingers and rivets.

B.S. 1564: 1949—Pressed Steel Sectional Tanks (Rectangular). 3/–.

The sectional tanks considered in this standard are made up from four feet square unit plates bolted together, giving depths of 4, 8, 12 and 16 feet with capacities from 400 to 270,000 gallons. There are four tables of sizes giving capacities and weights, illustrations three types of flange joints and five fusion welded connections, together with a diagram showing the method staying.

NEW CANADIAN STANDARDS

Canadian Standards Association, Ottawa, Canada.

C22.2, No. 1 - 1949—Construction and Test of Power-Operated Radio Devices.

This specification applies to power-operated radio and similar electronic devices designed to be employed on supply circuits operating at no more than 150 volts to ground. This will include Radio receivers, portable electronic test equipment, portable public-address equipment, radio-phonographs, etc.

C22.2, No. 51 - 1949—Construction and Test of Armoured Cables and Armoured Cords. 50c.

Applies to armoured cables and armoured cords intended for use in power and lighting circuits in accordance with the Rules of Part 1 of the Canadian Electrical Code.

C22.4, No. 106 - 1949—Tolerable Limits of Radio Interference from Radio Frequency Generators — Industrial, Scientific and Medical. 50c.

This Code is intended to co-ordinate the use of radio frequency energy for communication and non-communication purposes. The tolerable limits of radiation herein specified are intended to protect radio receivers from interference to an extent required by Federal Legislation.

C22.4, No. 107 - 1949—Tolerable Limits and Special Methods of Measurement of Radio Interference from Wire Communication and Signal Systems 50c.

The tolerable limits of radio interference specified herein are intended to ensure freedom from interference to radio receivers when the apparatus in question is in normal operation. In arriving at these tolerable limits various factors of signal intensity and coupling from source of interference to the receiver have been taken into consideration.

C22.5, No. 1 - 1949—Use of Electricity in Metalliferous and Industrial Mineral and Quarries. $1.00.

Governs all electrical work and electrical equipment, apparatus, etc., operating or intended to operate at all potentials in electrical installations for Metalliferous and Industrial Mineral Mines and Quarries and shall be used in conjunction with "The Canadian Electrical Code—Part I, III and VI.."

C22.5, No. 2 - 1949—Use of Electricity in Coal Mines. $1.00.

Governs all electrical work and electrical equipment, apparatus, etc., operating or intended to operate at all potentials in electrical installation for Coal Mines and should be used in conjunction with "The Canadian Electrical Code—Parts I, III, and IV".

ELEMENTS DE CONSTRUCTION A L'USAGE DE L'INGENIEUR; TOME 3 —organes de transmission du mouvement circulaire:

R. Prud'homme and A. L. Tourancheau. Paris, Dunod. 1949. 156 pp., illus., 9½ x 6½, paper, 320 frs.

Part one of this volume deals with shafts, bearings, bearing supports, shaft couplings and clutches. Shapes, dimensions materials, uses, machining and care are studied according to their purpose. Formulas for a strict control of bearing lubrication are given, as well as tables and diagrams, leading to easy understanding of modern realizations in this field.

HANDBOOK OF STEEL AND STEEL PRODUCTS:

British Standards Institution. London, 1949. 58 pp., 8½ x 5½ in., illus., paper, £1 5s 0d. (B.S. Handbook No. 10).

The intention of this handbook has been to present a comprehensive picture of the whole field of British steel products, and to give in summarized form all the standards that apply to them. The parts are:

(1) Articles describing the manufacture of steel and steel products.
(2) Classified summaries of the essential technical requirements of British standards for steel and steel products.
(3) Other information of general interest, e.g., methods of test, heat treatment definitions and conversion factors.

HIGHER ALGEBRA FOR THE UNDERGRADUATE.

Marie J. Weiss. N.Y., Wiley, London, Chapman, c1949. 165 pp., 8½ x 6 in., cloth, $3.65.

This textbook is intended for a six semester-hour course in higher algebra for the undergraduate who has had two years of college mathematics including calculus. Such topics as groups, rings, fields, and matrices are given an equal place with the theory of equations. The book is intended to serve merely as an introduction to algabraic concepts, so that the undergraduate may have some idea of the kind of concepts used in that part of mathematics usually called algebra. Examples and exercises are given throughout.

LA PIERRE, MATERIAU DU PASSE ET DE L'AVENIR:

Pierre Noël. Paris, Institut Technique du Bâtiment et des Travaux Publics, c1949. 112 pp., illus., 8½ x 5½ in., paper, 250 fr.

This book is mainly an history of stone work in France from the middle-ages to modern times. The text, with the help of photographs, diagrams, and reproductions of old drawings tells the story of stone, of its uses from the most remote times, and of the stoneworkers. Some suggestions are given as to the possible uses of stone in the future.

PRINCIPLES AND PRACTICE OF RADAR:

H. E. Penrose. London, Newnes; Toronto, British Book Service, 1949. 692 pp., illus., 8½ x 6 in., cloth, 42s. ($8.50 in Canada).

Assuming that the reader has an adequate knowledge of fundamental radio technique, large sections of this book have been devoted to a detailed consideration of pulsed and pulse forming circuits at high and low levels, timing circuits, gate circuits and applications of micro-wave technique to transmitters, receivers, feeder and aerial systems. In the micro-wave field, the resonant magnetron and its associated units have received special attention, while the many new problems that arise in connection with the employment of ultra-high frequencies in transmitting and receiving circuits have received suitable consideration.

PRINCIPLES OF ELECTRICITY; AN INTERMEDIATE TEXT IN ELECTRICITY AND MAGNETISM, 2nd ed.:

Leigh and Adam Page and Norman Ilsley. N.Y., Toronto, Van Nostrand, c1949. 619 pp., illus., 9 x 6 in., cloth, $6.00 (in Canada).

In preparing this book, the purpose of the authors has been to provide an elementary text suitable both for undergraduates who have completed courses in physics and in the calculus, and for advanced students who wish a more comprehensive training in electromagnetism. Considerable space has been devoted to the theory of electrical measurements in the belief that a didactic course should be accompanied by practice in the laboratory. Selected problems have been appended to most of the articles.

New Wiley books for your Engineering Career

The Rigid-Frame Bridge

By A. G. Hayden, *Formerly Westchester County Park Commission*, and M. Barron, *Farkas and Barron, Consulting Engineers*. The principal feature of this new edition is a greatly simplified method of analysis for skewed frame bridges. The design of the single span skewed frame bridge is now made almost as easy as the design of the unskewed structure; the design of the double span skewed frame bridge is also quite simple. Third Edition. *February 1950. 240 pages. $6.50.*

Matrix Analysis of Electric Networks

By P. LeCorbeiller, *Harvard University*. This is the first volume in a series of *Harvard Monographs in Applied Science*. The author presents a compact treatment of electric networks based on the use of matrix notation in the handling of the network equations and on the exploitation of the duality principle. *January 1950. 112 pages. $3.90.*

The Technique of Radio Design

By E. E. Zepler, *University College, Southampton, England*. Stressing practical applications, this enlarged edition contains a more detailed discussion of fundamentals and a lengthier treatment of receiver noise and negative feedback. Second Edition. *1949. 394 pages. $6.50.*

Engineers' Dictionary

Spanish-English and English-Spanish

By L. A. Robb, *Ambursen Engineering Corporation*. Contains 75,000 technical words and phrases. Covers the modern vocabulary of civil, mechanical, and electrical engineering, plus mining, shipbuilding, logging, sugar milling, and petroleum production. Second Edition. *November 1949. 664 pages. $16.25.*

Introduction to the Theory of Probability and Statistics

By N. Arley, *University of Copenhagen* and K. R. Buch, *Denmark Institute of Technology*. An elementary introduction with special emphasis on practical applications. *January 1950. 236 pages. $5.20.*

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PSYCHOLOGY OF INVENTION IN THE MATHEMATICAL FIELD.

Jacques Hadamard. Princeton, Princeton University Press; Toronto, Saunders, 1949. 145 pp., 8 x 5½ in., cloth. $3.00 (in Canada).

In this essay, Mr. Hadamard analyses the workings of the mathematical mind. The study is based both upon his own introspection and upon writings and statements of many other noted mathematicians. Conscious and unconscious thinking, the use of mental images or symbols, visualized or auditory words, "meaningless" words, logic and intuition, are a few of the phenomena discussed. Among other important documents included in the volume is a letter from Albert Einstein analysing his own mechanism of thought.

QUANTITATIVE ORGANIC ANALYSIS VIA FUNCTIONAL GROUPS.

Sydney Siggia. N.Y., Wiley, 1949. 152 pp., illus., 8½ x 5½ in., cloth, $3.00.

It is the purpose of this book to give a series of working methods for determining organic compounds by the functional groups on the molecule. The book was written with a view to its use by laboratory analysts who find themselves in need of a method of analysis for a certain type of compound. This reference work attempts to eliminate the need for searching through the literature and for weeding out and testing procedures that show promise.

STRENGTH OF MATERIALS:

Gerner A. Olsen. N.Y., Prentice-Hall, 1949. 442 pp., illus., 9 x 6½ in., cloth, $5.70.

This book is designed for use in institutions offering courses in strength of materials where calculus is not a needed or required subject. The book includes a large number of illustrated problems, use of Mohr's circle in the study of combined stresses, and explanatory remarks in statics when pertinent to the solution of problems. A comparison of the various codes utilized in riveted joint design and recent changes in design stresses for riveted and welded joints are discussed.

TABLES OF INVERSE HYPERBOLIC FUNCTIONS.

Harvard University Computation Laboratory, Cambridge, Mass.; Toronto, Saunders, 1949. 290 pp., illus., 10½ x 8 in., cloth, $15.00 (in Canada).

In this compilation, the inverse hyperbolic sine, cosinus, and tangent are explicitly tabulated to nine decimal places. Differences are available to provide second-order interpolation to this accuracy, and the other inverse hyperbolic functions are readily obtainable. These tables have been compiled to meet the growing demand in the fields of physics, statistics, engineering, and applied mathematics generally. Apart from the tables, the book contains an introduction to the method of calculation, and what is believed to be a complete bibliography of all existing tables of these functions, with critical notes on their range and reliability.

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.

ALLOY STEELS, CAST IRON AND NON-FERROUS METALS:

F. Johnson. Chemical Publishing Co., Brooklyn, N.Y., 1949. 227 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., linen, $5.00.

Essentially a reference work, this book covers the general aspects of steel-making processes and their relation to the properties of alloy steels. The physical and chemical properties and the applications of individual steels and cast irons are discussed and illustrated. The heat treatment of steels, cast irons, and non-ferrous metals and alloys are considered in some detail. There is a special chapter on age-hardening.

ELECTRICAL ENGINEERS' HANDBOOK, Electric Power. (Wiley Engineering Handbook Series):

H. Pender and W. A. Del Mar, Editors. 4th ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. paged in sections, diagrs., charts, tables, 8½ x 5¾ in., leather, $8.50.

Seventy-one specialists have contributed to the fourth edition of this well-known handbook. In the thorough revision, increased space has been devoted to circuit stability and symmetrical components, electronic rectifiers, aircraft equipment, heat pumps, servomechanisms, permanent magnets, plastic insulating materials, and induction and dielectric treating apparatus. In addition to the comprehensive coverage of all aspects of the electric power field and related activities, basic information on mathematics and the properties of materials is included. The extensive section bibliographies have been brought up to date.

ELEMENTS OF DIESEL ENGINEERING:

O. L. Adams. 2 ed. Norman W. Henley Publishing Co., New York, 1949. 367 pp., illus., diagrs., charts, tables, 8¼ x 5½ in., fabrikoid, $5.00.

This basic book on diesel engines has been considerably revised to conform with modern practice. It begins with chapters considering terminology, mathematics, and fundamental engine cycles. Succeeding chapters deal with fuel injection systems; combustion and heat distribution; rating, testing and performance; air intake and supercharging. Interpretation of diesel indicator diagrams, diesel fuel and lubricating oils, fuel properties and engine performance are also discussed.

HYDRO-ELECTRIC ENGINEERING:

G. Gerard. Sir Isaac Pitman & Sons, Ltd., London, Toronto, 1949. 181 pp., illus., diagrs., charts, maps, tables, 8¾ x 5½ in., cloth, $5.00 (in Canada).

Written from the practical angle, this book outlines the civil, mechanical and electrical aspects of hydro-electric engineering. To illustrate certain of the principles touched on, an appreciable space is devoted to descriptions of typical hydroelectric plant and schemes in operation in various parts of the world.

INDUCTION HEATING:

N. R. Stansel. McGraw-Hill Book Co., New York, Toronto, London, 1949. 212 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.55 (in Canada).

Supported by measurements to provide a factual basis, this book presents the electrical and thermal principles of the use of eddy currents for industrial heating service. It shows how these principles are applied in practice and indicates the procedures for the development of new uses of this method of heating. The examples cover the entire range of practice in the heating of metals and metal parts.

INTRODUCTION TO STATISTICAL MECHANICS:

R. W. Gurney. McGraw-Hill Book Co., New York, Toronto, London, 1949. 268 pp., diagrs., charts, tables, 9¼ x 6¼ in., cloth, $6.05 (in Canada).

Intended for use by graduate students of physics and chemistry, this book studies the behavior of large groups of particles. It shows how the behaviour of matter in bulk follows directly from the properties of individual atoms. There is an unusual development of the principles of partition functions followed by their applications. A feature is the treatment of metallic alloys. Problems appear at the end of each chapter.

LIGHT METALS INDUSTRY:

W. Lewis. Temple Press, Ltd., London, E.C.1, 1949. 397 pp., illus., diagrs., charts, maps, tables, 8½ x 5½ in., linen, 21s.

Four-fifths of this book is devoted to aluminium. The several chapters cover ores and their treatment, the principal alloys, the various fabricating processes, secondary aluminium, and the conditions, markets and statistics of the aluminium industry. The remaining one-fifth covers briefly the same material for magnesium and beryllium.

MAINTENANCE MANUAL OF ELECTRONIC CONTROL:

Edited by R. E. Miller. McGraw-Hill Book Co., New York, Toronto, London, 1949. 304 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.85 (in Canada).

Based on a series of articles published in "Electrical Construction and Maintenance", this book is a practical installation, maintenance and service manual for the electrical and electronic technician. Involving no mathematics and requiring only a fundamental knowledge of electricity, it takes the reader from simple electrical circuits through the more complicated circuits for electronic control devices. The remaining chapters consider the use and adaptation of tools and instruments for servicing specific types of equipment.

METHODS OF JOINING PIPE:

J. E. York. Industrial Press, New York, 1949. 236 pp., diagrs., tables, 8¾ x 5½ in., fabrikoid, $3.00 U.S., elsewhere $3.40.

Illustrates and describes all types of pipe joints, including expansion joints, for different classes of metallic and non-metallic piping, with discussion of their advantages and disadvantages. The proper selection of pipe joints, based on consideration of influencing factors, is also covered.

PHYSICAL PRINCIPLES OF OIL PRODUCTION:

M. Muskat. McGraw-Hill Book Co., New York, Toronto, London, 1949. 922 pp., illus., diagrs., charts, maps, tables, 9¼ x 6¼ in., cloth, $18.15 (in Canada).

This book formulates and correlates our present knowledge of the physical principles and facts underlying the mechanics of oil production. Chapters 1 to 3 present background material and the physical properties of petroleum fluids and oil-bearing rocks; chapters 4 to 6 cover the hydrodynamics of the flow of a single-fluid phase through porous media; multi-fluid-flow principles and their applications to general oil-producing mechanisms are discussed in chapters 7 to 11 including detailed expositions of gas-drive and water drive reservoirs; the last three chapters treat secondary-operations, well spacing, estimation of reserves, etc. Where feasible, actual oil-field data are presented as illustrative parallels of the theoretical considerations.

REINFORCED CONCRETE:

A. L. L. Baker. Concrete Publications, Ltd., 14 Dartmouth Street, Westminster, London, S.W.1, 1949. 295 pp., illus., diagrs., charts, tables, 9¾ x 6½ in. linen, 15s.

Beginning with the theory of statistically-indeterminate structures, this book continues with the analysis of various members, such as beams, slabs, columns and struts. Prestressed concrete beams are dealt with at some length. Design procedure covers a variety of structures as well as general considerations, and includes a brief treatment of economic design. In line with the practical emphasis of the book is a short chapter on estimating, costing, and progress charts.

TECHNICAL SKETCHING AND VISUALIZATION FOR ENGINEERS:

H. H. Katz. Macmillan Company, New York, Toronto, 1949. 163 pp., illus., diagrs., charts, 10¼ x 7½ in., cloth, $5.75 (in Canada).

This book is a text and reference on the applications and techniques of technical sketching. Initial chapters describe the various types of sketches. Following chapters give thorough, step-by-step instruction in drawing. A final chapter describes various non-graphical means of visualization used in engineering, such as cutouts, overlays, clay models, etc.

YEAR BOOK OF THE HEATING AND VENTILATING INDUSTRY:

Published by Technitrade Journals Ltd., 8 Southampton Row, London, W.C.1, England, 1949. 247 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, 5s. 6d. post free.

This third issue of the Year Book provides in one volume technical, contractual and other trade information. It is of interest to architects, consulting engineers, surveyors and others who are in close contact with heating and ventilating contractors. Technical topics covered include panel heating, atmospheric pollution, heating boilers, and thermostatic control.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

ADVANCED DYNAMICS:

S. Timoshenko and D. H. Young. McGraw-Hill Book Company, New York, Toronto, London, 1948. 400 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.50.

This text presents the general principles of dynamics together with their applications in various engineering fields. Five self-contained chapters deal with the dynamics of a particle, of a system of particles, and of systems with constraints, as well as with the theory of small vibrations, and the rotation of a rigid body about a fixed point. About 150 problems, most of them supplied with answers, are included for student solution.

ELECTRONICS IN THE FACTORY:

Edited by H. F. Trewman. Sir Isaac Pitman & Sons, London, Toronto, 1949. 187 pp., illus., diagrs., charts, 8½ x 5½ in., fabrikoid, 20s.

This small book provides a description of the latest applications of electronics to industrial production. The various chapters deal with electronic heating, welding control, electronics in chemistry, electronics in medicine, and with electronic devices for timing, counting, motor and generator control, and voltage and current regulation.

FUNDAMENTALS OF POWER PLANT ENGINEERING:

G. E. Remp. National Press, Millbrae, Calif., 1949. 347 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $6.50.

This book is designed as a text for a course in power engineering and as a reference work for engineers. Although the principal portion is devoted to steam power plants, there are also chapters on Diesel-electric, hydro-electric, and gas-turbine power plants. Special emphasis is placed on power plant economics, the estimation of equipment performance, and heat transfer calculations.

HARDENABILITY AND STEEL SELECTION:

W. Crafts and J. L. Lamont. Pitman Publishing Corp., New York and London, Toronto, 1949. 279 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.50.

This book presents a co-ordinated pattern of hardenability theories and calculations. The approach is practical with sufficient theory introduced to explain the practice. The hardenability calculations represent quantitative prediction of behaviour for each step in the process of developing reliable qualities in the finished product. Many charts, graphs and tables are included as well as a bibliography.

INDUSTRIAL ELECTRONICS:

A. W. Kramer. Pitman Publishing Corp., New York and London, Toronto, 1949. 311 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.00.

More than half of this practical book is devoted to a consideration of basic principles. These principles are dealt with more or less chronologically, thus progressing logically from the simpler tube types to the more complex. Following this groundwork, applications are considered in terms of classified groups. The book is intended for those with a knowledge of general physics and engineering but with little training in electronics. The step-by-step explanations are achieved without the use of mathematics.

MECHANICAL VIBRATIONS:

W. T. Thomson. Prentice-Hall, New York, 1948. 222 pp., diagrs., charts, tables, 8½ x 5½ in., cloth, $5.00.

Based on courses presented at the University of Wisconsin, this book presents the fundamentals of vibration theory and provides a general background for advanced study in the field. The student is assumed to have an elementary knowledge of calculus, dynamics, and strength of materials. No familiarity with differential equations is presupposed. Numerous problems are presented throughout to illustrate the method of analysis.

MODERN OSCILLOSCOPES AND THEIR USES:

J. H. Ruiter, Jr. Murray Hill Books, New York, Toronto, 1949. 326 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.00.

Written for electronics students and engineers who use oscilloscopes in their work, this book deals with the principles, components and uses of oscilloscopes. The operation of the oscilloscope is explained with detailed information on each element. Numerous step-by-step procedures are included, as well as a glossary of terms, descriptions of auxiliary equipment, and techniques for photographing patterns from the screen of the cathode-ray tube.

OXYACETYLENE WELDING AND CUTTING, a Course of Instruction:

S. Plumley, revised and rewritten by T. B. Jefferson. 4th ed. McGraw-Hill Book Company, New York, Toronto, London, 1949. 356 pp., illus., diagrs., charts, tables, 11½ x 8¼ in., cloth, $6.50.

This book fills the need for a concise, easy-to-understand course of instruction in oxyacetylene welding and cutting techniques. It begins with basic principles and proceeds, step-by-step, to show how to develop skill in handling both repair and production work. Particular stress is placed on pipe welding and the newer techniques in the welding of alloy steels, aluminum and magnesium, silver brazing and hard facing. Most chapters close with exercises and questions.

PETROLEUM REFINING, Vol. II:

M. M. Stephens and O. F. Spencer. 2nd ed. Pennsylvania State College, State College, Pa., 1948. 522 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.50.

Vol. 2 of a three-volume set, this book covers a practical application of unit processing in petroleum refining. Noteworthy additions to the revised edition are in crude oil analysis procedures, natural gasoline manufacture, lubricating oil additives and blending, catalytic cracking, and refining by the use of chemicals. Omitted in the new edition is the material on refinery hazards, water conditioning, marketing, and legal problems in the petroleum industry. Intended as an extension course, the book includes review questions, practice problems, and suggested further references with each chapter.

QUALITY CONTROL METHODS:

C. W. Kennedy. Prentice-Hall, New York, 1948. 243 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.75.

This book supplies the necessary elementary information needed to understand the more technical and involved practices that modern quality control requires. It is a combination of the theoretical and practical. Acceptance sampling, batch control, distributions and the standard deviation, average and range, and administrative methods are the major topics considered.

STRENGTH OF MATERIALS:

J. P. Don Hartog. McGraw-Hill Book Company, New York, Toronto, London, 1949. 323 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.00.

Designed for use in a first course in the subject, this book is a companion volume to the author's "Mechanics", and employs the same notations and sign conventions. Written in a descriptive style, each article starts with general theory and then presents the practical examples of the theory. There are 350 problems, complete with answers, at the end of the text.

THEORY OF MODERN STEEL STRUCTURES, Volume I. Statically Determinate Structures:

L. E. Grinter. Rev. ed. Macmillan Company, New York, 1949, 341 pp., illus., diagrs., charts, tables, 9½ x 6¼ in., cloth, $5.00.

Intended as a text for undergraduate courses in the analysis of statistically determinate structures, this book studies the basic problems of stress analysis by relating them to specific types of structures. In this second edition, the text is reorganized with considerable revision for clarity and to include modern practices and procedures. The chapter on the basic theories of stress analysis is extended and more attention is given to flat-roofed buildings.

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BUSINESS & INDUSTRIAL BRIEFS

A Digest of Information received by The Editor

Appointments and Transfers

W. L. McAdam.—W. Lyle McAdam has been appointed Ontario representative of L'Hoir Inc. of Levis, Que., makers of stainless steel and aluminum dairy, brewery, food processing and chemical equipment. Mr. McAdam will make his headquarters at the Toronto office of the Company, 503 Kent Building—corner of Yonge and Richmond Streets. Telephone Plaza 5406.

W. L. McAdam

L'Hoir Inc. is an old-established Belgian organization and is comparatively new in Canada.

●

W. A. Parker.—W. A. Parker has been appointed transportation specialist in Canadian General Electric Company's Montreal district. He is responsible throughout the Province of Quebec for the sales promotion of a wide range of transportation equipment including industrial and railway diesel-electric, electric, and mining locomotives and other transportation products.

●

R. J. Berkol.—Roland J. Berkol has been appointed sales development engineer by Atlas Steels Limited. Mr. Berkol's principal duties will be to assist fabricators in developing their manufacture of stainless steel in sheet and other forms for industrial and consumer products.

●

Anglobois Co.—Messrs. David & Marchal, 451 Greenoch Avenue, Montreal, have been appointed eastern Canadian agents for the Anglobois Co. of Paris, France. This concern is exploiting a process for the production of solid fuel from plant waste such as sawdust, pine needles, etc. The process involves grinding, drying, partial carbonization and briquetting. The Company operates two plants in France where, it is claimed, briquettes are produced at a price competitive with other solid fuels.

●

R. H. Macdonald. — Robert H. Macdonald has been appointed sales manager, Construction Materials Division, of The Steel Company of Canada, Limited. He will make his headquarters in the Company's general sales office in Hamilton, Ont. The Construction Materials Division is a new division of the Company set up to promote the sale of reinforcing steel and other steel products used by the building and construction industry. Mr. Macdonald was formerly assistant sales manager in the Reinforcing Steel Division.

●

Canadian Fan Manufacturers.—At the Annual Meeting of the Canadian Fan Manufacturers' Association, held on January 12th, J. H. Gregory was elected president for the coming year. W. C. Caldwell was elected vice-president and L. O. Monroe secretary-treasurer. Mr. Gregory is sales manager of the Canadian Blower & Forge Co. and Mr. Caldwell is the sales manager of Sheldons Engineering Ltd.

●

Airmotive Appointment. — Sir George Godfrey & Partners (Canada) Ltd. has

(*Continued on page 150*)

BURNDY CANADA LIMITED APPOINTMENTS

W. A. Hill

Roy Bunston, M.E.I.C.

W. A. (Bill) Hill has been appointed general manager and Roy Bunston, M.E.I.C., has been appointed chief sales engineer. They will make their headquarters in Toronto. Bryce W. Kell is now district sales manager for Quebec and the Maritime Provinces, and A. Thomson will serve as sales engineer in the Province of Ontario. Fred McLenaghan, who has been with the Company for over three years in a sales-engineering capacity, will continue in that work in the Toronto area.

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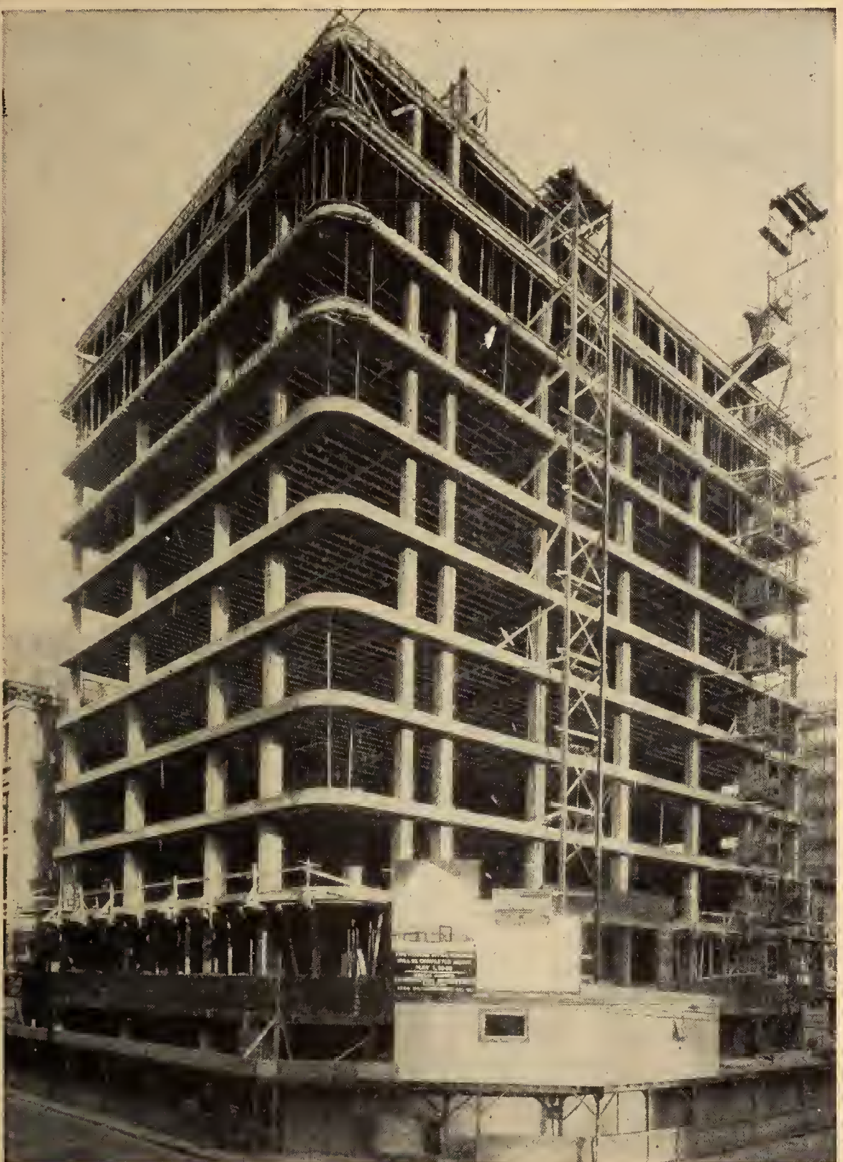

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BUSINESS AND INDUSTRIAL

(*Continued from page 146*)

been appointed Canadian representative of Pacific Airmotive Corporation of Burbank, California. The Canadian company will handle the sale of PAC-manufactured test and service equipment as well as cabin pressurization equipment. W. F. S. Carter, M.E.I.C., is president of the Canadian organization.

J. Gilmore.—J. Gilmore has been named a partner in the naval architectural firm of German & Milne. The firm will now be known as Milne, Gilmore & German. The headquarters of the organization are at 401 Dominion Square Building, Montreal.

Durex Appointments.—Canadian Durex Abrasives Ltd. of Brantford, Ontario, announce the following staff changes: F. C. Bingham, formerly manager of the Toronto Regional Sales Office, is now executive assistant at the head office, Brantford. A. Bartholomew succeeds Mr. Bingham in Toronto. D. M. Steiner is sales manager, Adhesives and Coatings Division. H. J. Goodman is sales supervisor of Reflective Materials Division; R. E. Corbett, sales supervisor of Electrical Tape Division; J. V. Powell, sales supervisor of Cellulose Tape. Messrs. Steiner, Goodman, and Corbett will make their headquarters at Brantford and Mr. Powell's headquarters will be in Toronto. M. J. Martin has been appointed sales promotion manager for the Company.

K. J. Dewhirst.—K. J. Dewhirst has been appointed manager of the Toronto district office of the B. F. Sturtevant Co.

Tagliabue Representative. — Powerlite Devices, Ltd., with head office and factory in Toronto, has been appointed Canadian representative of Tagliabue products. The name "Tagliabue" is well-known to those who use indicating, recording, temperature controlling, pressure controlling, oil-testing, and moisture equipment and laboratory thermometers and hydrometers. The Tagliabue Corporation was recently acquired by the Weston Electrical Instrument Corporation which has been represented in Canada for many years by Powerlite Devices Limited.

T. J. Cunerty, former Tagliabue representative in Canada, has joined the staff of Powerlite Devices Ltd.

C.G.E. Appointments.—H. D. Quinlan has been named manager of the Air Conditioning Division of Canadian General Electric. A. W. Warrender has been appointed manager of sales in the Ottawa district for all products of the Air Conditioning Division. Mr. Warrender is responsible also for the sale of commercial refrigeration, cooking and ventilation equipment in his area.

New Dosco President.—Lionel A. Forsyth, K.C., became president of the Dominion Steel and Coal Corporation Ltd., Canada Cement Bldg., Phillips

L. A. Forsyth, K.C.

Square, Montreal on January 1st. A native of Nova Scotia, Mr. Forsyth has been associated with the Dosco organization for the past twenty-two years.

G.M.-Diesel Appointments. — T. N. Snyder, formerly of Detroit, has been appointed general service manager of General Motors Diesel Ltd. He will make his headquarters in Montreal. R. W. Sherk has been appointed general parts manager at the new London, Ontario, plant of the Company.


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New Equipment and Developments

U.K. Tools & Instruments. — British manufacturers of tools and scientific instruments have been asked by the British Government to give outright priority to Canadian orders, "even if this means substantial diversion from non-dollar markets, including the home market". This information is contained in a bulletin issued by the British Tool and Scientific Instrument Association. The bulletin urges nearly 100 companies participating in the co-operative British Tool, Machine Tool, and Scientific Instrument exhibit at the third Canadian Trade Fair to "go all-out to make the exhibit a success". "The objective is not immediate returns", it notes, "but the permanent establishment of the U.K. as Canada's major source of supply for tools and instruments."

•

Aluminum Box Car. — The Roberval and Saguenay Railway has recently put into service a box car with an all-aluminum body. It is believed to be the lightest car of its size and type in existence. Its first operating load was a record breaking 2,243 bushels of grain weighing 134,580 pounds. The car weighs only 34,400 pounds, some six tons less than the standard 46,500-pound North American car of smaller capacity.

•

Rotary Brush. — It is claimed by The Osborn Manufacturing Co., Cleveland, Ohio, that a recent development in the use of a rotary brush on a conventional centreless grinder is resulting in large time and cost savings for manufacturers of cylindrical parts. Further information on this subject may be obtained from the Company.

•

Canada-U.K. Trade. — In a recent address on the Canada-United Kingdom situation, Sir Andrew Jones, Head of the British Food Mission in Canada, said "Trade is not a one-way street. Canada's current rate of expenditure on British goods is estimated at $24 a head. An expenditure of $54 a head would yield all the dollars required to enable the United Kingdom to buy the bacon, cheese and eggs, and everything else Canada wishes to sell".

•

Engine Choice. — A new plan under which customers may have their choice of engine when ordering the C Roadster Tournapull is announced by R. G. LeTourneau, Inc., Peoria, Ill. This tool is available with either a General Motors 6-71, Cummins HBI-600 or Buda 6-DC-844 engine.

•

U.S. Outlook. — U.S. Secretary of Commerce, Charles Sawyer said "Economic prospects for the immediate future in the United States are good and business probably will continue at its present high levels throughout at least the early part of 1950."

•

Australian Paper. — Australian Paper Manufacturers Ltd., one of the largest companies in the Australian paper making industry, increased its production of paper and boards in the last year, despite shorter working hours, in the five mills which it controls. Production totalled 130,206 tons. The pulp mill at Maryvale, Victoria, had an output of 41,343 tons which was also in excess of the previous year. Plans to increase the plant at this mill will expand production to 67,000 tons annually. The Company is to establish a new mill at Petrie, Queensland, and technical officers are at present in Great Britain, to arrange for the building of the first machines for this mill.

•

Aluminum Roofing. — Shortage of galvanized iron for home building in Australia has resulted in a keen demand for corrugated aluminum roofing.

•

Glass Plant. — The Canadian Industrial Glass Company Ltd., is renovating its window glass producing plant at St. Laurent, Quebec. The firm is Canada's only window glass manufacturer.

$500,000 has been spent in preparing the plant for the manufacture of glass by the Pennvernon process. Two Pennvernon drawing machines have been installed, replacing the Fourcault machines formerly used. In the Pennvernon process the glass is drawn vertically from

SHEDDING THE SHACKLES

The creative imagination of the engineer is no longer shackled by the limitations of heavy metals. Lightweight aluminum provides a new medium of engineering expression because only aluminum has such a practical combination of properties.

Aluminum gives high strength with light weight. It has fine appearance, ease and economy of fabrication. It is rustproof, corrosion resistant, has good electrical conductivity and rapid heat transference. Its proven durability, low maintenance cost and the way it reduces dead-weight to a minimum make aluminum the ideal medium for giving substance to engineering ideas.

Everywhere, more and more engineers are shedding the shackles of the conventional and turning to light, long-lasting aluminum.

ALCAN ALUMINUM CASTINGS

Weigh approximately 60% less than similar castings of other metals. Cast to close tolerances, costly machining is reduced and often eliminated. Can be heat treated for extra strength.

ALCAN ALUMINUM STRUCTURAL SHAPES

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Clean, rustproof, non-toxic. Resists corrosion. A yard long piece weighs the same as a foot of other metal tubing of equal size. Bends, flares, cuts and welds without special jigs.

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Montreal, Quebec, Toronto, Vancouver, Windsor

★Behind this scroper lies 24,000 lbs. weight ond driving power. Tough Grade 6 Deloro Stellite hardfacing kept this blade work-warthy nearly six times longer than the original hard steel.

A non-ferrous olloy of Cobalt, Chromium ond Tungsten, it's made to stand up against rust, heat, abrasion and impact . . . takes punishing wear far beyond steel.

Deloro Stellite Grade 6 coated electric arc rad is a low heat rod . . . easy to apply . . . thrifty to use. Write for full information today.

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"DELORO STELLITE"

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the tank and the sheet is not contacted on either side until the surfaces are cool ed beyond the danger of being marked or marred.

●

New Ships.—The Minister of National Defence recently announced plans for the construction of three new anti-submarine destroyers for the Royal Canadian Navy which embody a number of new construction features, including low superstructures made almost entirely of aluminum.

●

New Government Department. — The newly-created Department of Resources and Development combines Federal Government responsibilities in the following fields: forests; water resources not specifically assigned to any other department; wildlife; the Northwest Territories and Yukon administrations; the National Parks and Historic Sites and Battlefields Commission; all Federal Crown lands not dealt with by any other branch of the government; the tourist industry; housing; the planning and development of public projects and services, including the Trans-Canada Highway; the National Museum of Canada.

It is expected that the head office of the Department will be in the Langevin Block where the minister, deputy minister, and director of administration will be located.

●

Hydro Potential. — Arthur L. Brown, president of the Canadian Electrical Manufacturers Association, said on January 16th "Canada's hydro power potential is from 35,000,000 to 40,000,000 horse power." He was addressing the 16th winter convention of the Canadian Electrical Association.

●

New Oil Refinery. — Imperial Oil will build a refinery, of about 10,000 barrels per day capacity at a cost of roughly $10,000,000.00, at Winnipeg. The contract will be let shortly and completion of the project is scheduled for May, 1951.

Increased refinery capacity together with movement of Alberta crude eastward by pipe line will mean lower petroleum product prices in the area served by the new facilities. The crude will be moved either by rail or branch pipe lines from a take-off point on the Inter-provincial line at Gretna, Man.

Engineering design for the new plant has been under way for some time and field work will begin as soon as weather conditions permit.

●

Paving Breakers.—Canadian Ingersoll-Rand Co. Ltd., Birks Building, Phillips Square, Montreal 2, Que., announce two new paving breakers PB-8 and PB-6. The PB-8 weighs 82 lb. and is suitable for heavy duty demolition work and general paving breaking jobs. The PB-6, weighing only 58 lb., is designed for lighter jobs where a machine of lighter weight can be used to advantage. The new kicker-port valves used in these paving breakers greatly increase their efficiency and striking power. Oil economy is assured by a metering device that furnishes proper lubrication for all working parts, and an adequate oil reservoir is provided. Many additional favourable features are claimed for this new equipment. Ask for Bulletin No. CF-497.

●

Plaster Mixer.—A new plaster mixer, the Beaver No. 3, is now being manufactured by United Steel Coarporation at its Construction Equipment Division at Welland, Ont.

The mixed has a capacity of three cubic feet and is powered by a wholly-enclosed engine with dust-tight reduction unit. A bag ripper and hinged drum guard permit easy loading and cleaning and the stuffing box is plaster tight. The machine will pass through a standard doorway. Other equipment manufactured by the Company at Welland include a quarter-ton hoist, a 9-D concrete dump cart, and concrete mixers of two, three and a half, and six cubic feet capacity. The hoist is specially recommended for roofing work.

●

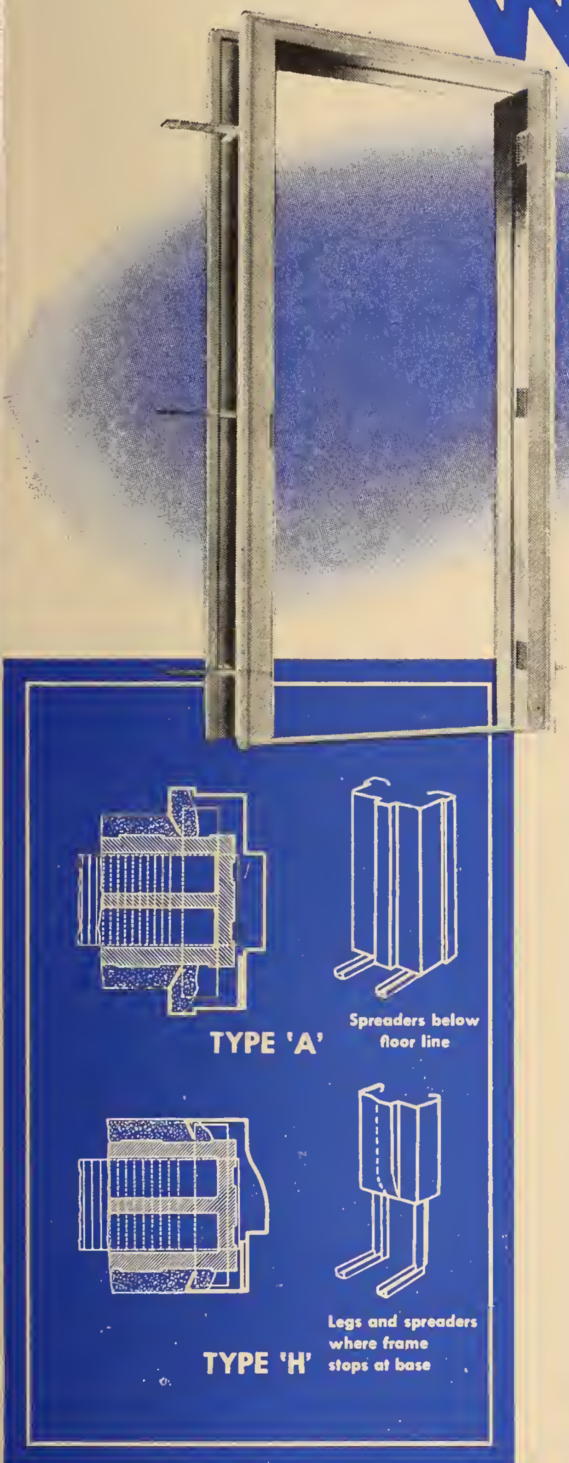
Mining Lease.—Steep Rock Iron Mines Ltd. and Inland Steel Co. of Chicago have announced an agreement under which Inland Steel has taken action to lease from the mining company a large undeveloped acreage in what is known as the "C" zone in the vicinity of Steep Rock Lake, Ont., for the purpose of exploring and developing a new iron ore mine.

●

New Oxygen Plant. — British Oxygen Canada Ltd., a subsidiary of a British company, will erect a $1,000,000.00 plant on a forty-eight-acre site at Etobicoke, Ont., for the production of oxygen and dissolved acetylene. This information was released by the Ontario Government.

Three buildings of special design, having a floor space of 35,000 sq. ft., will

Custom-built Door Frames by WESTEEL



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Here are some of the advantages of having Steel Door Frames built to your particular requirements—no need to "cramp your style" to accommodate stock frames.

Perhaps you will want some frames rabbetted on the hinge side so that door swings clear of opening—on lock side just a 5/8" door stop—we will make them just that way.

Perhaps you will want door stops on some frames to die at top of baseboard, others to continue to floor line, others to go below floor line. We will make them just that way.

Specify any template hardware you wish—we will contact manufacturer, then blank out for hinges and strike plates to exactly fit.

Standard profiles can be otherwise varied to suit special requirements.

ASK FOR CATALOGUE No. 22

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Camp Hill Hospital	Halifax, N.S.
Moncton High School	Moncton, N.B.
Bell Telephone Co.	Quebec, Que.
Shawinigan Bldg.	Montreal, Que.
Canadian Bank Note Co.	Ottawa, Ont.
Sunnybrook Hospital	Toronto, Ont.
Sick Children's Hospital	Toronto, Ont.
Princess Elizabeth Hospital	Winnipeg, Man.
Regina General Hospital	Regina, Sask.
University Hospital Addition	Edmonton, Alta.
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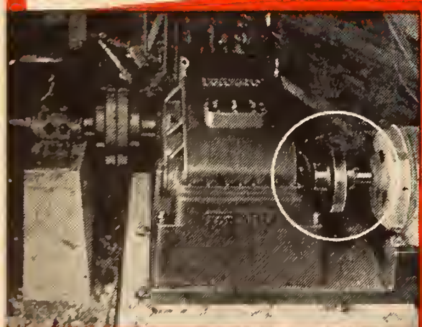
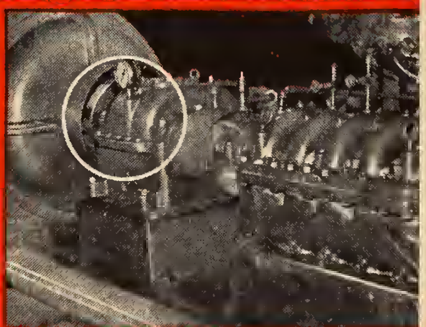


BLM Automatic Clutch in drive from 150HP electric motor to Forano speed reducer in drive to conveyors in pulp mills. Complete unit supplied by Forano Limited, Montreal.



BLM Automatic Clutch in drive to speed increaser to centrifugal pump. Supplied by Northern Foundry and Machine Co. in pump installation at International Nickel Co. mines.

The Automatic Clutch Corporation of Canada

165 SPADINA AVENUE — TORONTO, CANADA

be erected within the next few months. The parent company has been established for sixty-three years and operates thirty-eight oxygen and eighteen acetylene factories in South Africa, Rhodesia, East Africa, Egypt, Australia, New Zealand, India, Pakistan, Ceylon, Burma, Malaya, and Hong Kong.

●

U.K. Steel Output. — In the first 48 weeks of 1949 British steel output was 14,338,000 tons; an increase of 4 per cent over the corresponding period of the previous year.

●

Diesel Train.—On January 14th the first Diesel locomotive to cross the Canadian Rockies in regular passenger service arrived in Vancouver over C.P.R. lines after a successful trip under most adverse weather conditions.

The locomotive used was on loan to the Canadian Pacific Railway Company by General Motors. Officials aboard this train said "The trip was completely satisfactory."

●

Oil Leases.—The Alberta Government and Imperial Oil Ltd. have reached an agreement on a division of Imperial leases and Crown reserves in a 69-section area of the rich Redwater Oil field near Edmonton, Alta.

The split involves 44,160 acres of provincially-owned petroleum and natural gas rights held by Imperial for more than two years under exploration reservations. The 69 sections, about one-half of which were taken by Imperial, are near the Company's Simmons discovery well in the south-east section of Redwater field.

●

Threadless Pipe.—On January 13th at Buffalo, N.Y., Eric McLean, Canadian-born machine shop president, said that he had developed a method of using threadless pipe "which makes installing plumbing look easier than putting up a curtain rod."

●

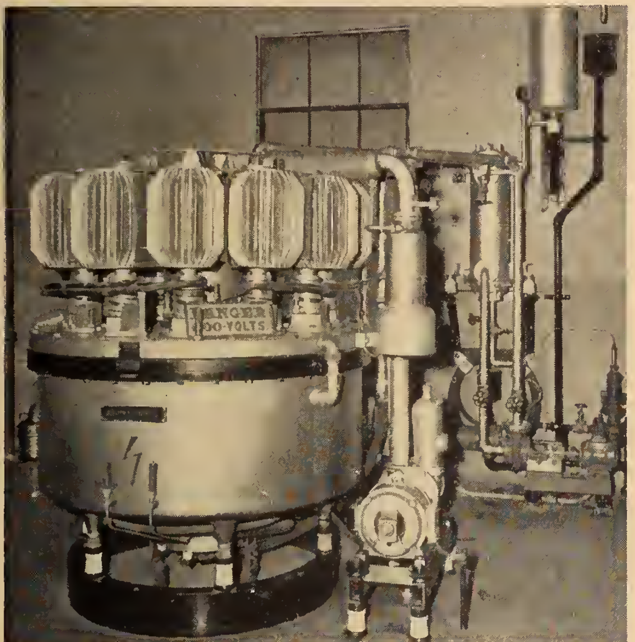
Hydro Electric Expansion. — During 1949 the post-war boom in hydro-electric construction continued without abatement, according to a statement issued by the Department of Mines and Resources. Although no new large plants were brought into operation, an appreciable increase in the total of installed capacity in Canada accrued from additional units coming into operation in existing stations, principally in those which were partially completed last year.

Installed capacity in Canada, including 272,050 h.p. located in the new province of Newfoundland, now totals 11,622,668 h.p. This shows an increase during the year of 479,900 h.p. which is slightly larger than the increase of 1948 and is far in excess of the pre-war yearly rate of expansion.

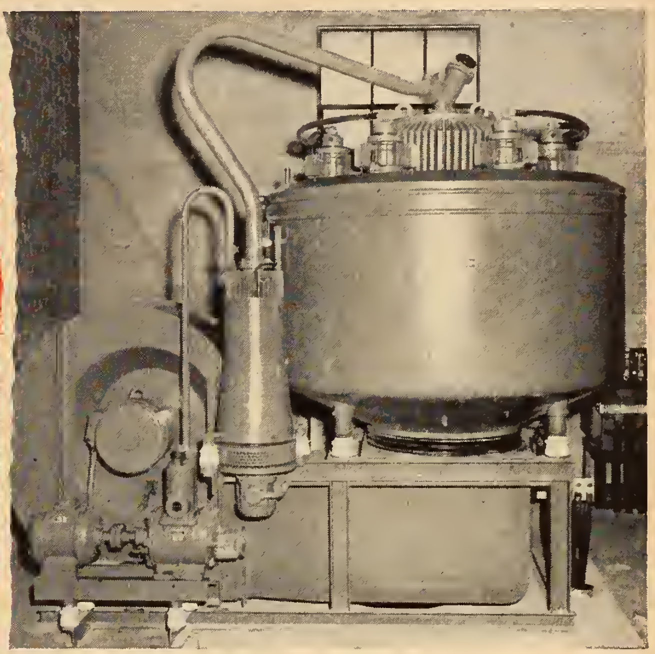
●

Rust-Inhibitor.—According to an announcement received from Pittsburgh, Pennsylvania, on January 9th, for the first time in recorded street railway history, a rust-inhibitor will be employed there in conjunction with the rock salt used for ice and snow removal at switches, passenger stops, and other points along the right of way. Officials of the Pittsburgh Railways reported that experimental use will begin as quickly as weather conditions require use of de-icing salt. Details on the success of the

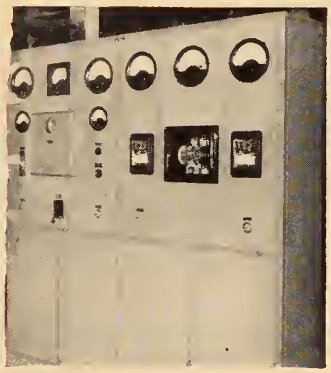
20 YEARS OF RECTIFIER PROGRESS



1930 — STILL GOING STRONG



1950 — JUST INSTALLED



Day in, day out, for over 20 years, the 1200 kw. rectifier, pictured above left, continues to serve the street railway system of a Canadian municipality. Typical of the 36 Brown Boveri rectifier units totalling 30,000 kw. in traction service from coast to coast, its long life and efficient operation resulted in a repeat order.

The new 1,000 kw. unit, above right, is a striking example of the strides made in rectifier design by Brown Boveri. Completely air-cooled, it features grid control for high-speed short circuit clearance and freedom from backfires.

Brown Boveri has pioneered the development of the mercury arc rectifier since 1913. In addition to the industrial, electro-chemical and light traction fields, Brown Boveri rectifiers have an outstanding performance record in heavy railway service (up to 3,000 volts) and in large subway systems.

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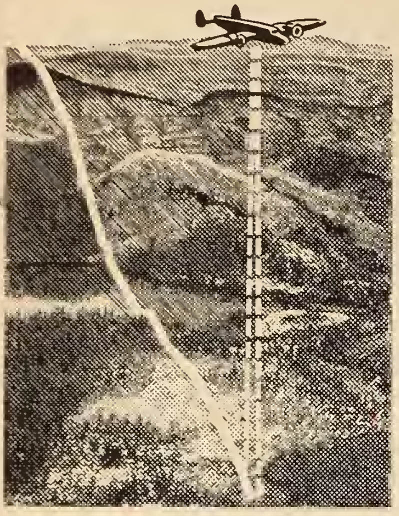

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experiment may be obtained from the engineering department of the Company.

●

Aircraft Pretesting.—A new machine designed to check flight characteristics and control equipment of an aircraft prior to its construction was announced at a meeting held in the Massachusetts Institute of Technology in January, by Dr. James R. Killian, Jr., president of the Institute.

On this elaborate and sensitive calculator, known as the "flight simulator", M.I.T. engineers will be able to set up an "electrical model" of any aircraft which is in an advanced stage of design and then apply an actual autopilot to fly this non-existent, theoretical craft.

●

New Chatham Plant.—Tube Turns of Canada Ltd., which was granted its Dominion Charter on December 2, 1949, is establishing a modern plant in Chatham, Ontario. The Company will manufacture Tube-Turn welding fittings.

The two storey plant, of brick construction, is located on the north side of Colborne Street, between Adelaide and William. Preparations are now being made for the installation of special machinery and facilities, and operations will start in about three months.

●

Canadian Trade Fair.—Jean Monnet, eminent French financial authority, will open the third Canadian International Trade Fair next May.

The Canadian Passenger Association, in recognition of the importance of the Fair to the business and economic life of Canada, is co-operating with the Canadian Government by reducing railway fares for participants in the 1950 show. The Association has announced that rail travel rates for the Trade Fair will be fare-and-a-half from any point of origin in Canada to the Fair and return. Foreign exhibitors, and their personnel, travelling to the Fair will also benefit by this special rate, starting from their point of entry into Canada, and return to the same point. All applications for reduced rates must be made to the Administrator, Canadian International Trade Fair, Exhibition Park, Toronto. The administrator will forward the necessary credentials for presentation to the ticket agent.

●

Outdoor Switch Gear.—At the winter general meeting of the American Institute of Electrical Engineers, held in New York on February 1, it was reported "high building costs are causing utilities and other power distributing agencies to use outdoor metal clad switchgear at substations. The present trend is toward the increasing use of outdoor metal clad switchgear as a means of eliminating high building costs, reducing ground area requirements for switching stations, eliminating exposure hazards, improving continuity of service and the appearance of outdoor switchgear installations". These remarks were made by P. R. Pierson of the Westinghouse Electric Corp.

●

Sensitive Ammeter.—A new instrument now being used to detect nuclear-energy rays — an instrument capable of measuring to 100 millionths of a millionth of an ampere — is getting considerable attention among scientists and research engineers. This new instrument known as the Brown electrometer, was designed by the Brown Instruments division of the Minneapolis-Honeywell Regulator Company to measure and record very small currents, like those developed in an ionization chamber as a result of radiation.

The extraordinary accuracy of the device was recently demonstrated to approximately 80 U.S. government scientists, research engineers and representatives of the Bureau of Standards. Further information may be obtained from the Minneapolis-Honeywell Regulator Co., Leaside, Toronto 17, Ont.

●

British Trade Fair.—Designing for the needs of overseas markets now has first call on Britain's resources and skill, and the 1950 British Industries Fair will offer more than 1,000,000 sq. ft. of stand space for the display of the latest products of 3,000 exhibitors. Ninety British industries will be represented. Exhibits will be displayed in 32 groups of closely allied trades for the convenience of buyers. Extensions at the Castle Bromwich, Birmingham, section of the Fair will allow the presentation of a special display of civil engineering contractors' plant, largest show of the kind ever held at a British Fair.

●

Nickel Consumption. — In 1949 the United States again was the largest consumer of Canadian nickel, with approximately 65 per cent of the total being used in that Country. Consumption in the United Kingdom was about 20 percent. These two countries with Canada accounted for approximately 88 percent of consumption.

●

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Monel cheaper in the long run

Monel offers: strength and toughness of structural steel . . . total immunity to rust . . . inherent resistance to corrosion . . . good performance under conditions of abrasion and erosion . . . and easy fabrication. Today, manufacturers and users of a wide variety of equipment regard Monel as sound investment. Case histories prove conclusively that the ultimate cost of this nickel alloy is surprisingly low.

Outlasts the best of others by 3 to 1!

An interesting example of the longevity of Monel is its use in propeller shafts. One fisherman on the East coast writes "My Monel shaft has lasted three times longer than the previous shafts installed and it is still in excellent condition. It cost me more at first but I've got that money back many times over." In hundreds of other applications, Monel is supplying the strength, hardness and corrosion resistance needed for trouble-free performance.

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INCO NICKEL ALLOYS

When selecting metals for your requirements make sure *you* get *all* the properties you need. They are *all* available in Inco Nickel Alloys.

MONEL*— (nickel-copper alloy), rust-proof, corrosion resistant, hard, tough, strong, attractive.

"R"* MONEL — Free machining Monel.

"K"* MONEL — Heat treatable Monel. Very high strength.

"KR"* MONEL — Free machining "K" Monel. Heat treatable to very high strengths.

"S"* MONEL—Extremely hard, non-galling cast Monel.

INCONEL*—(nickel-chromium-iron alloy). Exceptional strength, hardness and corrosion resistance at high temperatures.

NICKEL — Commercially pure malleable nickel. excellent corrosion resistance, high thermal conductivity, product purity protection.

DURANICKEL* ("Z" Nickel) — Heat treatable malleable nickel, extremely high strength.

"K" MONEL, "KR" MONEL and INCONEL are non-magnetic alloys.
*Trade marks.

THE INTERNATIONAL NICKEL COMPANY OF CANADA LIMITED

U.K. Car Exports.—Britain hit a new export record in motor cars in November 1949 when vehicles valued at more than twelve million pounds were sent abroad. The U.S.A. bought 1,400 of the 28,000 cars exported. This was the first time the number of cars exported to the United States had passed 1,000 since January, 1949.

●

Fire Fighting Equipment.—With the introduction of its large stationary fire fighting units, Ansul Chemical Company is making a bid for new markets in the rapidly expanding field of dry chemical fire protection. These units are being built in 500-lb., 1000-lb., and 2000-lb. capacities. They are designed to protect wide areas where a minimum of man-power is available—such as gasoline bulk plants, gasoline storage areas, refineries, railroad yards, petroleum and natural gas fields, large chemical plants, liquefied petroleum gas tank farms and other major public utility hazards.

One person can operate the Ansul stationary unit and fight a fire in any portion of an area several acres in size—according to information released by the Company.

●

Canada's Economy.—In the year 1949 the Rt. Hon. C. D. Howe said "Today, Canada with a population of some 13 million people is one of the leading trading nations of the world. On a per capita basis our trade is double that of the United Kingdom and about four times that of the United States. Industrially, Canada has come of age. We are, today, among the first half dozen countries in commercial agricultural production, in fisheries, in metal mining, in forest industries and in manufacturing. Our present level of domestic investment, including housing, is not only the highest in our history, but highest in terms of gross national product of any country of which we have any record. Our increased productivity—that is, output per man-hour—compares favourably with that of any country in the world, including the United States. In short, when we review the situation in other countries, we have much for which to be thankful."

●

Chlorine Plant.—A new $100,000 chlorine cylinder filling plant belonging to Canadian Industries Ltd. is now in operation at Cornwall, Ont.

The chlorine cylinders will be distributed in Ontario, Quebec and the Maritimes. These areas were previously served by C.I.L.'s chemicals plant at Windsor, with only tank car lots obtainable from Cornwall.

●

Huge Refinery Vessel.—The rapid development of the Canadian oil industry is being accompanied by an expansion of the Nation's facilities for the production of refinery equipment. One notable advance has been in the manufacture of vessels of which a number have recently been completed for the Shell Oil Company's Montreal East refinery by the John Inglis Co. Ltd. of Toronto.

Shipped by rail, one of these huge vessels presented many transport problems. Twenty-one ft. long and 14 ft. in diameter, it necessitated re-routing and schedule changes for the railways.

A feature of particular interest is the method of construction. The vessel is made of ¾-in. carbon steel plate lined with 7/64-in. stainless steel, spot welded by a new mechanical process developed by Inglis. It is claimed that this type of construction is much more economical than a vessel of solid stainless steel, yet it has corrosion resistant properties similar to a solid stainless steel vessel. In this particular vessel there were over 100,000 spot welds, evenly spaced throughout the whole area, so that the lining is fused inseparably with the outer shell.

The vessel was designed by Arthur G. McKee Company for 800 degrees Fahrenheit temperature, pressure of 50 lb. per square inch gauge, and full vacuum.

●

Jet Engine Details.—Details have been released of the Rolls-Royce Avon turbo jet, one of the most powerful gas turbines in the world. The engine has a multi-stage axial compressor and eight combustion chambers. It weighs 2,400 lb. Two Avons have been fitted in the English Electric Canberra, the first British jet bomber. Two Avons have also been fitted experimentally in a Meteor jet fighter, and it was this aircraft that achieved a rate of climb of 40,000 feet in about four minutes. It is officially stated that the thrust of the Avon is 6,000 lb. at sea level.

●

Stainless Steel.—Canada will start its own stainless steel industry this year when Atlas Steels Limited installs the first stainless steel sheet rolling mills at its mile-long works at Welland, Ontario.

Commenting on this development President R. H. Davis said, on January 28 "while this step in the expansion of Atlas Steels has been part of the Company's postwar expansion programme, we have been encouraged to make this move at this time for several reasons—Canadian fabricators have been completely dependent for their stainless steel sheets upon foreign suppliers. The United Kingdom has been supplying a part of their needs but most of their demands have been met by United States producers. Rising steel prices in the United States, together with our own Canadian import duty, transportation costs, Canadian excise taxes and the recent 10 per cent devaluation of our dollar all have had the effect of raising stainless steel costs for Canadian fabricators and users of end products made of stainless steel sheet".

Publications

Pickling Nickel.—A revision of The International Nickel Company's technical bulletin on pickling nickel alloys has been issued. It deals with nickel, Duranickel, Monel, "K" Monel, "KR" Monel, "R" Monel, Inconel and Inconel "X". Copies are available free of charge from the Company's offices at 25 King Street, Toronto 1, Ont.

The Company offers also a revised edition of "The Technical Editor Speaks", a booklet explaining the mechanical properties of metals and alloys and the technical terms used in describing these properties. The publication covers such topics as tensile properties, hardness, torsional properties, corrosion, magnetism, strengths, temperature properties, etc.

"Metallurgical Methods for Combating Corrosion and Abrasion in the Petroleum Industry", is also available.

●

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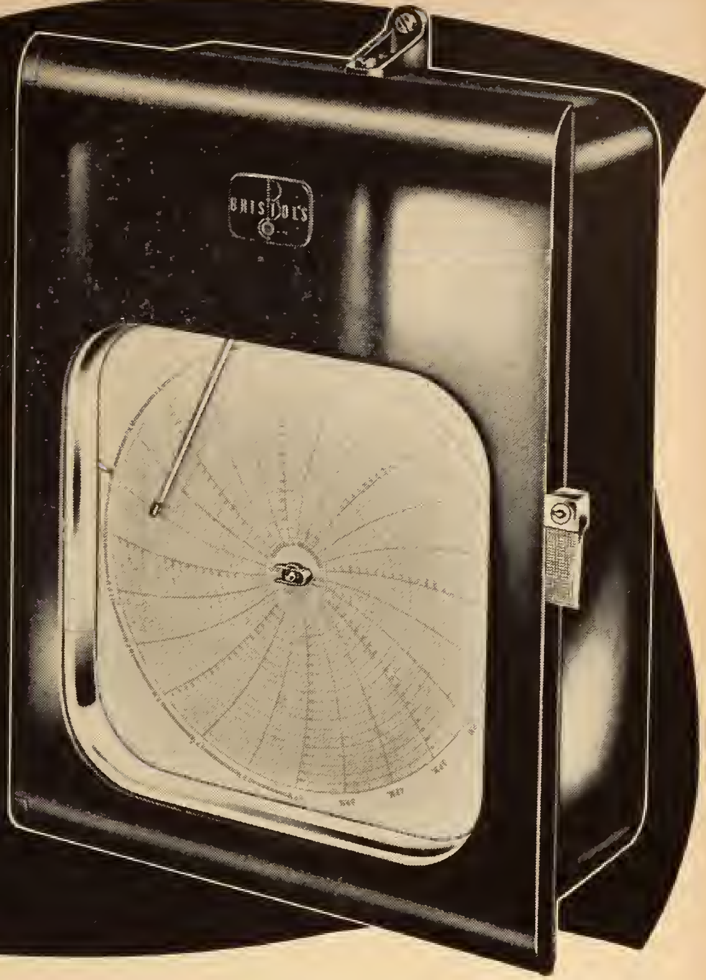

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Combustion Safeguard. — The new Bristol Electronic Pyrotrol Combustion Safeguard is described in bulletin W1816 which is being distributed by the Bristol Company of Canada Ltd., 71-79 Duchess Street, Toronto 2, Ont. This eight page, two colour, pamphlet is highly informative and most attractive in appearance.

●

Gear Data. — Hamilton Gear and Machine Co. Ltd., 950 Dupont Street, Toronto 4, Ont., offer a new technical data sheet "Non-Metallic Pinions Rawhide or Bakelite". The pamphlet is one of a series and it has been published to assist the engineer in the selection and design of the best type of gear for a specific purpose. The Company will be pleased to place readers of the *Journal* on the permanent mailing list for these informative data sheets.

●

New Vickers Booklet.—Canadian Vickers Ltd., Montreal, have released an extremely attractive 30 page booklet "Copper — Stainless Steel". In the preface it is stated "This book was prepared to give an indication of the plant capacity and abilities of Canadian Vickers in the metal working field and, in a general way, how we are equipped to take care of the ever increasing engineering needs of industrial Canada."

The publication is extremely well produced and it should be a useful addition to the files of those who have need of copper and stainless steel equipment. There is no charge for the publication.

●

Recent Graduates. — Prospective employers of recent graduates are advised to ask the Dominion Engineering Company, P.O. Box 220, Montreal, for a copy of the September 1949 issue of the "Dominion Engineer". It contains a most interesting and authoritative article, "What Can the Machine Design Field Expect from the Recent College Graduate".

●

Fire Fighting Equipment. — Ansul Chemical Co., Marinette, Wisconsin, announce an improved Model B Fire Extinguisher said to be completely watertight. It is claimed that this new design has twelve new features, chief among which are the nozzle and cartridge receiver. Specially designed seals inside the nozzle and receiver have made these two vital parts water-tight. Other changes are new threaded hose connections, new cartridge guard finger grip and redesigned carrying handle. The extinguisher is available in 20- and 30-lb. sizes. A two-colour brochure describing this equipment is available.

This Company has also a new 20-page fire extinguisher catalogue which lists the complete Ansul line. Included are descriptions and illustrations of the new model B Extinguisher, piped systems, large stationary units, fire trucks, trailers, etc. The catalogue also features charts showing characteristics of approved hand fire equipment and comparative effectiveness graphs. Canadian representatives of the Ansul Chemical Co. are: Dial Industries, 1003 First Street, Calgary, Alberta; Levitt Safety Ltd., 1652 Yonge St., Toronto 12, Ont.; and Levitt Safety Ltd., 477 Champs de Mars St., Montreal. For copies of the brochure and catalogue apply directly to the manufacturer.

●

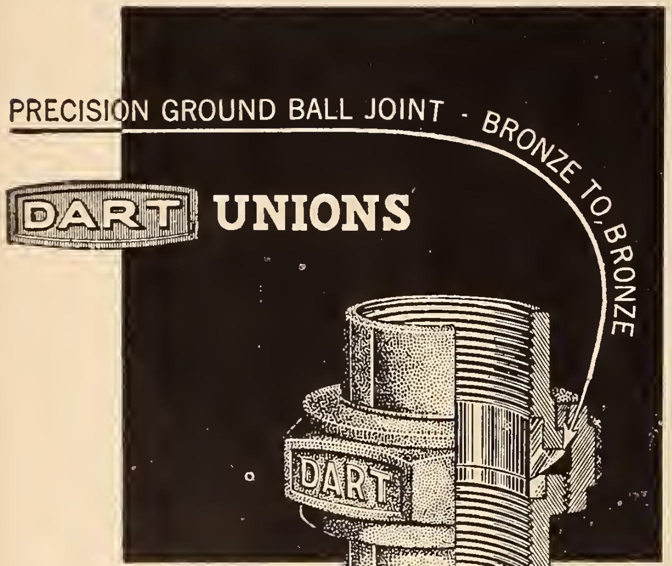
Cast Aluminum Parts.—The Aluminum Co., 1700 Sun Life Bldg., Montreal, has published a 24-page attractively designed book showing some of the uses of cast aluminum parts in manufactured products.

A description of the various types of aluminum castings is included with the reasons for using either sand, permanent mould or die castings, and a chart showing the mechanical properties of each type. There is also a description of Alcan's Etobicoke Foundry and photos of aluminum foundry equipment. The products covered by "Aluminum Castings Case Histories" are diversified and include cast aluminum chair bases, peavy sockets, pistons, spandrels, steam electric irons, portable pumps, film projectors. Copies of this attractive and informative publication are available.

●

Fluid Drives.—Link-Belt Company, 519 North Holmes Ave., Indianapolis, Ind. have released a new catalogue "Fluid Drives". The publication contains 28 pages and it is, in effect, a progress report on the Link-Belt Electrofluid Drive "ED" type. A supply of these publications is being maintained by Link-Belt Ltd., 791 Eastern Ave., Toronto 8, Ont. Copies will be sent to Institute members on receipt of written request.

●



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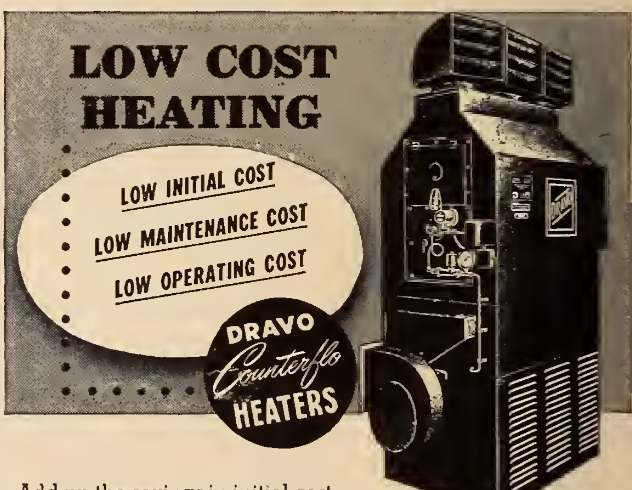

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J. E. ARMSTRONG, M.E.I.C
President

L. AUSTIN WRIGHT, M.E.I.C.
Editor

W. D. LAIRD, M.E.I.C
Assistant Editor

E. J. BLANDFORD
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ANNUAL GENERAL and PROFESSIONAL MEETING

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SNARE RIVER POWER PROJECT

A paper specially prepared for publication in the Journal of the Engineering Institute of Canada.

by

G. V. Eckenfelder, M.E.I.C.
Montreal Engineering Co. Ltd., Calgary, Alta.

and

B. E. Russell, M.E.I.C.
Inspecting Engineer, Department of Mines and Resources, Calgary, Alta.

This paper describes the construction of a hydro-electric power plant in a sub-arctic region. Outlining the early and more recent mineral discoveries in the Northwest Territories, it shows how the need arose for power, and the steps taken to find sources of waterpower within transmission distance and to develop it.

The various components of the development are discussed in turn, as well as the methods of construction adopted for each. A description is given of the unusual obstacles that had to be overcome in transporting equipment, materials and machinery to the site. The experience obtained in building an earth dam in a "permafrost" area is of particular interest.

The development of water power in the Northwest Territories is so closely associated with the mining activities in the region that it would be impossible to evaluate the present and possible water power development without a brief history and appraisal of the mineral development. Recent interest in the District was aroused by the discovery in 1930 of mineralized zones on the shores of Great Bear Lake, and the later discovery in 1934 by Major Burwash of gold in the vicinity of Yellowknife Bay on Great Slave Lake.

Early Discoveries

However, the occurrence of valuable minerals in the Northwest Territories, on the south shore of Baffin Island, was reported by Frobisher in 1576. Later exploration by Samuel Hearne in 1771 revealed copper showings on the Coppermine River, and history relates that the name Yellowknife was coined by Hearne when he discovered Dogrib Indians, located on the bay of that name, using implements of native copper.

During the period 1820 to 1850 John Franklin, on behalf of the British Government, made a series of exploration trips, which extended from Hudson's Bay to Great Slave Lake and up the Yellowknife and Coppermine rivers to the Arctic Coast, and reported the existence of oil seepages in the vicinity of Ft. Norman.

Contemporary explorers whose investigations and reports have contributed in large measure to mineral discoveries and the development of the mining industry in the Northwest Territories, were William Ogilvie of the Dominion Department of the Interior, who explored the Mackenzie River basin for the Department in 1888, and Mr. J. W. Tyrell of the same Department, who in 1900, made important explorations in the area east of Great Slave Lake.

Coinciding with Tyrell's investigations, in the employ of the Geological Survey of Canada, J. Mackintosh Bell and Charles Camsell made the most significant surveys; their reports of numerous calcite stringers containing chalcopyrite with cobalt bloom and copper, on the McTavish arm of Great Bear Lake, led to the discovery, thirty years later, of the Eldorado Radium Mine by Gilbert Labine, and indirectly to the gold development in Yellowknife.

Recent Developments

In 1933 the Bear Exploration Company, under the direction of Major L. T. Burwash, sent out parties to prospect their claims on Prosperous Lake; these parties, extending their horizon, discovered in 1934, a high grade deposit on the east shore of Yellowknife Bay. With a progressive interest in the expansion of the mining industry, the Department of Mines and Resources sent out geological parties to Yellowknife Bay in 1935, whose findings on the west shore resulted in a staking rush that clinched the future of Yellowknife as a mining camp.

From 1934 to 1940, when gold mining was subordinated to the more vital matter of national defence, an almost uninterrupted series of promising discoveries occurred. The Consolidated Mining and Smelting Company was among the first to follow staking with development, and in 1938 the Con Mine was brought into production.

The Giant Yellowknife Mine, whose existence was the initial reason for the construction of the Snare Development, is located some miles north of the Con, and although the property had been staked in 1935, it was not until 1945 that extensive development began under the control of Frobisher Exploration, and as a culmination of these activities, by the summer of 1948 a 500-ton mill was ready to operate.

For an area so remote and beset with such great handicaps of climate and difficult transportation, the rate of development of gold mining has been astonishing. In 1936 the gold production in the area amounted to only one ounce of fine gold at $35.00; by 1942 the output had increased to 99,394 ounces and, despite the crippling effect of the war years, by the end of 1948 the total production of the field had reached almost $20,000,000.

The Need for Power

In this remote region with practically no fuel resources, hydro-electric power was essential to the development of the gold mining industry. Water power surveys of the Beaulieu and Yellowknife Rivers were made by the Dominion Water and Power Bureau in 1937. The Consolidated Mining and Smelting built a hydro plant in 1941 on the Yellowknife River above Prosperous Lake, intended principally to serve the Con and Ptarmigan Mines.

Water power investigations were already underway. Mr. W. G. Stuart, acting for the Frobisher Exploration Co., seeking power for the Giant Mine, had begun investigations of several streams in the region in 1944. Also in 1944 a party in charge of Mr. Monkman of the Calgary Power Co., accompanied by Mr. May of the Dominion Water and Power Bureau, made a detailed reconnaissance of the lower Lockhart.

In 1945 a party under the direction of the Dominion Water and Power Bureau, made a further reconnaissance of the Snare and Emile Rivers, and chose a location on the Snare River as offering the most advantageous site for present and future development. Cost estimates were made and the Giant Mine in January 1946 prepared to begin construction. Machinery was purchased and delivered to the site in February of that year.

As the construction of the power plant and transmission line would

Fig. 1

Fig. 2. Tractor train on Great Slave Lake, carrying parts of 6000-kva. generator. Note front tractor required to help start the train moving and also the caboose in which the crew eat and sleep.

have severely taxed the Company's resources, Giant officials approached the Dominion Government in February of 1946 for aid. As a result, an agreement was reached, dated August 31st, 1946, whereby the Government would build the plant while the Giant Mine would construct the transmission line. The line was to be subject to expropriation by the Government one year after the time of completion and with six months notice. By a subsequent agreement, the Government took over the line upon completion.

Location and Accessibility

The project is located on the Snare River 1¼ miles south of the outlet of Big Spruce Lake, latitude 63°30′, longitude 116°00′. The inaccessibility of the site presented a serious problem. The railheads at Grimshaw and Waterways are 500 miles (airline) from the project, and Yellowknife, the nearest town and source of supplies, is 90 miles distant by air, 130 miles by cat train. The closest water port, Fort Rae, is 40 miles distant by air and 64 miles by cat train.

In placing orders for materials, a great deal of foresight was necessary, so that shipments would arrive in time to meet deadline dates for water or tractor transport. Furthermore the post war shortage of many vital materials was at its most severe point during the early stages of the project. A considerable part of the equipment was in transit for more than one year, transhipped in many cases from railway to riverboat, trucked over the Fort Smith portage, reloaded aboard Slave River boats, unloaded on a swampy, windblown stretch of beach at Franks Channel, and stored there in the open until loaded on sleighs the following February for the final lap to Snare. The incredible fact is that a negligible amount of material was lost, or even damaged.

Fig. 3. Downstream end of tunnels, at future site of power house.

Water Supply

In general, most streams rising in the Northwest Territories have similar characteristics. The rainfall being light, the water supply is dependent largely on the snowfall. Run-off starts at the headwaters in June, and flood stage affects the lower reaches of the river in late August. The remarkably late period of high water is due not only to the long winter and late spring, but also to the nature of the watersheds and river channels. The surface of the area is made up of rounded granite knolls or hills, the depressions between which contain muskegs or lakes.

Concentration of the run-off takes place by the process of these depressions filling with water until each overflows into the next lower, the water slowly finding its way, step by step into rivers, which themselves do not possess well defined channels, but consist of a series of depressions, or lakes, some of which are very large, joined together by short stretches of rapids or waterfalls. The result is a system of streams possessing a large natural storage, and having remarkably small variations in seasonal flow.

For instance on the Lockhart the minimum measured flow during the period from 1945 to 1948 was 2000 c.f.s., whereas the maximum was 6000 c.f.s. The area is classed as semi-arid, and some sections might be called near-desert. Precipitation results in a run-off of the order of 0.2 second feet per square mile. Watersheds with upper reaches in the Barren Lands appear to have a somewhat higher run-off; for example, the Lockhart River basin produces 0.345 c.f.s. per square mile.

Most of the streams within an

Fig. 4. Placing rolled fill in north channel.

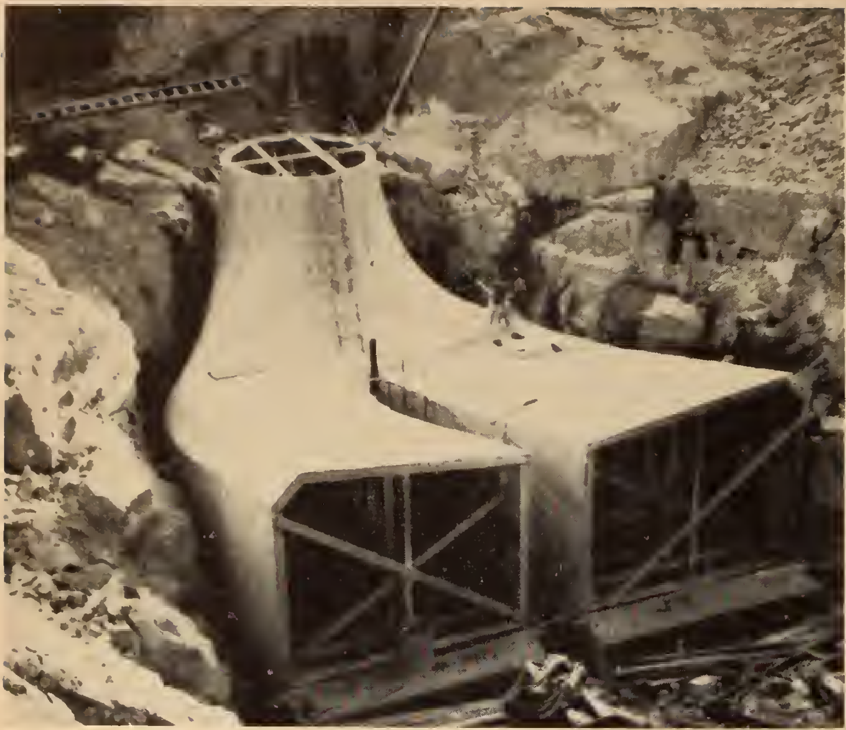


Fig. 5. Draught tube form in place.

economic transmission distance of the areas with known mineral resources present some power possibilities and streams so far investigated have a high proportion of economic sites. Attractive damsites are frequently found in the narrow channels connecting the lakes, the lakes themselves providing ample storage.

The first discharge measurements of the Snare River were made late in 1944. Thus four years of actual record on the river are available. The highest measured discharge was 3,980 c.f.s. on August 25th, 1946. The peak flow was estimated at 4200 c.f.s. The low discharge occurred on April 30 of the same year — 393 c.f.s. The mean flow for four years determined by the hydrograph is 1,430 c.f.s. Ten years of record are available on the Yellowknife River and a comparison of available concurrent records on the Snare indicates a ten year mean flow for the Snare River of 1,320 c.f.s. A further 343 c.f.s. can be readily diverted from the Emile River.

General Features of Development

The site of the Snare River dam and plant is located in a narrow section of the river valley, 1¼ miles below the outlet of Big Spruce Lake. The overall length of dam at crest elevation 735 above M.S.L. is 763 ft., developing a total head of 63 ft. The foundation is for the most part exposed bedrock which is a hard tight granite showing surface cracks in some places. Light overburden overlays portions of the south bank. Big Spruce Lake provided a storage basin 7 square miles in area, and Kwejinne Lake provided an additional 27 square miles, resulting in a total reservoir area at Elevation 725 of 22,000 acres. The estimated usable storage is 220,000 acre ft.

The development consists of an earth fill dam spanning across the rock island, a concrete intake structure with trash racks and roller gate at the upstream end of the island, which admits water to a tunnel through the island. The powerhouse is located at the downstream end of the tunnel, and contains one main unit of 8350 hp. at 56 foot head. A second parallel tunnel forms the penstock for a 190 hp. house service unit. This turbine drives a 150 kva. a-c. generator and a 90 kw. spare exciter. Power is transmitted to Yellowknife over a 115,000-volt line 89.8 miles long.

Unwatering and Pressure Tunnels

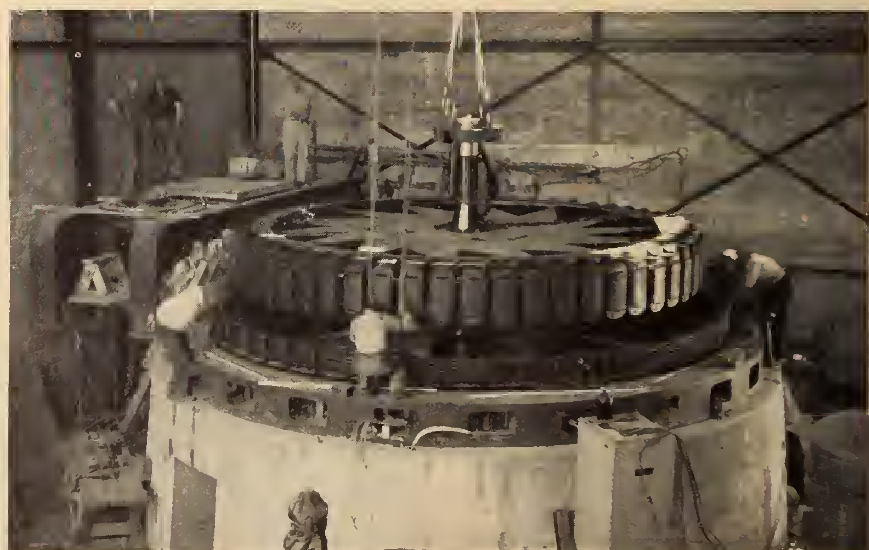
Unwatering was accomplished by driving the tunnel 256 ft. through the island. Since the floor of the tunnel was five feet below tailwater, the upper half was first driven while a timber crib cofferdam was being erected at the head of the North channel. Logs cut on Big Spruce Lake yielded some 280,000 ft. of rough lumber for the job. The subcontractor completed the tunnels and cuts on November 11th of 1946.

The Dam

The earth fill dam has a rolled impervious core, and pervious embankments graded from fine sand adjacent to the core, to quarried rock at the outer faces. Side slopes are 2½:1 downstream and 3:1 upstream. The impervious material for the core was obtained in nearby swamps and consisted of rock flour of very uniform size, and low permeability. The sand required for the pervious zones of the dam was found in great abundance and in a great range of gradings within twelve hundred feet of the damsite. A total of 165,000 cubic yards of material is contained in the dam.

The core material in its natural state was permanently frozen, and contained considerable excess moisture. This necessitated costly and time consuming treatment before it

Fig. 6. Installing generator rotor.



could be placed. The procedure followed was that of allowing the pit to thaw to a depth of 6 inches or more, after which the unfrozen material was peeled off by bulldozers and pushed within reach of a dragline standing on firm ground at the side of the pit. The dragline loaded the clay into track wagons, for carrying to the dam, or to stockpiles where it remained until sufficiently dry to place.

The bulldozers, as long as they did not travel repeatedly in the same track, had no difficulty travelling on the freshly uncovered frozen clay and ice lenses, but if allowed to wallow too long in one area, they became hopelessly "gummed up", with resulting frequent transmission failures. To add to the difficulties the season turned out to be much wetter than normal, with frequent rains of long duration. This turned the clay into an unmanageable mud, totally unsuitable for the purpose of dam construction.

Due to these difficulties the work fell behind schedule, and it was found advisable to reduce the core thickness by about one-half, the side slopes being steepened to .45:1. These slopes were permitted to carry down to within 8 feet of bedrock where the limits of the core reverted to the original section. This change in design resulted in a saving of 12,000 cubic yards of clay.

The dam was left in 1947 with a 5-foot cover of sand over the core to prevent frost penetration. In May 1948, as soon as the mean temperature rose above freezing point the sand was removed, and it was found that a maximum of fifteen inches of the core was frozen. In a country where moist material will freeze eight or nine feet in an average winter, this was considered to be full justification for the provision made to protect the core.

Fig. 7. General view from tailrace showing completed dam and power house.

Intake Works

The entrance structure, a reinforced concrete tower at the tunnel portal, contains the roller type gate and hoist. A steel gallows frame for removing the gate, and a gate house, were mounted on top of the structure. The gate is fabricated of structural steel, 14½ feet by 18½ feet, with ½-inch skin plate. The gate is operated from the hoisting floor by an electric hoist and including ballast, weighs 26 tons.

The entrance to the exciter tunnel, 4 ft. by 6 ft. is located in the south wall of the entrance cut, 32 feet from the face of the main gate. The tunnel is collared with concrete in which are set the gate guides. The 2-inch steel plate gate is operated from the gate house by chain blocks. The total area of the trash racks is exceptionally large due to the fact that the forebay was not cleared No provision was included for mechanical cleaning of the racks The structure was built and the gate installed during the spring of 1947 prior to blowing the upstream tunnel plug. Operation of the gate during the summer of 1947 was by means of a dragline, or by chain blocks.

Fig. 8. General view of completed project.

The Powerhouse

The powerhouse is of steel frame construction, with walls consisting of a double course of concrete blocks made on the site, with the voids in the inner course filled with rock wool for added insulation. The roof is of osmosite treated laminated spruce, with fire resistant provision in the form of a ⅛-inch asbestos board below the lamination, and separated from it by a ½-inch air space. Over the lamination is vapour barrier paper, building paper, half-inch fibre wall board, and finally a four ply felt, tar and gravel roof. A steam radiator system was supplied from a 200-kw. G.E. steam generator, which also heats the nearby staff dwellings.

The main generator is a Canadian General Electric 7000-kva. 6900-volt vertical unit, driven by an S. Morgan Smith Francis type turbine rated at 8350 hp. at 56 feet head and 128.5 r.p.m. Water is admitted to the turbine through a 13½-foot diameter welded steel penstock thimble, grouted into the lower end of the tunnel. The service unit is a horizontal set consisting of a 190-hp. Charles Barber turbine, directly connected to a 90-kw. spare exciter on one side of the turbine, and to a 150-kva. alternator on the other. Water is admitted to this turbine through a 3-foot diameter penstock grouted into the tunnel. The switchgear is Canadian General Electric, cubicles enclosed, and includes four 7500-kva. oil circuit breakers; the main generator breaker; station service, local feeder, and feeder to the step-up substation.

Construction of the power plant presented many problems not usually encountered in small structures of this type. The season during which concrete can be poured without frost protection extended from late May to mid-September. Considerable concrete was poured during other than these months, heating water and aggregate. Heating of forms was accomplished with burning stoves and gasoline fuelled Herman Nelson "Jeep" heaters. On only one occasion did concrete freeze.

The steel erection crew and their equipment were flown to the job early in April, 1948, and prior to erecting the superstructure were employed in welding and installing the penstock and scroll case. Handling of the steel members was done by a North West dragline with a 65-foot boom, extended 12 feet by lashing the last column to be erected to the end of the boom. Installation of the turbine was begun on its arrival, regardless of the fact that the preliminary floor and speed ring piers were entirely in the open and the temperature well below zero.

Assembly of the generator stator frame began June 18th, and the switchgear installation was started a few days later. The roof of the powerhouse was now partially completed, but the tar and felt had not yet been applied, and walls were only started. Large tarpaulins and building paper ineffectually kept out rain and sand. Despite delays the bus was energized early in September and power was supplied to the Giant Yellowknife Mine October 1st, 1948.

Transmission Line

The step-up substation structure is of wood pole construction, with four (1 spare) 2500-kva., 60-cycle, single phase 115,000/6900 C.G.E. outdoor radiator type transformers, a gang operated horn gap air-break switch, and thyrite lightning arresters. The low tension bus is of 1-inch copper tubing. The 115,000-volt transmission line is 89.9 miles in length from the plant to the Giant substation, and carries 3/0 7-strand ACSR conductor, on 716 wooden structures, with insulators composed of seven units. The right of way is cleared 60 feet wide, and the minimum ground clearance is 22 feet. The line was designed for ¼ inch of ice and an 8-pound wind load at 15° F.

A telephone line of No. 8/A 3-strand copperweld conductor is carried 12 feet below the power conductors and transposed every other structure. Poles are of native spruce, Osomar-treated, except 150 cedar poles 50 feet or longer which were imported; cross arms are of B.C. fir.

Supplementary Dams and Spillway

The full supply level was limited by several low draws, the lowest of which was at elevation 719. In order to provide an inexpensive spillway, and to keep the number and size of the containing dams within reasonable limits, the full supply level was set at 725.0. At this elevation two containing dams were required about five miles from the main dam.

The first of these was underlain with a bed of sand about 35 feet in depth. Excavation to bedrock was too expensive and not justified for such a minor structure. No attempt was made to render impervious either the foundation or the dam placed upon it, the anticipated seepage being unimportant. The dam was therefore built in the form of a lightly compacted embankment, the central portion of sandy silt being flanked with sand and the shell formed of gravel. Heavy rock berms were placed on both toes.

The second draw was underlain with a rock reef, the deepest section of which was under seventeen feet of permanently frozen muskeg and silt. This draw was chosen as the most likely site for a spillway. Here the closure finally selected consisted of excavating the rock nose to elevation 722, and building a simple flashboard controlled spillway. The rock excavated was used to build berms across the depression adjacent to the rock dyke. Between the berms, a compacted fill of silt and sand was built.

This dam, being on permafrost, was bound to settle considerably once the thawing effect of the reservoir water was felt and, rather than attempt to correct this condition, the dam was simply built some ten feet oversection, permitting a large amount of settlement. The wide rock berms were intended to prevent pushing out of the underlying material due to excessive settlement. The fill actually settled about three feet during the construction period, but as far as is known, subsequent movement has been negligible. The spillway structure consists of six-inch "H" beams set vertically in concrete, 8 feet 6 inches apart with the webs parallel to the flow and the flanges forming a gain for flash boards. The capacity of this spillway is 11,500 c.f.s. at elevation 725, and at this elevation other draws will discharge the balance of the estimated maximum flood of 13,000 c.f.s.

Permanent Dwellings

Housing provided for the permanent staff consists of a five roomed house for the plant superintendent, a four roomed cottage for a married operator, and a large staff house containing an apartment for the housekeeper and ten single rooms for staff members. These buildings were built with ample provision against the cold. Steam and water are brought from the plant in an insulated wooden duct which also contains the condensate return line and the sewer.

Transportation

The most difficult problem encountered in this project was the transportation of men and materials to the job. It is over five hundred air miles to the Snare Development from Waterways on the Athabasca, or Grimshaw, in the Peace River District. From Waterways there exists a river boat service with one portage at Fort Smith, which permits delivery of cargo to Fort Rae, or Frank's Channel, at the extremity of the North West Arm of Great Slave Lake, some 64 miles short of Snare. The Navigation season lasts roughly from July 1st to September 20th. Rates from Waterways to Frank's Channel are $35.00 to $40.00 per ton.

From Grimshaw a road was completed in 1948 to Hay River on the south shore of Great Slave Lake, a distance of 380 miles. During the period of construction at Snare, this road was only partially completed and was passable in the winter only. From Hay River it is some 250 miles by tractor train to Snare, making a total of 630 miles from Grimshaw to the project. Road construction from Hay River was entirely out of the question due to the nature of the ground.

Air Transport in light, pontoon or ski equipped aircraft is possible the year round, except for a month or so in the spring and fall when flying is prevented by the breakup and freezing of the lakes. Such planes carry a maximum of 1500 pounds. A Norseman, owned by the contractor on the job, made daily trips to and from Yellowknife, carrying men and light freight and supplies. D.C. 3's landed on a prepared runway on the ice at Big Spruce Lake during the latter part of the winter. The only means therefore, of transporting heavy freight from the head of navigation on Slave Lake was by tractor trains, during the late weeks of the winter where the ice had attained a minimum thickness of thirty inches.

Winter Haul Over Slave Lake

The period during which Great Slave Lake may be crossed with a minimum of danger is at the most two months. This method of transportation, common to all the unsettled parts of Northern Canada, is expensive, uncertain, and hazardous. The usual procedure is to plow a road with a bulldozer through the snow covering the ice, the bulldozer being followed by a train or trains, each containing up to ten heavy sleighs pulled by a tractor. The total pay load pulled by one tractor under favourable conditions may reach 125 tons, but the normal load is 50 to 75 tons. Each train is self contained, with a caboose, where the crews eat and sleep. Travelling is continuous, two shifts being employed. Trails on open lakes are blown full of snow in a very short time, and must be freshly broken on every trip.

Constant vigilance is necessary to see newly formed cracks, and frequently aircraft and snowmobiles are used to reconnoitre routes through areas of thin ice and pressure ridges. These latter are the result of contraction during cold weather, where the ice of large lakes fractures, then, after the open water in the fracture has frozen, if warmer weather occurs, the resulting expansion will cause the ice to buckle, piling up ridges of broken ice slabs, which may reach heights of twenty-five to thirty feet. Generally, there is open water on either side of these ridges, when they are newly formed, which thus become impassable obstacles. These cracks and pressure ridges generally stretch between points of land, or perpendicular to the long dimension of the lake. They may be a hundred miles in length.

The first freight was delivered during the late winter of 1945-46, and consisted of some construction equipment, dynamite and cement. During the summer of 1946 the equipment, some lumber, cement, dynamite and non-perishable food supplies were delivered by water to Frank's Channel. This, together with further construction materials from Grimshaw and Yellowknife, was brought by tractor to the job in March, 1947. This winter operation involved 1,577 tons at a cost of $0.456 per ton-mile. The freighting in this case was done by an independent transportation contractor.

Transportation Costs

In the open water season of 1947 some 1,200 tons of material, including the main transformers and the generator upper bracket, were delivered to Frank's Channel and the Yellowknife. In February and March, 1948, this tonnage was hauled to Snare, and in April, when the ice on Great Slave Lake had reached a depth of 30 inches, 220 tons of machinery, trucked from Grimshaw, was brought by tractor from Hay River. This tractor haul was done by the project forces and tractors, at a cost of $0.345 per ton-mile. At the same time 250 tons of cement and small freight was flown from Hay River in D.C. 3's. This airborne freight cost $149.00 per ton from Hay River, not including the cost of unloading the aircraft or maintaining the runway on the ice. The total cost of transportaton for the job, including operation of the project Norseman, cost of chartered planes, and airline tickets for personnel from and to Edmonton, was 13 per cent of the cost of the job.

Equipment and Personnel

The construction equipment consisted of three draglines; a 2-cubic yard Northwest and a ½-cubic yard Koerhing, both equipped with shovel attachments, and a 1¼-yard Link Belt; eleven caterpillars; six 10-yard Athey track wagons; two 5-cubic yard dump trucks and two 4-cubic yard dump trucks; one ½-ton light delivery; four Ingersoll Rand Diesel air compressors with total capacity of 1,150 cubic feet; three wagon drills; drills and steel sharpening equipment; a portable sawmill; two Diesel powered lighting plants with total capacity of 78 kva.; two concrete mixers; two 25-ton landing craft and one "Penn Yann" air force crash boat. The majority of this equipment had been used on the Canol project and was in storage at Norman Wells.

The general contractors were Northern Construction — Fred Mannix Companies of Vancouver and Calgary, with A. C. McEachern as project superintendent. The transmission line was constructed for Giant Mines by the Gowganda Timber Co.; consulting engineers, Sutcliffe and Company. Montreal Engineering Company Limited was responsible for the design layout, and for supervision of the project. The project was completed and officially opened on October 4, 1948, and delivery of power over the 94-mile transmission line commenced. The estimated cost of the project was $4,500,000, including the transmission line. The final cost was $4,485,295. It was remarkable that the final cost, despite the remote locality and extremely difficult conditions, was actually under the estimated cost.

Power Will Stimulate Mining Industry

The Northwest Territories Power Commission Act was passed by Parliament, and came into effect on September 1st, 1948. By this Act the Northwest Territories Power Commission was set up to operate and maintain the Snare River Power Plant, and to facilitate the construction and operation of power plants in the Northwest Territories for mining and other interests. Electric power from Snare River, and such other plants as may be constructed, will be sold at as low a rate as possible, of overhead, operation and maintenance. Through the Commission, power will be made available in the Northwest Territories as soon as its need is definitely established in any area, thereby encouraging the development of mineral properties.

REPORT on TELEVISION

by

J. A. Ouimet, M.E.I.C.
Chief Engineer, Canadian Broadcasting Corporation, Montreal, Que.

A paper presented at the joint meeting of The Engineering Institute of Canada and of The Institute of Radio Engineers in Montreal on November 10th, 1949.

Broadly outlining the history of "TV", the author shows how each of the five countries broadcasting today have different standards. Reasons for Canada's choice of a standard similar to that used by the U.S. are given. The advantages and disadvantages of each national standard are compared and the technical features of each are described.

The economic aspects and programming in each country are discussed to show that each has its own peculiar problems and particular needs. Canada's problems and needs are entirely her own and we must find our own solution. In conclusion the author shows how broadcasting and receiving set manufacture are dependent on one another.

Most of you probably know that television is about 25 years old, and that the first real television images were shown in England, in the middle twenties, by John Baird. But few remember that we had television in Montreal some 20 years ago. It is believed that the first successful television pictures obtained in Canada were shown at l'Ecole Polytechnique by Professor Bernier, in 1930. Then, in 1931, the newspaper La Presse went on the air with the first experimental television transmission in Canada, using the 45 line system of Sanabria. A year later, they changed their system to 60 lines, using equipment supplied by the first Canadian television company, Canadian Television Limited.

In television, the image to be transmitted cannot be handled " in toto ", i.e. as a whole, in one shot. It has to be analysed, or divided up in a series of elements of varying light intensity, which are transmitted one by one in rapid succession, and are reconstituted at the receiving end in their proper position and intensity. All of this is done so quickly that the eye is not conscious of the process, and actually sees a complete and uninterrupted picture. This process of analysis is called " scanning ". In the early days, it was done mechanically. Today we do it electronically. Considering only the optical dissection of the image before it goes into the electrical conversion system, we can see readily that the number of lines determines the fineness of the analysis, and, hence, the definition of the detail which the system can transmit.

Baird started with 15 lines and then went to 30, in a vertical scan. What we used in Montreal, in the early " thirties ", was 45 and 60 line horizontal scanning. After this, progress became very rapid. In 1937, television jumped to 405 lines with the installation, by the B.B.C., of the first high definition system in the world. They are still using it today, with excellent results. Later, the United States settled on 525 line in 1945, after an interim stop at 441. France had been using 450 until recently, but they are now changing over to 819.

It is easy to recite this ascending series of figures, but you must remember that each improvement in the line structure represented many thousands of hours on research and development. Generally speaking, the difficulties to be surmounted increase as the square of the number of lines. For one thing, the frequency band, which is necessary for transmission of television, varies also as the square of the number of lines, everything else being equal. It also varies directly with the number of pictures transmitted per second. This rate of repetition determines, in turn, the evenness of reproduced motion and the amount of subjective flicker experienced. In order to get high repetition rates to reduce flicker without increasing band width, television has resorted to an optical trick,—the presentation of two incomplete pictures in succession. But even with this stratagem, medium and high definition television eats up the frequency spectrum faster than its frontiers can be rolled back by electronic research.

While the original thirty-line picture could be transmitted in the spectrum space occupied by an ordinary radio station, that is, something in the neighbourhood of 10,000 cycles, the 525 line American television channel takes 600 times as much space and the French 819 line will eat up two and a half times as much again, that is 14,000,000 cycles. The only space left in the radio spectrum for such large frequencies is to be found in the very high and ultra high frequencies, which is just a hard way to describe metric and decimetric regions of the spectrum.

Each Country on a Different Standard

There are only five countries in the world with television stations actually in operation. The United States is far ahead with 91 stations, using a 525 line, 60 frame standard. Great Britain has only one station in operation in London, but a second one will go on the air in Birmingham, in December. These two stations use the 405 line, 50 frame standard. France has one station in Paris, on the Eiffel Tower, with 450 line, 50 frame transmissions. They are completing, also in Paris, the installation of new equipment to give 819 line, also 50 frame. Italy has one station in Turin, operating on 625 lines, 50 frames per second. This is a very recent installation and uses American equipment. Russia also has one or more stations operating, probably on 625 lines, but it is very hard to get any technical information on these installations.

Thus it can be seen why the question of standards is such an important one in Europe. Until the European countries can reach some understanding on a more or less uniform standard, they will not be able to interchange programmes and cut down operating costs to an acceptable figure. Until this is done, most countries in Europe will not be able to afford television. This is probably the proper place to stress the fact that the problem of television is no longer a technical one, but entirely an economic one; in other words, with money you could solve practically any technical problem, in television today.

Everyone in Europe recognizes the seriousness in the lack of uniformity between television standards now in use. A serious effort was made last July, in Zurich, at a meeting of C.C.I.R. to arrive at some international standard acceptable to all, but the results were not too encouraging.

All countries that had not started in television, including Italy, formed a "625 line block", advocating a 625 line, 50 frame, 6.75 mc. channel. This group claimed they could not accept the 405 British standard, because it was, in their opinion, too low and obsolescent. They rejected the 525 line American standard because its 60 fields per second did not suit the European power frequency of 50 cycles per second. Finally, they rejected the French 819 as unrealistic and too costly in money and in frequency space.

On the other hand, Great Britain considered its service quite good enough, simple and relatively economical. In any case, they let it be known that it could not be changed because of commitments made to the British public and because of the large sums already invested.

The Americans claimed that the difference between the proposed 625 standard and their own 525 was so small that it made very little practical difference. In any case, they had half a billion dollars invested in their present system and could not possibly change it. France stuck to its thesis that all other countries would regret it later if they saddled themselves with a system of inadequate definition. In that respect, they claimed that 819 was the minimum acceptable compromise.

Why Canada Will Follow U.S. Standard

No attempt will be made here to take sides in such a learned controversy, but you already know that, in Canada, we are going to use the same standards as in the United States. This was decided a year or so ago by the Department of Transport, after consultation with the C.B.C., R.M.A., C.A.B., and others interested. I think it will be agreed that this was a most practical decision.

In the first place, a good 525 line picture is good enough, and, for that matter, so is 405. But the adoption of 525 line definition for Canada will enable Canadians to tune in directly to American stations, if they live near enough to the border to be able to receive them. What is equally important, it will similarly enable Americans to enjoy Canadian television programmes, as many of them now do in the case of radio.

It will also enable us to bring in the better American programmes which Canadians will wish to see, and vice versa. Any other standard would have erected a television curtain between Canada and the United States, and, although Canadians will always insist on an adequate amount of Canadian programmes, I do not believe they would like any standard which would automatically exclude anything else.

Furthermore, 525 line was a good compromise between cost and quality. The success of television in any country will depend mainly on the ability of its people to support it financially. Higher definition or colour will cost more than medium definition black and white. In that line of thinking, the French thesis of 819 line is not practical for Canada with the tremendous transmission problems we have to face, because of the vastness of our territory.

Furthermore, such high definition would cut down the number of channels to less than half of what we could have with 525 lines. If this was done, the shortage of frequencies would not permit the type of operation which we like to have in Canada. Besides this, then, there obviously are other tremendously important technical and economic advantages in falling in line with the most highly developed television system in the world, particularly when this system is being developed right at our doorstep.

Thus, our Canadian standards will be: 525 lines, 60 fields per second, 2 to 1 interlace, 4:3 aspect ratio, frequency modulation for the sound, negative modulation for the picture, horizontal polarization and a 6 mc. channel. Furthermore, we will use the same frequency allocation structure. We will share the same channels, use the same frequency band width and, generally speaking, we will have the same allocation standards as to distance between stations, as to maximum radiated power, etc. This uniformity of standards will greatly simplify the work of both countries in dealing effectively with interference problems near our common border. But, let us get back to Europe and see how well they have done with their particular standards.

National Standards Compared

The French 819 line gives you, as is to be expected, the best detail. You can get closer to the picture before the line structure becomes noticeable. On the other hand, this system is not yet in full operation and it cannot be compared with others, under practical conditions of day to day operations. However, this will be possible in the near future, probably within a few months, since the Paris station is now being changed over for operation on both 819 and 450 lines. In any case, it will be interesting to see how this high definition system progresses in the next two or three years. French engineers are enthusiastic about it, so much so that they seem to have somewhat neglected their 450 line system in favour of their higher definition experiments. This is the impression obtained from the somewhat limited observations possible in 1947 and later during more recent visit, last September.

In England, on the other hand, they have been working faithfully at their 12 year old 405 line system, and they have been very careful about their equipment and their operations. As a result, the 405 line picture received in the average home is, in practice, just as good as the 525 line transmissions in the United States, although, theoretically and ultimately, the 525 line should be superior. As things stand today however, there is not much to choose between the two.

There are many elements other than mere resolution to take into account. For example, the contrast range, the gamma of the picture, its linearity, that is, the lack of geometric distortion, the cleanliness of the background, the absence of noise and of phase and transient distortion. Every one of these factors is just as important as good definition, and requires a great amount of care in setting up and operating the equipment. This is where the B.B.C., in England, really leads as compared to other countries. This pride in workmanship is of course characteristic of British engineering, and it permeates also their operating techniques, in the lighting and in the camera work of their television productions.

On the other hand, the cameras used in England are not as sensitive as those used in the United States. For that reason, the camera lenses have to be adjusted with larger diaphragm openings, with a resultant loss in the depth of focus of the picture. Furthermore, the British picture is generally not as bright as that given by the average American set. This is not because brighter pictures could not be produced, but rather because the 50 frame standard would give flicker, if the brightness was increased further. As already mentioned, the European standard is 50 as compared to the American 60. These specific rates were set to correspond to the frequency of the electric power service generally used in Europe and in the United States. This was done to minimize the effect of power induction interference, which was of great concern in the early days of television development.

However, the Americans can keep their lights turned on when they look at television, as a result of their higher frame standard. The British, on the other hand, can get much better film transmissions because they use a rate of 50 instead of 60. This is because the standard frame rate for films, throughout the world, is 48 per second and, thus, much nearer to the 50 standard used in Britain than to the American 60. As a result of this advantage, the British television industry has been able to develop their film projection equipment to a much higher degree of perfection than has been possible in the United States, where the problem is much more difficult.

It is for this reason that the B.B.C. film transmissions represent the best television in the world today. These film transmissions are much better than their own live broadcasts and much better also than both studio and film broadcasts in the United States. On a good home receiver, the B.B.C. film transmissions can give such good reproduction that it is doubtful if anyone would wish to go to the cinema, if the same films could be presented on home television. No wonder cinema theatres are greatly concerned with the situation in England.

Technical Features of Various Systems

We have been discussing 405 line film transmissions as received on a 10 in. or 12 in. receiver of good quality. These transmissions are really good, but you have not seen television unless you have seen the same transmissions as received on a nearly "ideal" monitor. By this is meant the best one that can be built now in the present stage of development of the art. One of these custom-built monitors at the B.B.C. uses a 20 in. direct view tube, with all possible distortions apparently removed: no transients, no smudging, no edging, good contrasts, probably 100 to 1, full band width and, most amazing of all, no visible line structure. This last development is an interesting one, and it is hoped that some day it can be applied cheaply to home receivers. The removal of the line structure to the point where it is hardly noticeable is accomplished by "wobbulating" the spot up and down with a very high frequency modulation. Under these conditions, you could really see what the 405 line system can give, when pushed to its limits, and the picture you got was something to remember. It seemed every bit as good as a good 16 mm. projection.

We have discussed this "flying spot" scanner and this very special monitor in some detail because, if 405 line can produce such a good picture, then you have every reason to have real confidence in the theoretically superior 525 system which we have adopted. Of course, it will take a long time before we can bring each element of our television chain to the same degree of development, in actual day to day operation, as can be attained under laboratory conditions. But we should try, and, first of all, this means care in design, care in manufacturing and care in operating the broadcasting equipment. It means also the careful engineering of receiver circuits, so that they may do real justice to the quality of the image transmitted. Here, again, is the problem of high fidelity placed before the industry in a more pressing and more challenging form than ever before.

Another interesting demonstration seen at the B.B.C. was the comparison between sequential and interlace scanning. As mentioned earlier, interlacing is the trick we use to cut down flicker for the same band width of frequencies. This demonstration really proved that we did not get anything for nothing. Compared with the interlaced picture, the sequential picture (nothing whatever to do with C.B.S.' colour system) was so steady that it seemed glued to the face of the tube. On the other hand, the interlaced picture, with half the band-width and with the same apparent definition, seemed to have a certain type of instability, which you most certainly perceived but could really not describe.

There is no colour to speak of in Europe. There was a colour demonstration at Radiolympia, using the equivalent of the C.B.S. system, but it was one of their first experiments, and the colour was really not as good as we have seen it in the United States. Of course, colour is the topic of the day in the United States. Two years ago, the possibility of an early colour development nearly stopped progress in black and white, but, this time, in spite of the much greater proportions which the colour vs. black and white controversy has taken in the United States, the sales of black and white receivers are continuing to zoom at an amazing rate.

This can probably be explained by the fact that the American public seems confident now that any decision that F.C.C. will take in colour will not render their black and white receivers obsolete. In other words, they feel that the standards will be such that they will be able to receive colour transmissions of the future on their black and white sets, in monochrome. Another thing is that they want to enjoy their television now, irrespective of what the future may bring.

In this rapid review of some of the technical features of the various television systems of the world, I have purposely picked out certain interesting items which stand out amongst the others. As a result, I have exaggerated differences, but, actually, the basic technical concepts, the operating practices and the equipment found in various countries are all very much the same, leaving very little to choose between them, when everything is considered. This is of course to be expected, and is as it should be, considering the ease with which patents and technical information can be exchanged, in television, on an international scale. It is in the philosophy of programming and in the economic structure of television that the real differences between European and American practices really become apparent.

Programming and Economic Aspects Compared

It must be stressed, at the outset, that the United States stands well ahead of all others in the sheer magnitude of their television operations. With 91 stations already on the air and with some 2,750,000 receivers already in the hands of the public, the American television industry dwarfs anything that can be seen in Europe. There are only three stations in regular operation in the rest of the world, one in London, one in Paris and one in Turin. This is excluding Russia, since we have no detail about their operations. In the London area, there are some 200,000 receivers in use, while in Paris, there are only a few thousands. The sale of receivers in Italy has not yet started, since the country has not reached a final decision with respect to standards.

This amazing difference between the growth of television in the United States and in Europe needs further explanation. First of all, the war left France and England in a vastly different state of affairs than in the United States. The European people must consider television more or less as a luxury, which can well wait until they have found solutions to much more urgent and important problems, of which they have plenty other than television. Then, whatever effort they have been able to make in television, it had to be gauged by the availability of basic materials, which are still in great shortage in Europe. If it had not been for this material situation, particularly the shortage of glass blanks for cathode-ray tubes, the number of receivers in Great Britain would have been much higher than it is. Finally, there is the question of national temperament. Both the British and the French are very cautious, and by no means as wealthy as their American cousins. They are more thrifty, more discriminating and more resistant to sales pressure.

The situation in France is even more easily explained. France's efforts in television have been excellent, but mainly technical and more or less theoretical. They seem to have been much more concerned with technical development than with the establishment of regular service. There has been nearly as much controversy regarding basic standards as there has been about their governments. Under these conditions, the French public has had little incentive to invest in equipment that might turn out to be obsolete after a few months of operation.

From the point of view of programmes, Britain is definitely ahead, not in quantity but in quality. What characterizes the British television programmes, as compared to other countries, is their maturity and their professional polish. Furthermore, there is no rushing about to get out quantity irrespective of quality. The B.B.C. television service really starts only at 8 or 8.30 p.m. and it ends around 10.15 or 10.30. In the afternoon, they have films or repeats for the purpose of testing receivers, but their main effort is concentrated in two or two and a half hours in the evening. There is no filling-in at the start or at the end of this period with old films or with second rate wrestling shows. Their lighting and their camera work is much more professional, with a visual appeal which is partly missing in the American pictures.

No secrets are being revealed in telling you these things, as the American television producers are the first ones to recognize this situation. There is no doubt that they could do just as well themselves, if they had the chance, that is, if they had the time and the money for that kind of operation. The B.B.C. spends about $4 millions a year for twenty-eight hours of programmes per week, for one station alone. Compared to this, the small American local station spends less than one-twentieth of that amount. Of course, the New York stations spend much more all together, but there are seven of them and they operate much longer hours, so that they still have to spread it pretty thin, especially when they can get back only 40 cents for every dollar they spend. For the moment, the big job for the American broadcaster is not turning out the best possible programmes, but to span the 60 cents gap between the dollar they spend and the revenue they get.

Canada Has Problems of Her Own

So, there you have it, *each one to his own philosophy, each one to his own system according to his own particular needs and to his own peculiar conditions.* This is perhaps the most important thing I have to say to you tonight. Let us remember it, in discussing Canadian television. When we talk about television in Canada, let us discuss it in relation to Canada and not in terms of what the British can afford or what Americans have been doing. In Canada, we have our own set of conditions to meet, which are quite different from what you find in other countries. It is because of this that our solution may have to be different.

God forbid that we be negative about such an amazingly important and stimulating development as television, but let us admit right at the start that the development, in Canada, of a truly *Canadian* television service will not be an easy thing. The experience of Great Britain and of the United States in television will be of tremendous help to us, but their problems are nothing compared to some of ours, particularly the vastness of our land and the smallness of our population. These are the same old difficulties we have had to face throughout our history, in the development of all our communications, our railroads, our airways, our telegraphs and our telephones. We had to face them again in developing our radio system, this time, with the added problem of preserving our Canadian character and our distinctive cultures, in an atmosphere of the closest friendship with our neighbour, the most powerful nation in the world.

As with radio, we will not find a solution in a straight copy of either the British or of the American system alone, but rather in a well co-ordinated combination of the two. This is the basis of the plan which the Government announced last March, and which Mr. Dunton described recently before the Association of Canadian Advertisers, in Toronto. He said:

> "The C.B.C. will establish television on production centres in Montreal and Toronto, with associated transmitters. The Government is prepared also to grant licences for privately-owned stations in different areas of Canada, including one in Montreal and one in Toronto, in addition to the C.B.C. stations there. Because of the high cost of television operations, the Government suggested that individuals or groups interested in any area join in applying for a licence and so be able to pool their resources. From its centres, the C.B.C. will furnish a service of television programmes for broadcasting by stations which may be established in other parts of Canada, and thus provide a part of their programming. In this way, privately owned stations in other areas will provide an outlet for at least a part of the C.B.C. national television service; and, on the other hand, they will be helped in their programming problems by having such a service supplied to them.
>
> It is planned that, in the early stages, this service will be supplied to stations by television recordings, as networks have done in the United States until co-axial cable or ultra-high frequency radio relay links are available."

How Canada is Developing Her Plan

The development of this plan has already started. Parliament is being asked at this Session to approve a $4,500,000 loan to the C.B.C. for the establishment and preliminary operations of production centres and transmitters, in Toronto and in Montreal. Obviously, the C.B.C. cannot get really started or make any real commitments before this loan is approved. However, it has not been idle, and it has done and is continuing to do everything it can to prepare the way for quick action once money is available.

We have our standards, 525 lines, and they are quite capable of giving excellent service. Our frequency plan for Canada cannot be finalized until the United States make up their own minds, but we can proceed, in the meantime, with frequency assignments on a limited basis.

We have made a careful investigation of American and British equipment and practices. We have chosen suitable transmitter sites, both in Montreal and in Toronto, and we have conducted extensive surveys to assure our two largest cities of the best possible television service. In Montreal, we have just completed a nine month study of television coverage in different areas of the city. We have installed semi-portable transmitting equipment on top of the mountain, both on the Montreal peak and on the Outremont peak, and we have literally combed the city and surroundings for ghosts and shadows.

We were afraid that reflections and refractions from the mountain peaks might create multiple paths of transmission, and spoil reception, with the resulting multiplicity of images. This is what we call "ghosts" in television. We want to make sure about the intensity of the shadows which these same peaks would cast in different parts of the city.

So, we used mobile receiving and recording equipment to tour all parts of Montreal and we made a continuous record of transmission conditions from both sites. Here is what we found. While the Outremont peak is a good second choice, transmitters on Mount Royal itself will definitely give better signal to more people than any other location in Montreal. Television ghosts, like ordinary ghosts, are not to be feared in this city.

We have also found that we had to modify the generally accepted concepts regarding transmission from mountain tops. The fact that you are using a natural high elevation does not mean that you can necessarily use a correspondingly short antenna tower. On the contrary, our measurements indicate that we must use a relatively high tower, if our population is to enjoy the best possible results.

As you know, we have an agreement with the City of Montreal regarding the use of Mount Royal for FM and TV stations. On the basis of our recent survey, we have reopened discussions with the City authorities, who have to approve our plans before we can proceed with actual construction, once the loan is approved. Finally, our Montreal project will have to be ratified by the Province and receive approval from Civil Aviation. As you see, there is still quite a bit to do before we start digging, but I feel confident that the improved service which the people of Montreal will receive from Mount Royal, will be a decisive factor in these negotiations.

In Toronto, the topography lends itself better to coverage predictions, and it was not necessary to undertake an elaborate survey of the type made in Montreal. We have a number of alternative locations selected and we will make a final choice in the near future. Both the Toronto and Montreal stations will use standard 5 kw. transmitters and high gain antennas, giving an effective radiated power somewhere between 15 and 30 kw. In Montreal, we will make provision in our construction for the installation of a second transmitter, so that we may eventually be in a position to give each element of our population a tele-

(Continued on page 187)

Canadian Induced Precipitation Experiments

by

D. Fraser
Low Temperature Laboratory, National Research Council, Ottawa.

K. G. Pettit
Meteorological Service of Canada, Ottawa.

John L. Orr
Low Temperature Laboratory, National Research Council, Ottawa.

A digest of a paper (1) presented on August 17, 1949, at Lake Success, N.Y., to the United Nations Scientific Conference on the Conservation and Utilization of Resources.

However intensely interested the meteorologist or the physicist may be in the theory of inducing precipitation, the practical and hard-headed engineer is more likely to want to look at actual results. For those interested in the mechanisms which produce precipitation, there is a short popular explanation in one of the Quarterly Bulletins issued by the National Research Council (2), and a more lengthy and detailed, but still popular, discussion in an excellent paper presented by Marcel Schwob, of which a translation is available (3). This present article deals solely with the results obtained in actual full-scale experiments in Canada, and also comparative tests in Australia, without attempting to delve into the meteorological processes involved.

The experiments in Canada, which began in June, 1948, were

Fig. 1 (above). Typical cumulus cloud formations.
A. Composed of water droplets (note "hard" outline)—suitable for seeding.
B. Composed of ice-crystals (note diffuse outline)—not suitable for seeding.

Fig. 2. Cumulus cloud with natural ice veil (20,000 ft., –12°C.).

a combined operation, in which the participants were the National Research Council, the Meteorological Service, the Defence Research Board, and the Royal Canadian Air Force, assisted in certain cases by the Ontario Department of Lands and Forests and the Ontario Hydro - Electric Power Commission. Altogether a total of 59 trials have been made, under both summer and winter conditions, and over diverse geographic areas.

Twenty-seven of these trials were of a selective nature, being specifically intended to produce rain, so that only promising clouds were seeded (Fig. 1). Twelve of these were carried out in the Mississagi district (near Lake Superior) in an attempt to quench forest fires (4); twelve in the Kapuskasing region in connection with the shortage of water for hydro-electric power (5); and three at Suffield, Alberta.

The remaining 32 trials, which were made at Arnprior, Ontario, were of a random nature; all types of clouds, not suspected of containing ice-crystals, (Fig. 2), being inoculated regardless of their potentialities (6). (The presence of ice-crystals near the top of a cloud is regarded as an indication that precipitation will occur naturally.)

Experiments of a similar nature have been performed in Australia (7) (8) and acknowledgement is made to the Council for Scientific and Industrial Research for granting permission to include some of their results.

Experimental Procedure

The dry-ice seeding technique proposed by Schaefer (9) was employed in all these tests. The procedure, which is described in an N.R.C. Laboratory Note (10), was to select a cloud for seeding, and then fly over or through the top, or if the aircraft could not climb to the top, fly around the edges of the cloud at the highest altitude attainable, and there scatter pellets of dry ice, of approximately ⅜ in. mesh; at from 2 to 10 lb. per mile. The rate at which the cloud was seeded with dry ice appeared to be unimportant.

With few exceptions, the subsequent observations of precipitation were purely visual and qualitative, as there was a lack of ground observers and of radar facilities in the regions of the tests. (Observations of precipitation can be made with certain types of radar equipment.) All of the recorded pre-

Fig. 3

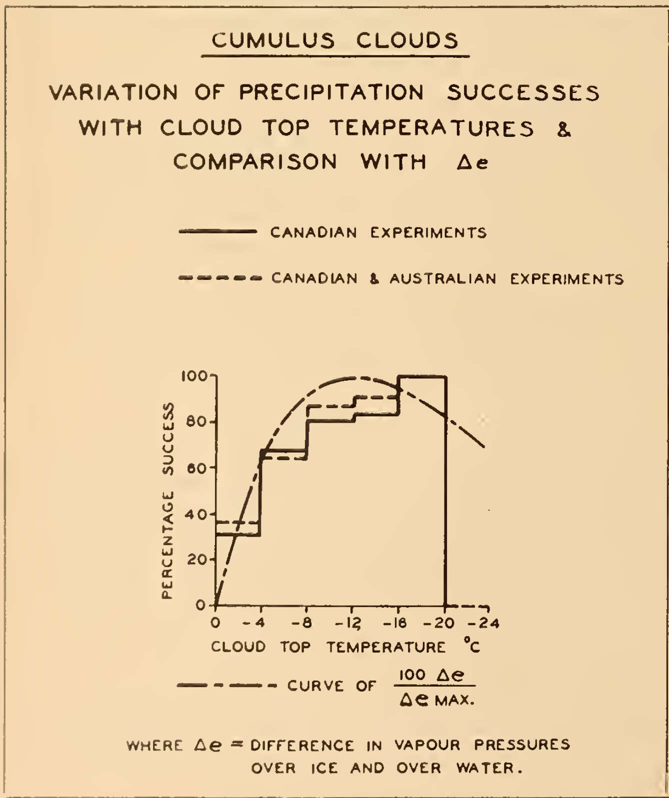
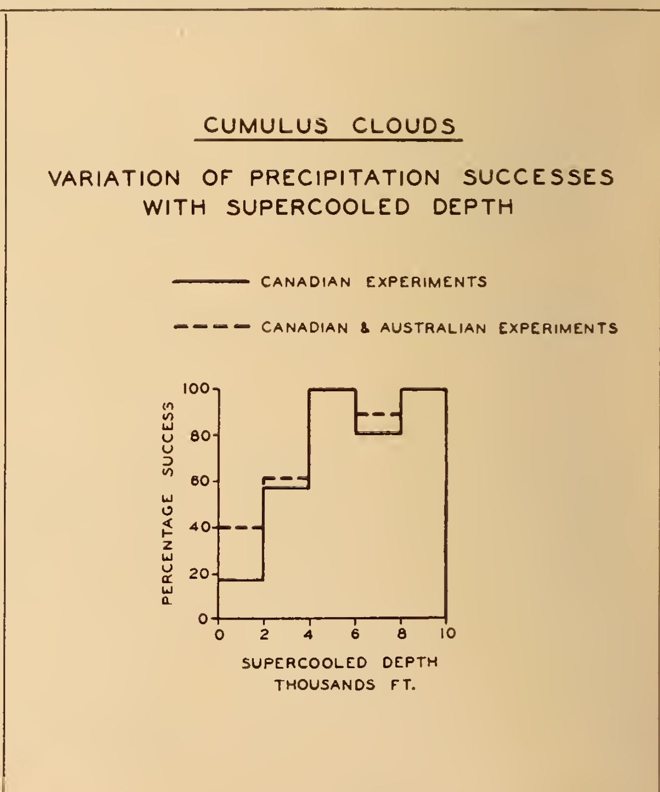


Fig. 4



cipitations occurred within 20 minutes of seeding, and the majority occurred within 10 minutes. This time of reaction is considered sufficiently short so that the effects could be attributed to inoculation.

Presentation of Results

Because of the tremendous number of variables involved in any meteorological phenomenon, the only way to analyse the results was on an overall semi-statistical basis. Such a general analysis is presented in Tables I, II and III, which are largely self-explanatory, except that some definition of the terms used is necessary.

"*Supercooled*" — a cloud is supercooled when all or a portion of it consists of liquid water droplets at a temperature lower than 0 deg. C. Most large cumulus clouds are supercooled, and most natural precipitation comes from supercooled clouds.

"*Precipitation*"—defined in this article as rain or snow leaving a cloud. Whenever precipitation reached the ground, without total loss by evaporation on the way down, it is so stated.

"*Unique*" — implies that precipitation was not occurring naturally within a 25 mile radius.

Perhaps the most remarkable thing about these results is that, although over half of the 59 tests were non-selective, yet precipitation or modification occurred in 76 per cent and precipitation reached the ground in 24 per cent of the total number. Twelve cases of unique precipitation leaving the cloud give so high an incidence as to preclude coincidence or faulty observation.

Effect of Type of Cloud

Clouds may be divided into two broad categories; *cumulus*, which are the normal cauliflower-form summer clouds, and are clouds of vertical development; and *stratus* or "*layer*" clouds, which are in general shallower and extend horizontally. Either type may be supercooled.

No definite results were obtained from non-supercooled clouds of either category. However, no very deep clouds of this type were seeded, so this cannot be regarded even as a definite negative result, as it has been stated that only deep non-supercooled clouds will respond to seeding (9). Supercooled clouds, on the other hand, gave some most definite results, which are shown in Table II for cumulus

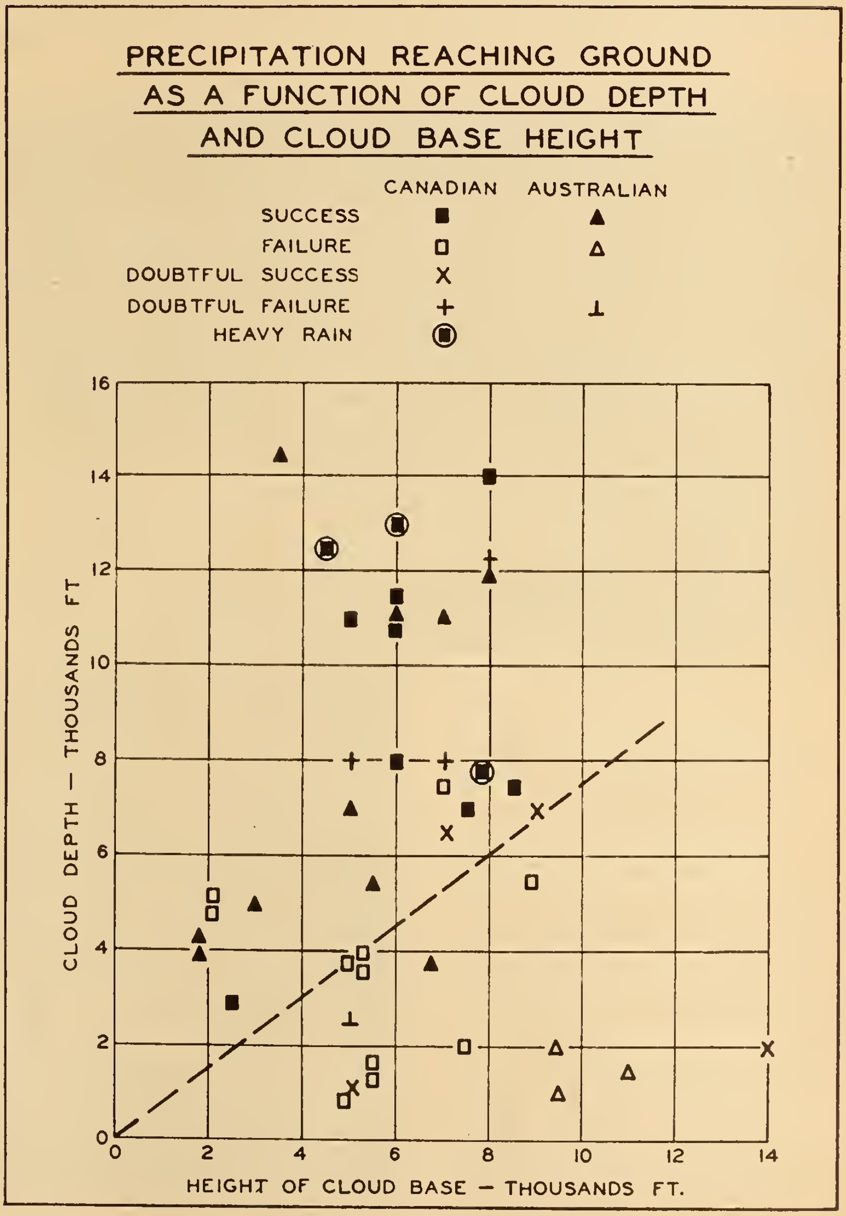
Table I
Over-all Tests
(Total — 59 Canadian trials)

Results (Precipitation or Modification)	45/59	76%
Precipitation leaving cloud	30/59	51%
Precipitation reaching ground	14/59	24%
Unique precipitation to ground	5/59	9%
Unique precipitation leaving cloud	12/30	40%

Table II
All Supercooled Cumulus-type Clouds
(Total — 35 Canadian trials)

Results (Precipitation or Modification)	29/35	83%
Precipitation leaving cloud	23/35	66%
Precipitation reaching ground	12/35	34%
Unique precipitation to ground	4/35	11%
Unique precipitation leaving cloud	8/23	35%

Fig. 5



clouds, and in Table III for stratus type clouds.

From Table II it will be seen that the percentage results from supercooled cumulus clouds are notable, precipitation or modification occurring in 83 per cent of the total 35 trials. If the criterion of success is precipitation reaching the ground, the percentage is 34 per cent, and if it is unique precipitation reaching the ground, then the percentage is 11 per cent.

A comparison of the tests on supercooled cumulus (Table II) and supercooled stratus type clouds (Table III) shows that with the latter there was a lower percentage of results and precipitations, with precipitation reaching the ground in only 12 per cent of the trials compared with 34 per cent. On the other hand, there was a higher proportion (57 against 35 per cent) of unique precipitation leaving the cloud. This is readily understood since stratus type clouds have less tendency than cumulus to precipitate naturally.

Factors Affecting Success in Inducing Precipitation

It was thought that either the depth of supercooling (that is, the amount of cloud above the freezing level containing liquid water-droplets), or else the degree of supercooling at the cloud top, might be the important factor deciding whether precipitation would be induced by seeding. Unfortunately, cloud-top temperature and supercooled depth can be treated neither as independent variables nor as direct functions of each other.

Accordingly, Table IV shows success ratios in terms of both cloud top temperature and supercooled depth, for combined Canadian and Australian results. From this table it would appear that there are limiting lines at both 4000 ft. depth of supercooling and —12 deg. C. cloud top temperature, beyond either of which practically 100 per cent success can be achieved. The one Australian failure, which occurred at —22 deg. C., has not been explained.

It also appears from this table that the chances of success, when they are less than 100 per cent, increase with either decrease of cloud-top temperature or increase of supercooled depth. This is shown more clearly in Figs. 3 and 4.

Factors Determining Whether Precipitation Will Reach the Ground

From the purely practical aspect, the only interest is in precipitation which reaches the ground. A number of Canadian experiments were directed towards this practical application. The results of these "selective" tests are shown in Table V. Their most noteworthy feature was the occurrence of three unique cases of heavy rates of rainfall, two of which were measured to be of the order of 0.2 inches in 20 minutes.

As two of the obvious criteria used in selecting a cloud for practical results were considerable depth of cloud and a reasonably low base, it is interesting to examine these criteria in the light of the subsequent results. Probably the main factors determining whether precipitation leaving the cloud will reach the ground without total loss by evaporation are, the amount of precipitation, the raindrop or snow-flake size, the height of the cloud base above the ground and the humidity existing between the cloud base and the ground. These could be reduced to some function of cloud depth and cloud base height.

This supposition is supported to some degree by Figure 5, showing for both Australian and Canadian experiments a fairly clear dividing line between success and failure in inducing precipitation to reach the ground as a function of cloud depth and height of cloud base. The dividing line appears to be in the region given by the ratio of cloud depth to height of cloud base of 0.75.

Cloud Modification

In the majority of cases when precipitation occurred from

Fig. 6a. Dissipation of cloud by seeding. Bank of cumulus cloud before seeding.

Fig. 6b. Dissipation of cloud by seeding. Remains of same cumulus cloud one hour after seeding.

Table III

All Supercooled Stratus-type Clouds

(Total — 16 Canadian trials)

Results (Precipitation or Modification)	11/16	69%
Precipitation leaving cloud	7/16	44%
Precipitation reaching ground	2/16	12%
Unique precipitation to ground	1/16	6%
Unique precipitation leaving cloud	4/ 7	57%

Table IV

Cumulus clouds — Distribution of Precipitation Success with Cloud Top Temperature and Depth of Supercooling

(Combined Canadian and Australian results)

(Total — 35 Canadian + 20 Australian Trials)

Depth of Supercooling	Cloud Top Temperature 0 to −3°C.	−4° to −7°C.	−8° to −11°C.	−12° to −15°C.	−16° to −19°C.	−20° to −23°C.
0 to 1500 ft.	2/8	1/1	1/1			
2000 to 3500 ft.	3/6	2/6	5/7	4/4		0/1
4000 to 5500 ft.		3/3	4/4	4/4		
6000 to 7500 ft.		1/1	3/3	1/2	2/2	
8000 to 9500 ft.				1/1	1/1	

Table V

Selective Tests

(Supercooled Cumulus Likely to Produce Precipitation)

(Total — 21 Canadian trials)

Results (Precipitation or Modification)	17/21	81%
Precipitation leaving cloud	14/21	67%
Precipitation reaching ground*	9/21	43%
Unique precipitation reaching ground*	4/21	19%
Unique precipitation leaving cloud	4/14	29%

* Includes three heavy rates of rainfall greater than 0.6 inch per hour.

cumulus-type cloud, it was accompanied by dissipation of the cloud. This is illustrated by Figs. 6a and 6b. However, in one Canadian experiment when heavy rainfall occurred, an associated cloud development was very spectacular. A heavy cumulus formation, with its top at 19,000 feet, was seeded, and within 20 minutes the cloud had billowed up to 30,000 feet and assumed a cumulonimbus (thundercloud) aspect. A similar spectacular development is reported by the Australians on one occasion ⑪.

In the case of supercooled stratus clouds there was no observation of large scale dissipation nor of extensive lateral growth of precipitation activity.

Cloud Generation

It is well known to meteorologists that portions of the atmosphere are sometimes supersaturated with water-vapour, which does not resolve into clouds because of the lack of suitable nuclei. This condition normally seems to occur at low temperatures and also, in many instances, at high altitudes, as is demonstrated by the occurrence of aircraft vapour trails. The amount of water-vapour existing under these conditions is not likely to be significant from the precipitation aspect, but the ability to release the supersaturation in the form of clouds is nevertheless of considerable scientific interest, and might eventually have some practical application.

On a number of flights at Arnprior it was found that clear air was supersaturated with respect to ice. On 18 occasions, when dry ice was dropped into such air, clouds were generated, and on 13 of these tests, the clouds persisted or even appeared to grow, until out of sight.

The clouds were all formed at temperatures lower than —10 deg. C., and micro-photographs showed them to be composed of ice-crystals. Measurements and theoretical considerations indicated that their specific free water-content was very small, being about 1 to 2 per cent of that of a normal cumulus cloud. From the scientific point of view, the main interest in these clouds at present is that they offer a technique for the better study of the effect of inoculants.

Appraisal

A total of 59 Canadian and 20 Australian tests have been compiled, which allows a general appraisal to be made. It has been shown that precipitation can be artificially induced under the appropriate meteorological conditions. These conditions are also conducive to natural precipitation, and require a supply of suitable clouds. Thus the feasibility of inducing precipitation can be determined from a study of the meteorological records for any particular region.

The technique is also subject to certain limitations, the more important of which are

(a) Induced precipitation can only supplement natural rainfall in any particular locality.

(b) It is extremely difficult to direct induced rainfall to a particular small area because of the random nature of clouds.

(c) The duration of any induced precipitation is relatively short since, in general, rainfall occurs only at the expense of dissipation of the cloud.

(d) Since induced precipitation is strictly local, it cannot be expected to affect the general character of any air mass, and therefore its effectiveness may be offset by subsequent evaporation. For certain applications precipitation in the form of snow may be more efficient because of reduced evaporation loss. On the other hand, the available water content of winter cloud is appreciably less than that of summer cloud.

(e) There has been no evidence that seeding can produce self-sustaining storms or extensive lateral growth of precipitation.

Applications

The relative importance of the above limitations is indicated for the three major applications with which these tests have been concerned.

Agriculture: The usefulness of any supplementary induced moisture is critically dependent upon timing with respect to the growth cycle of a particular crop. It is also necessary to direct the rainfall, to supply the minimum useful amount, to minimize evaporation losses and to avoid excessive rates of rainfall.

Forestry: The main usefulness here lies in the prevention rather than the extinction of fire, owing to the difficulty of directing the rainfall. For this use even an increase in forest humidity can be of benefit.

Water-power: Because of the large areas used as catchment basins, directing of the precipitation is relatively unimportant. It may be more advantageous in this case to precipitate snow by reason of reduced evaporation losses.

Conclusions

The ability to induce precipitation under certain conditions has been demonstrated. The economic significance of induced precipitation is specific to a given application and to a particular region. Its usefulness can therefore only be assessed on the basis of individual requirements.

This subject appears to have particular importance for the field of meteorology, and further study is required in order to obtain a clear understanding of the processes involved, and to evaluate the usefulness of the technique.

From the scientific standpoint, the results achieved are noteworthy. The ability to alter the structure of the great majority of clouds, to produce precipitation from many clouds, and even under certain conditions to generate clouds, with so slight an agent, is remarkable.

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FREQUENCY CONVERSION IN ONTARIO

by

H. H. Leeming, M.E.I.C.

Director of Frequency Conversion, Hydro-Electric Power Commission of Ontario, Toronto.

A paper presented before the Montreal Branch of the Engineering Institute of Canada on October 20, 1949.

Showing why the Ontario Hydro came to choose 25-cycle power for Southern Ontario in the first place, and how it has become surrounded with 60-cycle power, the author recounts the difficulties involved, and outlines the organization of the programme for conversion. The magnitude of the project is measured and progress to date is recorded.

It is indeed a privilege to have been invited to talk to you on the 25- to 60-cycle conversion project of The Hydro-Electric Power Commission of Ontario, now getting underway in earnest. Before dealing with this latest and largest Hydro project, it may be of interest to examine briefly the circumstances that contributed to the creation and expansion of this vast publicly-owned enterprise, which ranks among the three largest electricity supply utilities in the world.

Looking back, it is evident that a number of factors, strategic, political, racial and economic, combined to bring about that development. After Confederation, in 1867, the natural resources, including water power, remained under the jurisdiction of the provincial governments. At the turn of the century, following the general pattern in the United States, a few private companies in Southern Ontario secured concessions from the Government of Ontario permitting them to generate and distribute electric power. The idea of public ownership and operation gained ground under the driving leadership of Sir Adam Beck. Supported by public meetings and the press, appeals for enabling legislation were made to the Provincial Government which finally, in 1903, provided the means whereby municipalities could appoint a commission to investigate and report upon questions involving the supply and distribution of power. The authority granted resulted in the appointment by certain municipalities of the Ontario Power Commission.

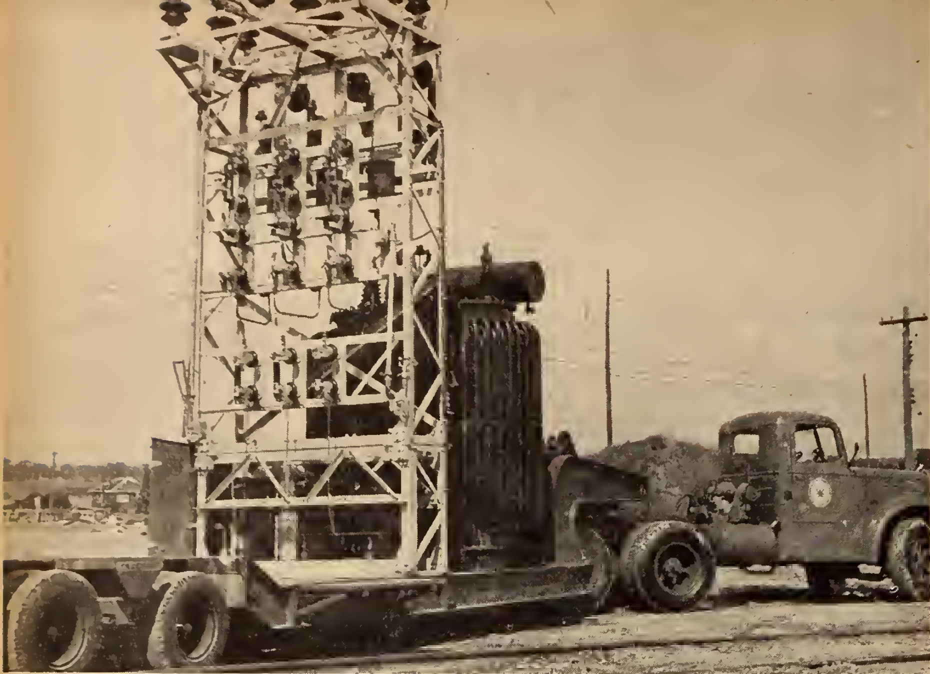
The Ontario Government in 1906 provided by special Act for the creation of The Ontario Hydro-Electric Power Commission. At that time there was little in the way of precedent upon which the authors of the Hydro scheme could rely for guidance. Power was first purchased at 25 cycles, at that time considered to be the most suitable frequency in the United States and Canada — from privately owned power companies and distributed over a transmission network constructed by the Commission. In 1908 the Commission entered into a contract with the Ontario Power Company at Niagara for the purchase of up to a maximum of 100,000 hp. Delivery of power was first made in 1910, a total of 3,500 hp. being delivered to ten municipalities.

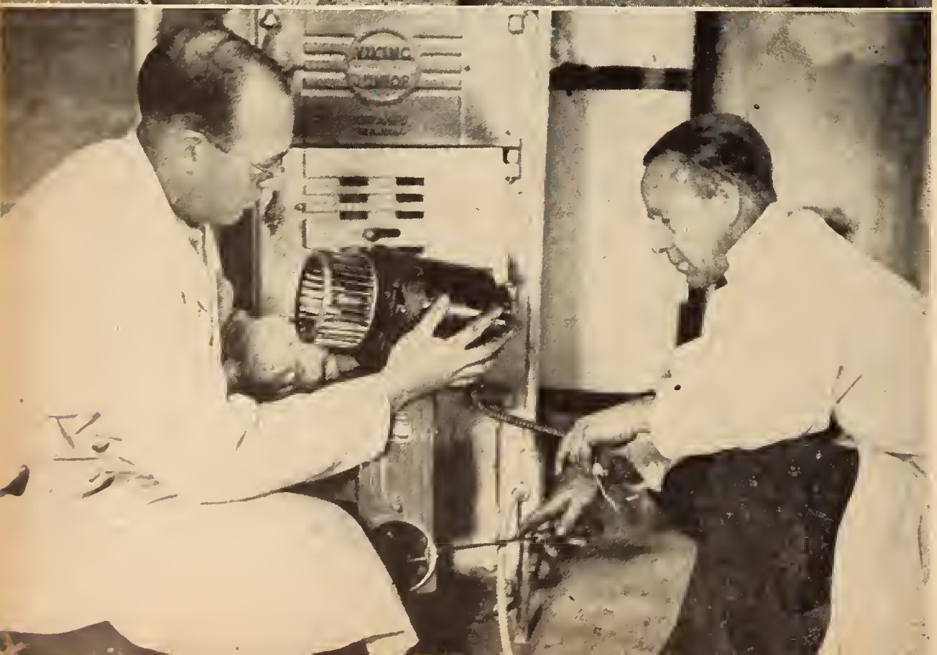
From then on the load growth was rapid, and the Commission soon entered the field of power generation. To-day it owns and operates fifty-five generating stations; the load demand approximates three million hp. The annual load growth is about 120,000 hp., and this rate of load growth would require the erection of a new power development the size of the Queenston Development every four years.

One million, eight hundred thousand hp., or 60 per cent of the present total load is supplied at 25 cycles throughout the southern part of Ontario. This frequency has now practically all been superseded by 60 cycles in the United States and in Eastern and Northern Ontario, so that the southern part of Ontario is now a 25-cycle island, which makes inter-connection between systems difficult and costly.

Moreover, 25-cycle equipment costs in many cases 25 to 30 per cent more than 60-cycle equipment, and certain special equipment and appliances cannot readily be obtained for 25-cycle service. The use of modern lighting units is seriously retarded by having to use 25 cycles, which results in an objectionable flicker. It is, therefore, essential for the good of the vast majority of the power consumers in the Southern Ontario System that the 25-cycle supply be changed to 60 cycles as soon as possible.

You may reasonably ask what is the Commission doing to meet this current demand for 120,000





additional hp. annually. We have under construction at the present time new power developments, transmission systems and transformer stations requiring an estimated total expenditure of some 350 million dollars. These new developments are the Chenaux Development of 120.000 kw., the La Cave Development of 135,000 kw., the Des Joachims Development of 360,000 kw., the Windsor Steam Plant, initial capacity 120,000 kw., and the Toronto Steam Plant of 155,000 kw.; a total of 890,000 kw., or 1,100,000 hp. of additional 60-cycle power. This is all scheduled to be ready for service by the late summer of 1953. With these developments completed, all major development sites within practicable transmission distance of Southern Ontario will be used. Future power demands must be met either by joint development of the St. Lawrence, additional development at Niagara by international agreement, or by the erection of steam plants. With this amount of new 60-cycle generation being developed, it is obvious that a programme should be established immediately to convert sufficient 25-cycle equipment to meet the incoming new 60-cycle generation.

With this in view, the Commission, in August, 1948, initiated the frequency conversion programme. Legislation was passed in 1948 and 1949, revising The Power Commission Act, and policies and procedures governing the frequency conversion programme have now been issued. This programme constitutes the largest and most lengthy project yet undertaken by the Commission. It involves an estimated gross expenditure of $191 millions, of which some $170 millions applies to the Commission and approximately $21 millions to the municipalities at their expense.

The estimated gross cost of consumer conversion alone is some $132 millions. Total net expenditure is $100 millions, most of which will be obtained from re-

Fig 1 (top). Mobile substation used at strategic points of a large area during changeover to 60-cycle power.

Fig. 2 (centre). One of the mobile 10-kilowatt gasoline engine generators used by the Ontario Hydro in the frequency conversion.

Fig. 3 (bottom). Hydro conversion technicians are shown in the process of converting an oil burner to operate efficiently on 60-cycle power.

serves. Time to complete the conversion was originally established as fifteen years, but by checking the growth in the 25-cycle loads as far as it is economically feasible and practical to do so, we hope to complete the work in from ten to twelve years. No project during the thirty-two years has involved to such an extent every division and regional organization of the Commission, as this. It has imposed a heavy load on an already heavily-burdened staff. In addition, it will require the continuous co-operation of every electrical manufacturer; the municipalities, and the public at large with the Commission's organization. Material supply and manufacturing facilities are major factors which will govern the rate of the conversion programme.

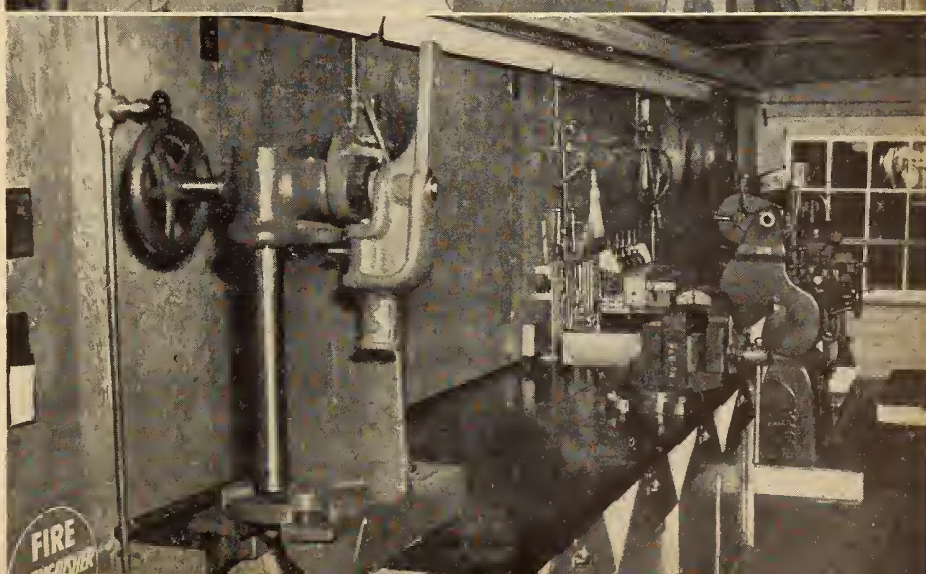
The total Frequency Conversion project has been allocated to two main divisions of the Commission as follows: the Engineering Division having supervision of converting for 60-cycle operation, the Commission's properties, namely, the generating stations; transmission facilities, transformer stations and municipal systems. Conversion of certain generating stations is scheduled to start in 1954. In the majority of cases all transformers are being purchased with dual frequency. In the case of Municipal Systems, this will involve engineering assistance, when requested, to the municipalities requiring studies and decisions with regard to the capacity of the stations, the type of distribution system, which equipment should be used " as is " and which rebuilt.

This work will require to be closely co-ordinated with the work of conversion carried out by the Frequency Conversion Division. This division will engineer, plan, supervise, purchase materials and carry out the actual work, either directly or by contract, necessary to convert with the consent of the owner, the electrical stations, apparatus, appliances or works of any rural, domestic, commercial lighting or industrial power consumer, so that same will operate successfully at 60 cycles. This Division will also direct the conversion or replacement of existing single-phase and poly-phase meters for a municipal corporation or municipal commission, as well as the conversion or replacement of all Commission-owned meters, and the conversion in consultation with the municipal systems, of the elec-

Fig. 4 (top). One of the aluminum trailer workshops used by Hydro in the frequency conversion.

Fig. 5 (centre). Conversion technicians are shown at work in one of the fully-equipped trailers where the smaller items such as record-player motors are converted to 60-cycle

Fig. 6 (bottom). Interior view of one of the mobile workshops in which the heavier types of frequency-sensitive motors are converted.



trical apparatus in any municipal pumping station or street railway system.

The nature of this work is vastly different from anything the Commission has undertaken previously. The equipment to be dealt with consists of industrial, commercial and domestic consumers' apparatus and appliances, and very large quantities are involved. For the field work, close scheduling is essential in that conversion "cuts" have to be planned, not within a week, or a day, but within the hour. The conversion crews working in each area will be mobile; in fact, the planning and operations in the field, in some respects, are very similar to an army operation.

The development of the Commission's frequency conversion division is now well under way. A staff of engineers is already at work. Policies and procedures have been issued, and work schedules and area maps are being prepared. Orders are being placed for the large quantities of bulk materials which must be carried in stock. To date we have on order some $6,500,000 worth of equipment, and orders are now being lined up for the late 1950 requirements. The stock on hand totals $2,550,000.

A vast amount of careful planning is essential for a project of such magnitude. Approximately 1,100 different forms are necessary for the efficient flow of this work. A head office staff of 396 is now working overtime, this staff which will later total some 620, must be completed, additional field organizations planned, storehouses erected and mobile equipment obtained. The material collected must be complete in every detail, and the work must be planned in perfect timing so that the actual conversion may be done with a minimum of inconvenience to a consumer.

A contract has been placed with the Canadian Comstock Company Limited for the carrying out, under the Commission's supervision, of the field work in the Scarborough, London, Sarnia, Hamilton, and Windsor areas. Eleven months after we started to organize the Frequency Conversion Division, with its related difficulties of obtaining experienced engineers and essential equipment, we started the conversion of domestic consumers in the Township of East York. These trial cuts have given us a vast amount of information, and we are now gradually stepping up the programme in accordance with an established schedule. We have already changed some 3,600 consumers, and have inventoried some 20,600 customers with a connected load of 487,000 hp. Eventually the contractors field personnel will number between 2,000 and 2,200, and approximately 700 vehicles will be required for the mobile field forces. These range from ordinary light cars to 5-ton trailers, and include mobile offices and work shops.

One of the reasons we were able to organize and to carry on actual conversion work so quickly, is that a year ago a number of our engineers visited the Southern California Edison Company in Los Angeles, where a large frequency conversion project had just been completed. A vast amount of information was obtained. This has resulted in a saving of considerable time and expense to the Province.

Experience has also been gained by visiting engineers of the Niagara-Hudson Power Corporation in New York State, where frequency

Fig. 7. Technician is shown converting washing machine motor for 60-cycle operation. More than 550,000 of these appliances must be changed over during conversion.

Fig. 8. Transformers on Neon signs are among the many types of frequency-sensitive equipment that must be converted for 60-cycle operation.

conversion on a somewhat limited scale has been carried out during the past several years. The problems of this company are very similar to ours, and a great deal of useful information, was obtained.

To house the vast amount of materials required for the frequency conversion programme, 240,000 total square feet of storage space is being completed at Islington, just west of Toronto. In addition a motor re-wind shop and meter change shop will be established, for motor rewinds, salvage, and meter conversion.

The nature of the work has necessitated the streamlining of the Commission's organization to some extent, as work of this nature cannot function efficiently by being channelled through various departments of the Commission, and in this connection the executive of the Commission have acted accordingly.

To give a rough picture of the materials involved it may be stated that the programme necessitates the conversion from other than 60 cycles to 60 cycles, of consumers in the Southern Ontario System forming a total load of one million eight hundred and eighty thousand horsepower. Domestic, commercial and rural consumers total seven hundred and seventy-two thousand, while power consumers total sixteen thousand. Comparatively, 16,000 consumers do not appear to be a great number, but those 16,000 have a load demand of one million four hundred and sixty-eight thousand horsepower.

The number of single phase watt-hour meters to be changed or replaced totals eight hundred and twenty thousand. Quantities of other equipment to be changed or replaced include twenty-four thousand polyphase meters, one hundred and eighty-five thousand portable fans, four hundred and fifty thousand clocks, eight hundred and two thousand radios, one hundred and thirty thousand combination and record players, three hundred and fifty thousand refrigerators with sealed-in units, five hundred and forty-two thousand washing machines, two hundred and eighty thousand vacuum cleaners, and two hundred and fifty thousand fluorescent lighting ballasts.

It is not necessary to burden you with the details respecting the various motors which we have to deal with, but perhaps it is sufficient to say that the estimated total number of electric motors involved is one million eight hundred thousand. Based on a ten year programme, this means that one hundred and eighty thousand per year will have to be dealt with. Based on two hundred working days per year, this would be nine hundred motors per day.

In addition to the foregoing list of materials must be added all the miscellaneous devices, such as X-ray; ultra-violet and therapeutic equipment; miscellaneous special transformers; electronic devices; conversion of radio stations, telephone stations, street railway stations; signal systems; etc. √

REPORT ON TELEVISION

(*Continued from page 176*)

vision service of its own. In addition, we propose to move our two existing FM transmitters to the new station, so that our FM listeners may also benefit from the improved location.

You can see how all this adds up as an antenna problem. There will be four transmissions at the start: the sound and the vision of the television service and two distinct FM transmissions. Later on, we propose to add another vision and another sound channel for the second television service. This will give you a total of 6 transmissions from the same location.

We have also done preliminary engineering on our studio facilities. We have tentatively decided on the number and size of the studios which we need, on the number and type of studio, field and film cameras, and other equipment required for a properly balanced programme schedule. I wish I could tell you more about it, but you will understand that it is desirable to wait until we have placed the necessary orders, that is, until after the loan is approved.

These are some of the technical things we have done, or propose to do, to establish television service in Montreal. But there is more to the launching of television than the construction of technical facilities. While engineers are at work planning and designing, programme specialists are developing programme ideas and preparing tentative schedules, while personnel officers are studying the problems of employment and training for the large staff which is necessary in television operations.

Broadcasting and Manufacture Interdependent

Then also, the broadcasting side of television is only one element in the television chain. In terms of dollars and cents, it is probably the least important element. The Canadian receiver industry will be of much greater magnitude than the Canadian broadcasting industry. In greater Montreal and in greater Toronto alone, there is a potential market for about half a million sets. At $200 a set, this would represent a public investment of $100,000,000. This figure of $200 per set is, of course, low as compared to current Canadian prices, which are closer to $500. No wonder there has been some gentle and, at times, somewhat impatient prodding on the part of the industry to get television broadcasters started.

In any case, the Canadian television receiver industry has been doing its share, during these last two years of television planning. Already, there are some 5 to 7,000 Canadian built receivers in the hands of the public in Toronto and in other regions of Southern Ontario, near enough to the border to tune in American stations. At the moment, there are some eight Canadian firms in television production, and R.M.A. estimates that they can produce some 20,000 receivers within twelve months after Canadian stations are started. The more the better and the cheaper the better, because the broadcaster needs the manufacturer just as much as the manufacturer needs the broadcaster.

So this is how things stand in television, in Canada, today. We have not got it yet, but, God and Parliament willing, it should not be very long.

UNITED NATIONS

SCIENTIFIC CONFERENCE ON RESOURCES

Abstracts of Papers Presented by Canadians

Log Transportation Project in Eastern Canada

J. A. McNally, Brown Corporation, Quebec, Que.

The product hauled was fire-killed logs 13 ft. 4 in. long, scaling about 3 cu. ft. per log and weighing 33 lb. per cu. ft. The locale lies about 1500 ft. above sea level in Quebec at the headwaters of the St. Maurice River. Annual snowfall during the past ten years has varied between 94.5 and 191 in., but the depth of snow normally does not exceed three feet. Mean winter temperature during the same period has averaged +8 deg. F., with —40 deg. F. the lowest recorded.

Operations covered the movement over a private road of 3,500,000 cu. ft. of wood during the winter of 1948-49 as a project to salvage fire-killed pulpwood. Preparatory work included construction of roads and loading areas, and preparation of the dumping ground at the lake. The wood was loaded with Drott Skidloaders, hauled on semi-trailer equipment and unloaded with a winch or with an industrial wheel tractor with pusher arms. Roads were prepared for winter hauling, ploughed and maintained with a motor grader equipped with V-plough, snow wing, grader blade and scarifier.

The semi-trailer equipment was designed and built in a woods shop using army-surplus tandem-axle dollies as rear supports. Trailers were 44 ft. long with an overall width of 10 ft. 8 in. and were designed to carry a load of 1500 cu. ft., weighing about 50,000 lb. The gross vehicle load was about 82,000 lb.

The skidloader's ability to grab, lift and carry a load weighing 6,000 lb., to lift it over the trailer stakes 11 ft. high and to place it on the trailer, contributed in great measure to the success of this operation. Although studies showed that it was possible to load at the rate of 125 cu. ft. per minute, and in actual practice loads of 1,400 to 1,500 cu. ft. were loaded in 15 minutes, average production under normal winter conditions will probably not exceed 3,000 cu. ft. per hour.

> On this and the following pages are presented summaries of papers read by Canadians at the recent United Nations Conference on the Conservation and Utilization of Resources. Some are on engineering topics, some are not, but all should be of interest to engineers. These were selected from a much larger number for this reason and because we feel that the work of the authors ought to be recognized by other Canadians. The Institute Library holds copies of all papers which were presented at the Conference.

There are many methods of unloading logs into open water. This operation was faced with a winter problem which was solved by using the ice of a lake as a dumping ground after it had been built up to a thickness of 30 to 36 in. by pumping water onto it and allowing it to freeze. Using a wheel-type tractor, equipped with home-designed and homemade pusher arms, a crew of five men unloaded the hauling units in an average time of 4.4 min. per average load of 1,400 cu. ft.

Before 1930 the logging railroad, the crawler tractor and the half-track log hauler were used to open up otherwise inaccessible areas. Twenty years ago the truck made its appearance in towing sleighs; the trend is to replace the sleigh by the trailer. Lately experimental work in towing sleighs has been done with the wheel-type farm tractor and the track-laying snowmobile. This has shown some success on the shorter hauls, up to 3 to 4 mi., but such units are not widely used. The horse still plays a prominent part in log haulage and is used at some stage to transport most wood produced.

Important factors in mechanized log transportation are:

(1) to secure the proper balance among, and the synchronization of, the loading, hauling and unloading units concerned, and

(2) to keep down loading and unloading costs while hauling maximum payloads. Failure to consider these factors may lead to lost time and high unit cost.

In eastern Canada there is a trend toward greater use of mechanical equipment in woods operations; to be specific, toward units of year-round use. This trend is bound up with the distinct, but often confused, objects of mechanization, which are to make timber areas accessible and to reduce the cost of wood.

In general terms, Canada is still logging her virgin timber areas. Mechanical transportation developments have permitted her to reach into hitherto inaccessible areas and to salvage timber which would otherwise be lost, because of over-maturity, fire, insects and disease.

Mechanization for Farming

E. A. Hardy, University of Saskatchewan, Saskatoon, Sask.

Agricultural science and development of the fundamentals of farming have been influenced by the use of power and machinery. Mechanization has been a factor in cutting the forest and breaking the sod. It has been responsible for the great misuse of natural resources in agriculture. It has accelerated food production at the expense of natural soil resources. Mechanization and agricultural science, however, are valuable tools to convert and stabilize land and agricultural production, and to assist in establishing scientific fundamental farming throughout the world. Power and machinery have been developed to help in the heavy work involved in agriculture. Power and machinery, when properly managed, have a part in the timeliness of agricultural operations for most effective results. Machines have been developed which make it possible to return crop refuse to the land, a valuable practice in conserving the soil and its fertility.

Mechanization has released both land and man-power for other productive fields. It has reduced the labour and drudgery of farm work. Mechanization in mixed farming has caused this and the production of animal products to extend into areas where these are essential to balance the demand for food.

The fundamentals of farming for permanent agriculture involve all crops. The production of crops requires man-hours, power, machinery, and elements from the soil. Mechanization applied scientifically to the soil and the crop will make food production possible without depleting soil resources.

New Processes for the Utilization of Low-grade Ores

R. W. Diamond, M.E.I.C., C. O. Swanson and B. P. Sutherland, Consolidated Mining & Smelting Co. of Canada, Ltd., Trail, B.C.

Low-grade ores may contain only a small percentage of metal (simple ores), or they may contain substantial amounts but yield only a little with usual smelting processes (complex ores). Both are important in the world's economy, because existing high-grade deposits are being worked out and not many new ones are being discovered, though there are vast known reserves of low-grade material.

Profitable treatment of simple low-grade ores requires the reduction of costs to the minimum. This reduction can most commonly be made in the milling process by automatic control, by the use of larger and more efficient equipment of conventional type, or by the adoption of new methods. In some cases, the recovery of marketable by-products reduces milling costs. Smelting methods may also be cheapened and improved, but those used with this class of ores are usually old-established ones. By these improved methods some ores carrying as little as $1.50 in gold, or 18 lb. of copper, per ton are being profitably worked.

Complex low-grade ores can carry high treatment costs; with them the problems are largely technical. Recent and continuing advances in milling and smelting methods are gradually making it economically possible to bring this class under control.

Much of the progress in the treatment of low-grade ores is due to research and co-operation within the metallurgical industry, but some stems from activities in other fields. The prospects are that a continuation and extension of this policy will lead to the pushing far into the future of the evil day of the exhaustion of our metal supplies.

Modern Geophysical Methods as Aids in Mineral Exploration

Hans Lundberg, Lundberg Explorations, Ltd., Toronto, Ont.

Geophysical methods are now accepted as tools for outlining formations and structures favourable for finding mineral deposits. Developments in aviation and electronics make it possible to realize the prospector's dream of geophysical surveys from the air. This has changed exploration routine and will revolutionize future exploration programmes.

Airborne surveys now include magnetic and electric methods and soon we hope to make gravity surveys thus. These surveys may be carried out with an accuracy comparable to that of ground surveys; in fact, with air surveys, interpretation becomes easier, since it is possible to fit details into the regional geological picture.

Surveys are carried out at the normal speed of aircraft; an airborne survey can be made some 500 times faster than on the ground. Cost is reduced to a fraction of that for a ground survey; in fact, if the survey covers enough territory, the work can be performed for one per cent of the cost of ground survey.

In the early days of geophysical exploration, when methods were comparatively expensive, the geologist made a reconnaissance of the area first and selected certain sections of promise to be covered. But now with the low cost and high speed of surveys from the air, without loss of detail or accuracy, probably air surveys should be the first step in making inventories of mineral resources.

Experience with airborne surveys shows that all portions of an area have the same chance of being studied, since such surveys are carried out systematically and unimpeded. When following the old routine sections difficult of access never came under the eye of the geologist, and consequently escaped exploration.

Airborne surveys have been carried out in many parts of the world, and have proven cheap, fast and revealing. Many valuable ore discoveries have been made in areas that were considered thoroughly and sufficiently prospected by ground exploration, and where chances of mineral discoveries were thought exhausted. The use of twin-motored aeroplanes or of the helicopter has made possible studies in considerable detail.

Even in old or active mining districts, where the limitation of areas to be surveyed on the ground has been a handicap, airborne methods are still extremely useful. Since airlanes are free, it is possible for any body to have geophysical records made over any mining area, and in that way obtain not only a more complete picture of his own claims, but also one of the broader geological setting.

Protection of Fish and Wildlife in Water-use Projects

J. D. Detwiler, University of Western Ontario, London, Ont.

The protection of fish and wildlife in water-use projects is a problem of improvisations. All represent efforts to readjust, or to compensate for, environments made artificial by the development of electric power, navigation, flood control and other water uses. In the fish category outstanding examples are fishways and hydraulic and mechanical lifts to overcome dam obstructions, hatchery and rearing operations to stock streams and lakes made inaccessible to anadromous fish and the naive resort to the rerouting of ancestral fish runs.

The demands for protection come from two sources, commercial and recreational, the former vocal in localized areas, and the latter rapidly becoming the voice of the people. The recreational demand stems from the realization that man cannot live by bread alone, and becomes the more insistent as labour is integrated with leisure.

The improvisations must not be afterthoughts, e.g., big dams make permanent changes in environment, and post-project improvisations may be costly or perhaps impossible, whereas pre-project provision is often possible with little additional cost. These improvisations are wise provisions and they should be provided for by experts and incorporated in the official plan. To illustrate the Muskingum Watershed Conservation District is taken as an example.

Methods for Reducing the Amount and Quality of Coke Used in Smelting Iron Ore

P. E. Cavanagh, Department of Engineering and Metallurgy, Ontario Research Foundation, Toronto, Ont.

There has been great interest in recent years in the possibility of reducing the quantity and quality of coke necessary for iron smelting. Reduction in coke consumption and quality can be achieved either by modification of present blast furnace practice or by using some smelting process other than the blast furnace. Detailed study of alternative processes showed that large tonnages could not be produced at a price competitive with the blast furnace.

Sufficient details of typical construction and operating costs of the most suitable electric smelting and sponge iron processes are given to permit an answer to the question "Which iron smelting process is worth detailed study in a country or region where construction of a blast furnace cannot be justified?" These processes may be suitable for supplying small local markets if the production cost is lower than the local price for imported blast-furnace pig iron.

Since there is no present possibility of the large-scale use of alternative iron smelting processes, the hope for major coke conservation lies in improving blast furnace practice. Modification of present techniques, particularly by ore beneficiation, high pressure in the furnace, and improvements in cooking practice, offer prospects of a reduction in the amount of coke required to smelt a ton of iron.

For the future, there is a chance that low-cost oxygen will allow construction of low-shaft blast furnaces which can use poor-quality, low-strength and, therefore, much cheaper coke.

Some Modern Aspects of Forest Fire Control in Canada

H. W. Beall, Forest Protection Division, Dominion Forest Service, Ottawa, Ont.

Fire is still a major cause of forest depletion in Canada, but substantial progress in fire-control methods and equipment has been made during the past fifty years. Until recently most of these advances have been concerned with the engineering aspects of forest-fire protection, but increased attention is now being paid to organization and planning.

Most forest protective agencies in Canada provide for the measurement of prevailing fire danger as a basis for planning fire-control operations. A method developed by the Dominion Forest Service requires for practical application only the daily observation of certain weather elements. The reliability of this system has been verified.

The Dominion Forest Service has recently developed a system of forest-fire protection standards adapted to the varying conditions of access and of forest values encountered in Canada. Both burned-area and elapsed-time objectives are included. A detailed fire-control plan has been prepared for the Petawawa Forest Experiment Station. Similar planning procedures are being developed elsewhere to provide the protection necessary for intensive forest management.

Conservation in Utilization for Space Heating in Canada

R. F. Legget, M.E.I.C., National Research Council, Ottawa, Ont., and Neil B. Hutcheon, M.E.I.C., University of Saskatchewan, Saskatoon, Sask.

Buildings in Canada for human habitation and for normal human activity, for the housing of most industrial activities, and for the storage of goods liable to damage by low temperature, require varying degrees of heating from October to May. Cost figures for such space heating applying to the nation as a whole are difficult to obtain; in the industrial field energy requirements for this purpose are not readily separated from overall data.

Canada's yearly consumption of coal is about 40 million tons, with domestic production accounting for only 38 per cent. The total energy provided from all major sources is about twice that obtained from coal alone. Space heating is estimated to require a total amount of energy equivalent to about 20 million tons of coal, or 26 per cent of the total energy requirements. 56 per cent of Canadian homes are heated by cookstoves or heating stoves, and only 43 per cent by furnaces. Coal is the most widely used fuel, particularly for furnaces. Oil and wood are extensively used as fuel in heating by stoves.

Fuel saving may be accomplished by reducing the heat lost, or by increasing the efficiency of production and distribution of heat. Heat requirements may be reduced by building designs improved to reduce heat losses, principally by insulating walls, ceilings, floors and roofs. The reduction of the amount of outside air to be heated, by reducing unnecessary air leakage, and by regulating the intentional air intake for ventilation more nearly in accordance with need, offers a potentially substantial saving in fuel. Heat can be used only when needed. Improved methods of control to maintain the rate of heat supply, in balance with the need, are capable of providing substantial savings.

Gravity flow furnace systems, widely used in Canada, are capable of overall heating efficiencies of 50 to 65 per cent when hand fired with coal. The greatest potential increase in efficiency is possible through the use of automatic firing, and a change to liquid or gaseous fuels, which are more valuable natural resources. Higher efficiencies of the order of 75 per cent are obtained from larger commercial boilers, and under exceptional conditions 85 per cent may be achieved. There has therefore been some considerable interest in the possibility of district heating, where one large plant is used to provide heat to all the buildings in an area.

District heating does not offer a great saving in overall energy requirements, but does permit the use of lower grades of fuel. The capital investment is high, and the equipment is used at full capacity for only a small part of the year. Whether or not district heating will develop will depend on the price which the individual owner is willing to pay for freedom from handling and firing fuel, for increased cleanliness, for release of space occupied by equipment and fuel storage, and for the reduction in first cost of the housing heating system. Should the relative cost of oil increase in Canada, there will be increased interest in district heating possibilities, since Canadians in increasing numbers are demanding automatic domestic heating, with this demand now being satisfied by conversion from solid to liquid fields.

Technical Development in Air Surveys and Interpretation of Forestry Data Therefrom

H. E. Seely, Dominion Forest Service, Ottawa, Ont.

There is nothing more suited to a study of the surface of the earth than the air photograph, which has multiple uses in providing information on resources, as well as on topographical features, and applies economically to the coordinated development of forest resources. And of all natural resources none is better adapted to detailed study by air photographs than the forest, standing, as it does, where it is particularly well exposed to a view from above.

A technique has been developed which is based on measuring and sometimes counting tree images in air photographs, with the result that estimates of the quantity of standing timber may be made thus. Tree heights are determined by measuring the images of the trees and their shadows in the air photographs. In some cases these estimates are compiled by the aid of field work, but in others estimates are made directly from the air photographs supported only by special data already on hand.

Treatment of Trees with Chemicals to Facilitate Removal of Bark and to Reduce Weight

J. D. Hale and D. C. McIntosh, Forest Products Laboratory, Department of Mines and Resources, Ottawa, Ont.

Tests still in progress by the Forest Products Laboratories of Canada show that the treatment of trees of pulpwood size with chemicals can facilitate removal of bark and cause reduction in the weight of wood.

Toxic chemicals are applied to a strip of sapwood, exposed by removing a narrow strip of bark around the tree as near to the ground as conveniently possible. The chemicals, which are water-soluble, are absorbed in the ascending sap-stream, with the result that trees are quickly killed. If the treatment is applied during the active growing season when the bark is easy to remove, the portions of the trees above the point where chemicals were applied remain in the easy-peeling condition thereafter, unlike normal trees which cannot be peeled economically with hand tools after the end of the growing season.

Certain coniferous species that received chemical treatment showed significant reduction of weight, as well as easy peeling. These tests have not yet shown loss of weight in broad-leaved species. While there is danger of attack of insects, stain or decay, if treated trees are allowed to stand through two summers after treatment, observations suggest that the usefulness of the wood for pulp is not seriously affected.

Soil Surveys in Relation to Land Use and Soil Conservation in Canada

A. Leahey, Experimental Farms Service, Ottawa, Ont.

Soil survey work in Canada is organized so that there is an organization in each province which is supported jointly by the Dominion and Provincial governments and by the agricultural college. This organization ensures that information obtained is readily available to all those engaged in teaching, administration of land, agricultural research, extension and land use.

Soil surveys in Canada have proved to be of value in indicating the best use of agricultural lands. Information provided by these surveys is used extensively by provincial authorities and others directing land settlement. Readjustments in land use, such as the development of irrigation projects and the retirement of cultivated land to permanent pasture or forestry, are now largely based on such information.

In Canada, where soil and climatic conditions often change markedly from place to place, soil survey information provides a logical basis for making sound agricultural recommendations and for conducting research on the most suitable crops and the best means of raising them in the different parts of the country.

Soil survey information is used for many other purposes. Since the agriculture of a country depends primarily on the soils and the climate, information on the nature, occurrence and extent of the soils is of fundamental importance toward the wise use of our land.

Preservation of Wood

J. F. Harcom, Department of Mines and Resources, Ottawa, Ont.

Preservative treatment often increases the life of timber from three to four times, reduces drain on the forests, increases the utility of wood, and opens a market for timber products made from species of low natural durability. The chief causes of deterioration of timber in service are decay, insects and marine borers.

The wood preservatives in common use form three distinct groups; toxic oils, salt preservatives soluble in water, and solutions of toxic chemicals in oil.

The principal non-pressure methods of applying preservatives to wood are by brush, spray, dipping, steeping and diffusion. The hot-and-cold tank process is intermediate between the non-pressure and pressure treatments. In pressure treatments the preservative is applied under pressure in a closed cylinder.

Increasing use of treatment has reduced the cross-tie requirements of Canadian railways from an annual average of 12,665,000 for the four year period 1919 to 1922 to an average of 8,456,000 for the five year period 1943 to 1947.

REMINDER!

The dates of the Annual Meeting are July 11, 12, 13. Mark your Appointment Pad ***NOW!***

DIFFERENTIATING CHARACTERISTICS of an ENGINEERING CURRICULUM

by

S. C. Hollister

Dean of Engineering, Cornell University

There has been a steady increase in specialized branches of engineering during recent years. Some of these are simply specializations in functional engineering, such as welding engineering, tool and die engineering, petroleum engineering and refinery engineering. Others are associated more closely with the basic sciences, as, for example, geological engineering or engineering physics. Still others tend toward the border line of business, such as administrative engineering or general engineering.

Many engineering schools have catered to the popular demand for specialized training in a wide variety of engineering specialties. As a result there exists today some confusion as to what really characterizes an engineer, or indeed a curriculum suitable for training for any of the branches of engineering. It appears timely, therefore, to examine this situation and to prepare, if possible, a compact statement of what characterizes *engineering* training. In fact, if accreditation is to be successful, curricula so accredited must contain such characteristics as may readily identify them as *engineering* curricula.

Boundaries Between Engineering and Contiguous Fields

Engineering education is surrounded by other educational operations. It will be helpful to explore the boundaries between engineering and those contiguous fields in order that a clearer understanding of engineering education may be had. It would be hoped that such a process of boundary exploration would eventually so circumscribe the training and function of the engineer as to make it feasible to undertake a direct definition of the characteristics of an engineer.

Editor's Note:

The following statement was adopted by the Committee on Engineering Schools of the Engineers' Council for Professional Development, at the Annual Meeting of E.C.P.D. in Chicago, October 29, 1949. It is followed by a discussion by Dean Hollister. It deals with a subject which merits the serious consideration of engineers. The *Journal* will welcome further comment.

It is generally accepted that engineering training is at the college level. Thus one segment of its boundaries would be represented by the trade school, the technical institute, and the general secondary school. Within the collegiate area it is bounded by programmes in the liberal arts, in science, in business, architecture, agriculture, etc.

Boundaries between college and secondary schools or trade schools are well defined. Similarly the technical institute operating at post high school level is readily distinguished from engineering training at college level. Confusion arises in varying degrees between engineering training and other college work. Particularly it arises in curricula which are in part engineering and in part other college subjects.

It should be stated clearly that this discussion does not undertake to evaluate curricula which are in part engineering and which are heavily charged with work in business, liberal arts or some other field. Such courses are highly desirable and more of them should be given. The sole problem considered here is whether such curricula should be considered as *engineering* curricula leading to an *engineering* degree. This calls for a specification of *differentiating characteristics contained in an engineering curriculum.*

Comparison of Science and Engineering Curricula

A comparative study of curricula in science programmes with those in engineering reveals a significant difference between the two groups of curricula. It is characteristic of the engineering programmes that mechanics, mechanics of materials, and courses in the properties of materials be included. Based upon such courses, it is also characteristic that in varying degree there will be courses relating to structures, apparatus, or machines, and the principles upon which they are designed, constructed and operated. Such courses are not found in the science curricula. For example, a curriculum in mining engineering will include mathematics, physics, chemistry and geology as will also a curriculum in geology. But the mining engineering curriculum also contains courses in mechanics, hydraulics, hydraulic machinery, heat engines, and electrical equipment. The inference is that the mining engineer is going to design, construct, and operate and that the geologist is interested in the formation and nature of the earth's crust but that he is not intending to design, construct, or operate works either above or below ground.

When curricula in engineering and in architecture are compared, courses in mechanics and materials and sometimes in structural design are found in the architectural programme. The principal characteristic of the architectural curriculum, however, is training to achieve artistic excellence in the proportions of parts and in the decorative treatment of structures. In practice the architect emphasizes function and beauty, whereas the structural engineer emphasizes function and safety. The two fields obviously lie very close together and it is conceivable and, in fact, is occasionally true that the architect may act as a structural engineer, and vice versa.

A comparison of curricula in electrical engineering and in physics reveals the characteristic presence in the engineering curriculum of mechanics and materials of engineering. The physicist ascertains the behaviour of physical phenomena in terms of physical principles and, generally speaking, is not concerned with design of machinery and apparatus for manufacturing purposes. The engineer, on the other hand, is applying the principles of physics in the creation of machinery and apparatus for manufacturing or other useful purposes.

Distinguishing Characteristics of an Engineering Curriculum

Throughout these differences of characteristics noted between the engineer and a person in an adjoining field, one finds *ability to design* as a significant and distinctive element. The process of contriving a scheme, system, or concept of a device, together with a forecast of behaviour thereof, which if built would be appropriate to the functional, economic and safety requirements, is here meant as design. An engineer, for example, *designs* a bridge by first *analyzing* the conditions and functions to be satisfied; and secondly, by *synthesizing* from his knowledge of foundations, loadings, construction methods, mechanics, properties of materials, traffic requirements, economic considerations, financing, etc. the elements appropriate to this particular structure.

It may now be stated that:

An engineer is characterized by his ability to apply creatively scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design, and of the limitations of behaviour imposed by such design; or to forecast their behaviour under specific operating conditons; all as respects an intended function, economics of operation and safety to life and property.

The function of design is not limited to machines and structures. Process design may be defined briefly as the determination of the best process to accomplish a given end from the standpoint of economy, safety, and available raw materials and equipment. Courses in engineering application, therefore, which supplement those in applied science for full development of design qualifications are not limited to machine or structural design, but include production processes.

A curriculum which adequately trains a man to become an engineer must furnish the technical background, and should supply also the general training, for the *process of analysis and synthesis essential to designing*. There is the question, however, as to what may be considered an *adequate* training in the various essential features of the curriculum.

All engineering curricula may be divided into five sections as follows:

1. Basic science (mathematics, physics, chemistry, biology).
2. Applied science (mechanics, thermodynamics, fluid mechanics aerodynamics, geology, properties of engineering materials, etc.).
3. Applied engineering courses (as for instance internal combustion engines, machine design, structures, industrial electronics, plant layout, etc.).
4. Administrative and managerial (cost control, quality control, industrial organization, labour relations, etc.).
5. General (liberal courses designed to provide a general educational background).

Mathematics, physics, chemistry, and biology are the fields of basic science which form the foundation of engineering training, in amounts appropriate to the particular branch of engineering.

Whether administrative and managerial subjects or courses relating to general educational background are included in the curriculum is not essential to our present study because they do not contribute to those peculiar characteristics which differentiate the engineer capable of large engineering works, especially when such subjects are reinforced by broad attitudes and inspiration of the teaching staff.

Preparation for any form of design originates in the basic science courses, and is governed not alone by what science courses are included, but also by the depth of such courses and the extent to which they are interwoven into subsequent courses in applied science and engineering. For example, mechanics taught without calculus results in much less design ability than mechanics taught with calculus. Similarly, electrical theory taught without differential equations and Fourier's series develops much less power of analysis and synthesis than would have been the case had these two branches of mathematics been employed. The level of course content, and thus of training, is usually set by the depth of training in the basic sciences and what is equally important, the extent to which these permeate the subsequent courses.

Discussion of the Foregoing Statement

No attempt has been made to describe all of the functions that engineers may perform in the course of the practice of engineering. Instead, the differing characteristics have been sought, by which the engineer's work may be recognized from the work of others. A common definition of an engineer frequently quoted is that he is "one who directs the forces of nature to create useful things". Such a statement would not, for example, exclude the architect or the agriculturist. Many of the engineer's functions overlap those of others, and thus are not in themselves distinctive characteristics of engineering. The engineer directs men; so do persons in many other professions and callings. He applies principles of economics and finance; so do business men and bankers. What is here sought is that characteristic which includes all kinds of engineering but which excludes all but engineering.

It is in part a characteristic of the engineer that he applies scientific principles in design, construction, and operation. This differentiates him from the artisan, who constructs or operates without scientific knowledge. The engineer, furthermore, constructs and operates within the framework of limitations inherent in the design; and to do such constructing and operating he must be fully conversant with the design and its limitations.

It is not essential that in order to be an engineer one must be engaged in designing. It is essential that a knowledge of design be had, based on the application of scientific principles. Such design is not aimed primarily at aesthetic or functional objectives alone, but in addition characteristically includes objectives involving economics and safety. The economic objective in part distinguishes the work of the engineer from that of the scientist or the artist.

It is recognized that the words "design" and "designer" mean different things to different people. They are not here used in the narrow sense usually attached to them in engineering offices, where some are "designing", some "detailing", others "developing", and so on. The whole creative process, extending from the initial conceptual thought to the subsequently refined final plan is here meant as design. It may be achieved by mathematical or development procedures, but it utilizes scientific principles.

There is real danger in undertaking to be specific as to the characteristics desirable in any professional programme, because there is the possibility of too literal a translation of such statement into courses rather than into guiding principles. The Committee is fearful that the mention of "design" might suggest to some the thought that what is desired is a certain number of credit hours in one or more courses labelled "design". This is not what the Committee has in mind. Rather, it hopes that "design" will be regarded in a broader and more fundamental way, involving the development within the student of original, resourceful, creative ability. Such an achievement results perhaps more from the nature of the teaching than from course outline. It becomes a way of education. √

Notes on Management

Management Conferences

This is the season when many who read these notes will have received literature outlining the various management conferences offered to the public under the sponsorship of management engineering firms or by at least two universities in Canada. It is appropriate, therefore, to say a few words, especially for those who are not yet aware that these opportunities exist, concerning the value to be derived by sharing in the free discussion of typical and pertinent problems that face management today with others who have gained their experience by different roads.

These management conferences generally last from two to four weeks during which time the conferees live together as a small purposeful community insulated from the various calls of their workaday lives. Thus they are provided with the opportunity for reflection and after-hours discussion.

An article by Professor E. M. Barnet in a recent issue of the magazine "Manufacturing and Industrial Engineering" quotes A. C. Nielsen as having found that "the average executive is correct, or substantially so, on 58 per cent of the important marketing questions. . . . These figures may be hard to believe, because 58 per cent appears to be only slightly better than you could get by tossing a coin. Why bother to have executives? But remember that, on many of these questions, there are three or more possible answers, and if you were to toss coins you would be right about 25 to 40 per cent of the time. So while the executives are undoubtedly earning their salaries by raising their batting averages to 58 per cent, the waste of 42 per cent (and there is a waste whenever we make a wrong decision) places a terrific burden on the costs of corporations."

The decisions of a manager are made after weighing various alternatives with respect to their effect upon production and sales results or their influence upon relationships with employees or the public. Industry is, therefore, calling for those men who have an understanding of the interaction of these factors. Some companies have instituted training programmes in their own organizations where selected candidates are shifted from department to department to learn how all co-operate towards the achievement of a desired result. Management conferences are an extension of that idea.

Stating the matter simply, the typical management conference, generally by the presentation of material in case history form, raises certain questions that are relevant to the conditions under which business operates today. Then, through the medium of conferences, under the tolerant guidance of conference leaders, the various members contribute possible courses of action in the light of their own experience. It will not surprise anyone that many solutions are usually presented—accompanied by vigorous debate to prove the varying contentions. This process of free discussion is most valuable in its effect of forcing the conferee to arrange his thoughts on certain topics and see how they withstand the impact of varying opinions. Perhaps, if the conference leader is fortunate enough, a generally acceptable compromise will be achieved and all will feel a sense of accomplishment.

Fortunately, all businesses are sufficiently alike to suggest a fairly standard agenda for these conferences, though presentations differ considerably. Each business must employ workers to man the machines in order to produce goods that will be accepted by the public in a competitive market. Thus there are employment practices, the development of an organizational plan, production controls, market forecasts, departmental and master budgets, sales policies, reports to top management, public relations, negotiations with labour unions, etc. This is the substance out of which management conferences grow.

Such an inclusive programme, supplemented with the remarks of guest speakers, and in some cases by field trips, can assist very materially in expanding the viewpoint of those attending. Those most likely to benefit from a conference of this type are men who have reached a high level in their department and whose ability indicates they are capable of assuming additional management responsibilities. They have probably risen in their department through specialized training or experience and the conference presents an opportunity for revising their perspective and getting a new slant — not to mention the pleasantly convivial hours that such a group can provide.

One of the more useful habits derived from an engineering training is the habit of breaking down a job into its component parts and attacking each part in order so as to better accomplish a given task. This technique is particularly applicable for those in executive positions. Conditions are always changing and at times it is desirable to undertake a new project or considerably change something that already exists. The person charged with such a responsibility can follow a procedure that may follow the five components itemized below:

1. From his knowledge of what he must accomplish, and after a study of present conditions, available men and equipment, he must decide on the broad course of action.

2. He must estimate the time to be consumed in the performance of each part of the plan, and if the problem is complicated he can resort to the use of Gantt charts.

3. Most important is the fixing of responsibility for carrying out the programme, making sure that duties do not overlap.

4. Concurrently with the preceding steps he must arrange for provision of labour, equipment, materials and finances.

5. He must keep himself informed concerning the progress being made, both in detail and on broader lines. In this way he knows where the special obstacles are that require his intervention, accompanied by replanning if the obstacles cannot be satisfactorily removed.

This technique of breaking a job down into its component parts focuses attention in a definite way upon the various phases of the operation, and is an instrument which enables an executive to achieve objectives that might otherwise prove cumbersome.

Technical Men Receiving Training in Business Administration

Sixteen men with degrees in engineering or science make up half the class in intensive business administration at the University of Western Ontario. When they graduate in May, they will have unusual qualifications for posts leading to executive positions.

All branches of engineering are represented, as well as geology, geophysics, and chemistry. The other sixteen students have specialized in economics, commerce, English, history, social science, and animal husbandry. There are graduates of fourteen Canadian universities from Saskatchewan to the Maritimes. With this distribution, a broad outlook is insured.

The one year course, designed to give a broad business background to non-business graduates, covers accounting, statistics, finance, marketing, production management, administration, and report writing. The case method, made famous by the Harvard Business School, is used exclusively at Western under the direction of Professor W. A. Thompson, a graduate of Harvard. This method rejects the formal lecture in favour of studying and analysing practical business situations. The course is aimed at executive-level thinking. Its purpose is to give the graduate an understanding of the many facets of a business enterprise, rather than to create specialists in any branch of business.

The trend toward technically trained executives is already marked in Canada. Previous graduates of Western's intensive course are filling important positions in Canadian business.

NEXT MONTH'S PAPERS

Canada's Greatest Problem
James S. Duncan

Electrical Installations in the Canadian National Exhibition Grandstand
Karel R. Rybka, M.E.I.C.

Propulsion and Auxiliary Machinery for U.S. Coast Guard "Northwind" Class Ice Breaker
James A. Wasmund

Enclosure and Reclamation of the Dutch Zuiderzee
Johannes Wartena

Technical Writing, an Easily Acquired Skill
John A. Miller

FROM MONTH TO MONTH

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

Conservation is YOUR Business Too!

Under this title, the Agricultural Institute of Canada published in its *Review* for January, 1950, an excellent outline of Canada's conservation problem and a suggested national policy for the conservation of our land and water resources. In much of their work, engineers are concerned with development and use of natural resources, and members of The Engineering Institute of Canada would undoubtedly endorse the views which have been expressed in the journal of our sister society.

The author of the article, C. Gordon O'Brien, general secretary of the Agricultural Institute, points out that the conservation problem is essentially one of education. The theory has been proved and good practices have been developed but the average citizen and average politician have not yet been convinced of the necessity for a broad and comprehensive programme. Mr. O'Brien quotes Dr. H. H. Bennett, chief of the United States Soil Conservation Service as follows:

"We cannot be assured of the permanency of our soil conservation work until the concept of its absolute necessity sinks deeply and fixedly into our physiological make-up. The one best way to get this into our national habits is to start early in our schools, in order to plant the ideas deeply and firmly in the minds of our children. We must get it into our very bloodstream, so that soil conservation—so vital to national and world prosperity, happiness, and health — becomes a part of our national culture as a fixed national objective."

The national policy suggested by the Agricultural Institute merits the attention and support of engineers and it is reproduced herewith.

The Agricultural Institute of Canada therefore urges:

a) that the Dominion Department of Agriculture recommend to the Government of Canada the immediate establishment of a national policy of soil and water conservation and land use for Canada, and that the Government make provision for the necessary legislation;

b) that under the Act there be appointed a Dominion Co-ordinator of Soil and Water Conservation and Land Use;

c) that a national council on soil and water conservation and land use be established on a joint Dominion and provincial basis, with sufficient powers to implement programmes according to the need across Canada;

d) that having regard for the variable nature of soil conservation, reclamation, and land and water utilization, procedure, and practices across Canada; and inasmuch as the land resources of Canada are for the most part vested in the provinces, the custodianship and conservation of our land and water resources available for agricultural purposes be the responsibility of the department of agriculture in the province concerned;

e) that the provincial governments be asked to provide the legislation, administrative organization, and educational services necessary for the effective utilization, conservation, and reclamation of soil and water resources and further that they be asked to design ways and means of encouraging cultural and land use practices which will maintain and enhance the productivity and usefulness of our soil and water resources;

COVER PICTURE

The long-span steel joists shown under erection in this month's cover picture are being used extensively in industrial construction today. The photograph is symbolic of current industrial activity in Canada and affords an interesting example of the artistic possibilities of engineering subjects in photography.—*Photograph courtesy Dominion Bridge Company.*

f) that the provinces provide such legislation, aid, and guidance to municipalities and farmers, as will permit them to effectively perform their duties resulting from soil and water wastage and deterioration;

g) that under the provincial legislation there be established local autonomous committees to implement land use and soil and water conservation projects;

h) that the Dominion and provincial governments inaugurate an immediate programme for the training of personnel adequate to provide an advisory service to farmers and,

i) that in view of the immediate need for an advisory service to farmers, existing staff be trained and used to the fullest possible extent.

Committee on Atmospheric Pollution

Professor E. A. Allcut, M.E.I.C., chairman of the Committee on Atmospheric Pollution in Canada, has advised that Dr. M. Katz of the Defence Research Chemical Laboratories, and Dr. D. Y. Solandt of the School of Hygiene, University of Toronto, have joined his committee.

The committee is now fully constituted, and has commenced studies of the problems of atmospheric pollution in Canada.

Thirty Years Ago

(*From the Montreal Star, Tuesday, January 27, 1920*)

MONTREAL—The largest annual convention to be held in the history of the Engineering Institute of Canada opened in Montreal this morning, and will continue for three days with an attendance of between four and five hundred members drawn from all parts of the Dominion. Colonel Leonard, of St. Catherines, Ont., the retiring president, occupied the chair, and among those who registered during the morning were City Commissioner R. A. Ross, the president elect and Sir John Kennedy, consulting engineer of Montreal Harbor Commission.

Meeting of Council

Secretary's Notes

The January meeting of Council took place at Montreal on January 14th with representatives present from eleven branches outside of Montreal and with eleven present from Montreal and the district.

Colonel L. F. Grant reported that his committee had given further consideration to the matter of letting Canadian engineering work to American engineering firms, and had the following recommendations to make as a programme on this subject to be carried out over the next many years:

(a) That the policy be continued of having the general secretary communicate with Canadian organizations that have engaged American engineering firms in order to enquire as to the basic reasons for not being able to employ Canadian engineers.

(b) That an effort be made to have certain other publications of wide distribution publish material dealing with this situation.

(c) That an effort be made to have one or more radio broadcasts on the subject.

(d) That the press be used to as great an extent as possible in order to keep the public adequately informed of what is going on and of pointing out the competence of Canadian engineers to do Canadian work.

(e) That the effort be continued to prepare a complete catalogue of consulting engineering services in Canada. This work is already under way but the committee proposes that it should be given a high priority.

(f) That the branches be encouraged to give publicity to the subject and also to advise Headquarters of any further examples which come to their attention.

(g) That efforts be made to have well-known journalists use this as a subject for some of their special and interesting articles which appear in different types of publications across Canada.

(h) That the list of cases already prepared by the General Secretary be given wide distribution.

(i) That conditions be brought to the attention of the industrial commissions in the various provinces so that they may give assistance in providing information to persons interested in the employment of consulting engineers.

(j) That for the moment at least a proposal to inaugurate a paid-for programme of publicity through the press be not acted upon. It is the committee's belief that proper results can be obtained through the other proposals but if this should prove to be incorrect then the paid programme of publicity could be tried out.

Council approved of the proposals of the Committee.

International Joint Commission

It was agreed unanimously that a resolution should be sent to the Prime Minister at Ottawa expressing Council's appreciation of the appointment of General The Hon. A. G. L. McNaughton to the International Joint Commission.

Department of Labour Booklet

The general secretary reported that since the last Council meeting a communication had been received from the Institute's representative on the Joint Committee in which it was explained that he (the representative) had examined the manuscripts and had approved them on behalf of the Institute.

After considerable discussion Council decided that no further action should be taken except that the members of the committee should be informed that in the event of the booklet being reprinted the Institute would like to have an opportunity to revise much of the material for which it had been responsible in the first instance.

New Branch at Sudbury

Vice-President Vance reported that he had just come from a meeting of the Sudbury group at which provisional officers had been selected. Mr. M. D. Stewart, the city engineer, was the provisional chairman. The committee was made up so that representation would be given to the various districts embraced by the branch.

Report of the Finance Committee — Financial Statement

Vice-President Heartz, chairman of the Finance Committee, reported on the auditor's statement for the year 1949. This showed that in spite of several substantial extraordinary expenditures the surplus of the year's operations was the best yet recorded. This was due largely to the improvement in the *Journal* advertising situation.

Nominating Committee

It was agreed unanimously that T. E. Storey, M.E.I.C. of Winnipeg, be asked to accept the chairmanship of the Institute's Nominating Committee for the year 1950.

Communication from Loyola College

A letter from the Dean was presented in which it was explained that students who obtain the B.Sc. degree with the certificate of engineering from Loyola College, and who are recommended by the Dean are admitted into the third year of the engineering courses at McGill University. Accordingly it was agreed by Council that students taking the engineering course at Loyola should be accepted as student members of the Institute.

Civil Defence

General Turner reported on conversations which he had had with Major-General F. F. Worthington, coordinator of civil defence at Ottawa, relative to assistance which the Institute might give in this field. Eventually it was agreed that the Institute should express itself to General Worthington as being favourably disposed towards his work and interested in lending its assistance in the solution of any problems with which it was thought the Institute could be of special assistance.

Ontario Division

Mr. Buss reported that the Ontario Division had met on January 12th in Hamilton. At this meeting a committee to study shore erosion on Lake Ontario had been formed.

Student Activities

It was noted that the number of applications from students was again very substantial, in many instances representing one hundred per cent of the total enrolment of the senior year at the university.

The general secretary reported that considerable progress had been made in securing papers and speakers for the student undergraduate engineering societies right across Canada. At least two companies had agreed to send a speaker to every degree-granting university in Canada, and one of them had already prepared its material and the other one was so far advanced that its representative was prepared to start on a tour within about two weeks' time.

Next Meeting of Council

It was left for the president and general secretary to determine the date, which would be either Saturday, February 11th or the 18th.

News of Other Societies

The annual convention of the **Canadian Electrical Association** (Room 704 Tramways Bldg., Montreal 1, Que.), will take place June 15 to 19, at Murray Bay, Quebec.

The **Chemical Institute of Canada** (Box 62, Station D, Toronto 9, Ontario) will hold its 33rd annual conference and exhibition at the Royal York Hotel in Toronto, June 19 to 22, 1950.

The spring meeting of the **American Society of Mechanical Engineers** (29 West 39th St., New York 18, N.Y.) will be at the Hotel Statler, Washington, D.C., the week of April 10. The semi-annual meeting of the Society is scheduled for June 19 to 23, at the Hotel Statler, St. Louis, Mo.

The **American Society for Testing Materials** (1916 Race Street, Philadelphia) has announced that the annual meeting of the Society will be at Atlantic City, N.J., June 26-30.

Presidential Reception in New York

On January 19, President Armstrong was the guest of honour at an informal reception at the Hotel Commodore in New York City. For some years an opportunity has been sought for the president to meet with members of the Institute resident in the United States, and

A group at the New York reception.

a committee headed by Col. C. E. Davies, secretary of the American Society of Mechanical Engineers, arranged the meeting to take advantage of the presence of a number of such members at the annual meeting of the American Society of Civil Engineers. Col. Davies' committee included W. L. Batt and S. Logan Kerr, Philadelphia; R. E. Doherty, Pittsburgh; and Malcolm Pirnie, Boris A. Bakhmeteff, and H. B. Oatley, all of New York City. Invitations were addressed to all members of the Institute resident in the United States.

The president was accompanied by president-elect J. A. Vance, vice-president R. E. Heartz, treasurer A. W. Whitaker Jr. and the assistant general secretary. Other Canadians present were Otto Holden, Toronto, J. M. Morrow, Hamilton, and Gen. A. G. L. McNaughton, Ottawa. The meeting was an informal affair with a few well-chosen words from Col. Davies to introduce the Canadian engineers and an expression of appreciation from Mr. Armstrong.

The American members present were: F. A. Annett, Boris A. Bakhmeteff, Geo. W. Burpee, W. N. Carey, C. E. Davies, H. B. Oatley, Malcolm Pirnie, D. B. Steinman, R .W. Tassie, all of New York; R. E. Doherty, Pittsburgh; J. M. M. Greig, Port Washington, N.Y.; A. W. Harrington, Albany; E. E. Howard, Kansas City; S. Logan Kerr, Philadelphia; N. W. Kershaw, Allendale, N.J.; A. C. Pasini, Detroit; W. S. Pardoe, Philadelphia; R. J. G. Schofield, Somerville, N.J.; F. A. Snyder, East Orange, N.J.; H. J. Williams, Boston.

The following American engineers attended as guests of Institute members: E. G. Bailey, Tacoma, Washington, George Brandow, Los Angeles; M. L. Brashears, Mineola, N.Y.; Irving Crosby, Boston; G. B. Ernest, Lincoln, Neb.; J. F. Fairman, New York; T. W. Green, New York; H. H. Henline, New York (secretary, the American Institute of Electrical Engineers); W. J. Johnstone, Olympia, Wash.; A. R. Mumford, New York; C. G. Paulsen, Washington, D.C.; Carleton Proctor, New York; E. H. Robie, New York (secretary, the American Institute of Mining and Metallurgical Engineers); R. A. Sherman, Columbus, Ohio; G. A. Stetson, New York; R. L. Templin, New Kensington, Pa.; James M. Todd, New Orleans; Alfred Yanda, Cleveland.

Personals

Notes of the Personal Activities of Members of the Institute

M. D. Stewart, M.E.I.C., the city engineer of Sudbury, Ont., is the provisional chairman of the newly formed Sudbury Branch of the Institute.

Mr. Stewart, graduated from the University of Toronto in 1922. He worked with MacVicar and Heriot in Montreal, and with Price Brothers and Co. at Chicoutimi, Que. He joined the Foundation Company of Canada in 1929 but in 1930 he became resident engineer with the Seigniory Club Community Association Limited, Seigniory Club, Que. In 1937 he became town engineer for the Town of Mount Royal, Quebec. He worked with Hugh C. MacLean Publications, Toronto, before receiving a commission in the Royal Canadian Engineers and serving in the recent war. He went to his position as Sudbury's city engineer after receiving his discharge in 1946.

H. L. Hayne, M.E.I.C.

H. L. Hayne, M.E.I.C., construction engineer for the Department of Public Works at Kamloops, B.C., has been elected chairman of the Central British Columbia Branch of the Institute.

Mr. Hayne is from London, Ontario. He worked first with the Canadian Pacific Railway in the West. He was resident engineer on construction for the Esquimalt & Nanaimo Railway in 1910 to 1912, and he was city engineer for Port Alberni, B.C., for two years before serving overseas with the Canadian forces from 1914 to 1919. On his return, he was made assistant engineer on the construction of the Esquimalt & Nanaimo Railway extension to Great Central Lake. In 1921 he was appointed assistant district engineer for the British Columbia Department of Public Works at Fernie. He was made district engineer at Revelstoke in 1929; district engineer at Pouce Coupe, B.C., in 1924. He was transferred by the Department to Kamloops in 1939.

George N. Scroggie, M.E.I.C., has been named chairman of the London Branch of the Institute.

Mr. Scroggie, who is from Guelph, Ont., received his B.Sc. degree in civil engineering from Queen's University in 1935. He worked on road and bridge construction for the County of Waterloo, Ont., in 1935-36, and he joined the Department of Highways of Ontario at Chatham, in 1937. He worked at London, Ont., as a junior engineer for the Department of Public Works of Canada for a time, before joining the R.C.E. and serving overseas with the First Road Construction Company. He returned to the Public Works Department on his discharge in 1942, and he has been stationed at the London office.

G. N. Scroggie, M.E.I.C.

J. C. Trueman, M.E.I.C.

J. C. Trueman, M.E.I.C., who is designing engineer of the Western Division of the Dominion Bridge Company Limited at Winnipeg, Man., has been named chairman of the Winnipeg Branch of the Institute.

Mr. Trueman was born in England. He received a B.Sc. degree in civil engineering from the University of Manitoba in 1923, and that of M.Sc. in structural engineering from McGill University in 1924.

He worked for the U.S. Gypsum Company of Chicago, after graduation, as a structural designer, and he went in 1925 to the position of detailer for American Bridge Co., Gary, Ind. He also worked in the United States for the Kimberley Clark Company in Wisconsin as chief draughtsman. He joined Dominion Bridge Company at Winnipeg in 1927.

H. F. Bourne, M.E.I.C., has been named chairman of the Victoria Branch of the Institute. Mr. Bourne is assistant district engineer at Victoria for the British Columbia Department of Public Works.

He was born and educated in London, England. In Canada, in 1906, he joined the Canadian Pacific Railway, and worked on location and construction for the railway system in the west for eight years. In 1914 he was employed by C. H. Topp & Co., Victoria, B.C., on design and construction of the sewerage system for Esquimalt, B.C. In 1916 he was employed as assistant engineer by the municipality of Esquimalt, and in 1917 he was appointed its municipal engineer. Mr. Bourne joined the Public Works Department of British Columbia in 1937 as resident engineer at Victoria.

Henri Gaudefroy, M.E.I.C., assistant to the dean, and registrar of Ecole Polytechnique, Montreal, was elected chairman of the Montreal Branch of the Engineering Institute of Canada recently.

Mr. Gaudefroy was born in Montreal, and studied at Mont Saint Louis College and at Ecole Polytechnique where he graduated as an engineer in 1933. He did post-graduate work at the Massachusetts Institute of Technology, obtaining a degree in electrical engineering in 1934. For the next four years he was an engineer with the Bell Telephone Company in Montreal, where he specialized in automatic central office equipment.

Going to Ecole Polytechnique in 1939 as assistant professor of mathematics, Professor Gaudefroy was named associate professor in 1943, and assistant to the dean, and registrar. In 1947 he became a full professor. He is commanding officer of the University of Montreal Reserve University Flight, with the rank of squadron leader.

Studio Albert Dumas, Montreal

Henri Gaudefroy, M.E.I.C.

A. B. Cooper, M.E.I.C., has been chosen president of the Toronto Industrial Commission. The Commission was founded 21 years ago to promote the industrial development of the Toronto area, and Mr. Cooper was among the founders.

He is president of Ferranti Electric Ltd., and a director of Ferranti Ltd., (England).

Mr. Cooper was instrumental in founding, and was first president (1945-1946) of the Canadian Electrical Manufacturers' Association. He was chairman in 1929 of the Canadian Manufacturers Association, Toronto Branch; president of the Ontario Association of Professional Engineers in 1927. He is a fellow of the American Institute of Electrical Engineers, of which he was vice-president in 1927-29. He is also a member of the British Institute of Electrical Engineers.

A. E. K. Bunnell, M.E.I.C., consultant to the Ontario Department of Planning and Development, has been named chairman of the mayors and reeves committee, which is to consider establishment of a metropolitan plan in the Toronto area.

B.C. Travel Bureau photo

H. F. Bourne, M.E.I.C.

Mr. Bunnell has been consultant of the Community Planning Branch of the Department since 1944.

Ignace Brouillet, M.E.I.C., was recently elected president of the alumni associa-

L. C. Sentance, M.E.I.C.

D. O. Turnbull, M.E.I.C.

The elections of Mr. Sentance and Mr. Turnbull as chairmen of the Hamilton and Saint John Branches of the Institute, respectively, were announced in the February issue of the *Journal*.

H. W. McLeod, M.E.I.C.

tion of Ecole Polytechnique, Montreal.

Mr. Brouillet, who is dean of the faculty of engineering of University of Montreal (Ecole Polytechnique), graduated from the Ecole in 1929.

J. Geoffrey Notman, M.E.I.C., has been elected executive vice-president and director of Canadair Ltd., Montreal. The former vice-president in charge of manufacturing of Dominion Engineering Works Ltd., Mr. Notman is a director of Dominion Hoist & Shovel Co. Ltd., Electric Tamper & Equipment Co. of Canada, Ltd., and Robert M. Miller Construction Co. Ltd.

H. W. McLeod, M.E.I.C., has retired as principal assistant engineer for the Canadian Pacific Railway's prairie and pacific regions.

He is from Saint John, N.B., a graduate in civil engineering of the University of New Brunswick. He worked for the Intercolonial Railway at Moncton, N.B., and for the Pennsylvania Railroad at Columbus, O., before joining C.P.R. at Calgary, Alta., in 1906, as a transitman.

During his 44 years in C.P.R., at Calgary, Medicine Hat, Alta., Vancouver, B.C., and Winnipeg, Man., his career has paralleled the surge of branch line construction in the West, and the switching from 85- to 100-pound rail, among other advances.

Mr. McLeod is a past chairman of the Winnipeg branch of the Engineering Institute. He is also a life member of the American Railway Engineering Association and was one of the charter members of the Association of Professional Engineers of Manitoba.

W. G. Dyer, M.E.I.C.

W. G Dyer, M.E.I.C., has been appointed to the new post of assistant engineer maintenance of way for the Canadian Pacific Railway's prairie and pacific regions, with headquarters at Winnipeg, Man.

Mr. Dyer was district engineer at Vancouver, B.C., since March of 1948, and has been for 27 years with the C.P.R. An Infantry veteran of the First World War (5th Battalion), he is a graduate in civil engineering from University of Saskatchewan. He worked for C.P.R. at Regina, Sask., as a rodman, while still a student. He became a roadmaster at Prince Albert in 1936, division engineer at Moose Jaw in 1941, and has also worked at Penticton and Montreal.

C. M. Thompson, M.E.I.C., of Canadian Pacific Railways, who has been roadmaster at Wilkie, Sask., has been ap-

C. M. Thompson, M.E.I.C.

pointed division engineer at Saskatoon, Sask.

Mr. Thompson, a graduate of University of Saskatchewan, has been for six years with C.P.R., starting as a transitman at Moose Jaw, Sask., and has also been acting division engineer at Moose Jaw. He has served with the P.F.R.A. in irrigation work. He was nine years with International Nickel at Sudbury, Ont., and has also worked with the Department of Transport on airport construction.

C. A. Colpitts, M.E.I.C., of the Canadian Pacific Railways, Vancouver, B.C., has been promoted to district engineer of the British Columbia district, from assistant district engineer.

Mr. Colpitts was division engineer at Vancouver for five years before becoming assistant district engineer a year ago. An engineering graduate of University of Manitoba, he became division engineer for C.P.R. at Saskatoon in 1941.

K. A. Truman, M.E.I.C., has been promoted from division engineer for C.P.R. at Medicine Hat, Alta., to assistant district engineer at Vancouver.

Mr. Truman's service with the C.P.R. started in 1929 at Coronation, Alta., and he has worked since at Lethbridge, Alta., Regina, Sask., Kenora, Ont., and at Nelson, B.C. He was a roadmaster at Manyberries, Alta., for a year before his appointment as division engineer at Medicine Hat in 1944. He is a graduate of University of Manitoba.

N. A. Williams, M.E.I.C., who was associate professor of electrical engineering and acting chairman of the department of electrical engineering of University of Manitoba, was promoted in January to the rank of professor and was made chairman of the department of electrical engineering. He succeeds Dean E. P. Fetherstonhaugh, who recently retired.

Professor Williams received the degree of bachelor of science in electrical engineering from Queen's University, Kingston, in 1938. He was affiliated with the International Nickel Company of Canada from 1938 to 1942, working on electrical power construction and maintenance. He has at other times been employed by the Aluminum Company of Canada, the Kingston Ship

N. A. Williams, M.E.I.C.

Building Company, the Department of Highways of the Province of Ontario, the McIntyre Porcupine Gold Mines Ltd., and by the Canadian National Railway.

His teaching career commenced in 1942 when he was on the staff of Queen's University. In 1946 he was appointed assistant professor in the department of electrical engineering at Manitoba.

He is an associate member of the American Institute of Electrical Engineers, and a member of the Association of Professional Engineers of Manitoba.

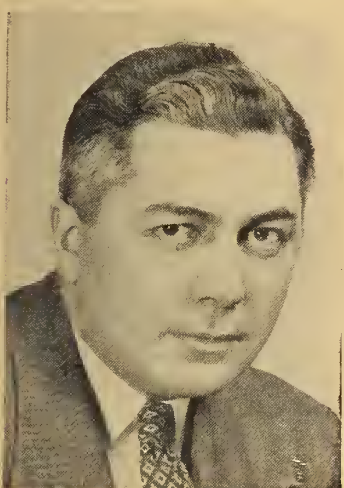
William Thornber, M.E.I.C., formerly of Longlac Pulp and Paper Co. Ltd., has joined the staff of the B.C. Coast Woods Trade Extension Bureau, Vancouver.

Mr. Thornber graduated from the University of British Columbia with a B.A.Sc. degree in mechanical engineering in 1932. He subsequently obtained his master's degree in timber engineering at the University of Toronto. This was carried out under a timber research fellowship sponsored by the Canadian Lumberman's Association.

Mr. Thornber is the author of several articles on timber and its uses. An article on "Tree Volume Determination" has been published by the Pulp and Paper Research Institute of Canada. "Panels for House Construction" is another article that resulted from Mr Thornber's investigations at the Dominion Forest Products Laboratory, Ottawa, on panel construction, box beams and timber trusses. Mr. Thornber has also written extensively on "Glued Wood Joints" and "The Glued Laminated Bowstring Truss".

Donald W. Campbell, M.E.I.C., has been appointed to the position of manager of the Farand and Delorme Division, United Steel Corporation Ltd., Montreal.

Following four years in the Northern Ontario and Quebec mining industry,



Donald W. Campbell, M.E.I.C.

Mr. Campbell attended Queen's University and in 1942 graduated from the faculty of applied science. He served five years with the R.C.E.M.E., rising to the rank of captain. After discharge, he was associated with T. C. Chown Ltd., and Westeel Products Ltd., before joining the engineering staff of United Steel Corporation Limited in Montreal. Mr. Campbell is a member of the Association of Professional Engineers of Quebec, and of the Canadian Institute of Mining and Metallurgy.

Constructor Cmdr. Frank Freeborn, R.C.N., M.E.I.C., has been transferred from the West Coast to the Montreal Area as principal overseer there for the Department of National Defence, Naval Service. His work includes the construction of the new escort vessels for the Royal Canadian Navy.

M. A. Montgomery, M.E.I.C., has been, since July, 1949, assistant sales manager of Canadian Blower and Forge Company Limited, Kitchener, Ont. Mr. Montgomery is the chairman of the Kitchener Branch of the Institute.

T. R. Wingate, M.E.I.C., of Dowty Equipment (Canada) Limited, is temporarily resident in England. He has been transferred back to the head office of Dowty Equipment Limited as personal assistant to the production director. He is at Cheltenham, Glos, England.

E. R. Jacobsen, M.E.I.C., returned to New York City in January from a two-months stay in Pakistan. He was a member of the United States Steel Corporation mission, which the Government of the new nation invited to make a survey of long term economic and industrialization plans, with particular reference to steel.

Alexander Hrenikoff, M.E.I.C., has won the Leon S. Moisseiff award for outstanding work in the field of civil engineering.

The award was made at a recent meeting of the American Society of Civil Engineers at New York, for his thesis in the field of inelastic bending theory with reference to engineering design.

Mr. Hrenikoff, who is a professor at the University of British Columbia, holds the degree of doctor of science from the Massachusetts Institute of Technology. B.A.Sc. and M.Sc. degrees were obtained at University of B.C. Prior to joining the University staff in 1933, he served with Dominion Bridge Company as a designer.

Hugh C. Brown, M.E.I.C., has been appointed branch manager for Canadian Westinghouse Company Limited at the Ottawa office.

Mr. Brown graduated from McGill University in 1936 in electrical engineering. He progressed through the Company apprenticeship course at Hamilton and joined the apparatus sales staff of the Winnipeg office in 1939.

From 1941 to 1946 he was absent on military duties, returning from overseas with the rank of captain, R. C. Signals, to join the apparatus sales staff at Montreal office. Shortly afterwards he was transferred to the Ottawa office.

W. A. Wheten, M.E.I.C., has joined the staff of Canadian Westinghouse Co Ltd., in Hamilton, Ont., as a manufacturing methods engineer.

Mr. Wheten recently returned after three years in Ceylon, where he was engaged as the irrigation engineer in charge of one of the largest irrigation schemes on the island.

Robert C. Freyman, M.E.I.C., who was with Husky Oil & Refining Ltd., Lloydminster, Sask., is now with Canadian Brown Steel Tank Co. Ltd., at Brandon, Man. He graduated from University of Saskatchewan in 1947 with a degree of B.Sc., in mechanical engineering.

Jean Bouchard, M.E.I.C., is working with Charles Duranceau Limited, general contractors in Montreal, as an estimator and construction engineer. He had been since 1942 at Mackenzie, British Guiana, with Demerara Bauxite Company.

Yvon Deguise, M.E.I.C., is now with the Quebec-Hydro, Montreal. He was previously superintendent of properties with the Beauharnois Light, Heat & Power Co., at Beauharnois, Quebec.

Gordon T. Aexander, Jr.E.I.C., who was with the Calgary Power Co. at Canmore, Alta., has joined the Canadian Pacific Railway Co., at Woodstock, N.B.

Mr. Alexander graduated from the University of New Brunswick with a degree of B.Sc., in civil engineering in 1948.

Maurice Beaudry, Jr.E.I.C., has joined the staff of Armco Drainage & Metal Products of Canada, Lennoxville, Que. He was formerly at Quebec City, on the staff of the Ministère de la Colonisation. He graduated from Ecole Polytechnique with a degree of B.Sc.A. in 1946.

G. J. Earle, Jr.E.I.C., is now with the Canadian Comstock Company frequency conversion division, at St. Catharines, Ont. He was formerly sales engineer with English Electric Co. in St. Catharines. He received the degree of B.Sc. in electrical engineering from the University of N.B. in 1947.

W. J. Gall, Jr.E.I.C.

S. H. M. Elliott, Jr.E.I.C., has left the Grinnel Co. of Canada, Toronto, Ont., to accept a position with the engineering department of Canadian Kodak Co., Toronto. He graduated in 1945 from Queen's University with a degree of B.Sc., in mechanical engineering.

William J. Gall, Jr.E.I.C., has obtained the position of technical assistant on the secretariat of U.N.E.S.C.O., Division of Science Co-operation, Department of Natural Sciences, Headquarters Branch, in Paris, France.

Mr. Gall received the degree of B.A.Sc. in chemical engineering from University of Toronto in 1946 and has done post-graduate work at the Swiss Federal Institute of Technology at Zurich. He completed his doctoral thesis late in 1949 and expected to take a final examination in January, 1950.

Gaston Jutras, Jr.E.I.C., has joined La Compagnie Jutras Limitée, at Victoriaville, Que. His new responsibilities will include product development, production methods and equipment. He was previously with the Montreal Tramways Company. Mr. Jutras received the degree of B.A.Sc. in civil engineering from Ecole Polytechnique in 1947.

T. R. Stuart, JR.E.I.C., is a P.F.R.A. engineer, employed by the Dominion Department of Agriculture, in charge of the district office at Gravelbourg, Sask. His work in the district pertains chiefly to irrigation with construction of both storage reservoirs and distribution systems. Mr. Stuart received the degree of B.Sc. in civil engineering from University of Manitoba in 1948.

R. S. Willmot, JR.E.I.C., is a plant engineer with Anthes-Imperial Co. Ltd., St. Catharines, Ont. He was previously production control supervisor of Monarch Knitting Co. at Dunville, Ont. Mr. Willmot received the degree of B.A.Sc. in mechanical engineering from the University of Toronto in 1943.

M. G. Bolsted, S.E.I.C., of Toronto, is on the staff of Gypsum, Lime & Alabastine (Canada) Ltd., at Caledonia, Ont. He graduated from the University of Saskatchewan in 1949, with a degree of B.Sc.

John A. Gurnham, S.E.I.C., is employed by the Cornwall Street Railway Light and Power Company, Cornwall, Ont. He graduated from McGill University in 1949 with a degree of B.Eng. in electrical engineering.

J. G. Tillcock, S.E.I.C., is working with the Ontario Department of Highways, at Chatham, Ont. He received the degree of B.A.Sc. in civil engineering from the University of Toronto in 1949.

H. K. Larsen, S.E.I.C., is on the staff of Fluor Corporation Limited in Montreal, Que. Mr. Larsen graduated from the University of New Brunswick in 1949 with a degree of B.Sc. in civil engineering.

F. W. J. Gowland, S.E.I.C., has joined the engineering sales staff of Canadian Fairbanks-Morse Co. Ltd., Toronto. Mr. Gowland graduated from the University of Toronto in 1949 with a degree of B.A.Sc. in civil engineering.

Visitors To Headquarters

Hew M. Scott, M.E.I.C., Toronto, February 1, 1950.

H. Randlesome, M.E.I.C., Regina, February 2.

A. G. Bridgman, M.E.I.C., Halifax, February 3.

A. A. Swinnerton, M.E.I.C., Ottawa, February 9, 1950.

Sidney Hogg, M.E.I.C., Vancouver, B.C.

D. J. Tynan-Byrd, England, February 9, 1950.

Bruce M. Goodall, England, February 13, 1950.

T. H. Kirby, M.E.I.C., Winnipeg, February 7, 1950.

Dr. Lillian M. Gilbreth, HON. M.E.I.C., Montclair, N.J., February 21, 1950.

Obituaries

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

Alex Watson Gregory, M.E.I.C., who was senior assistant engineer at Halifax for the Federal Department of Public Works, died in January, 1950, following a lengthy illness.

He was born in St. Stephen, N.B., in 1884. He received his early education in St. Stephen, and later attended the University of New Brunswick.

Mr. Gregory had been more than forty years in the employ of the Federal Government, and during later years his work took him to all sections of the province.

For four years he served overseas with the famous "Fighting 26th" Infantry Battalion in the First World War. He took part in engagements at Vimy Ridge, fought at Ypres and the Somme and was decorated with the Military Cross by King George V, at an investiture in Buckingham Palace.

Returning to civil life, he re-entered the employ of the Federal Government working in Ottawa for four years before being transferred to Nova Scotia.

He joined the Engineering Institute of Canada in 1912 as Junior, transferring to Associate Member in 1919, becoming Member in 1940.

William Gordon Mitchell, M.E.I.C., who was a consulting engineer in Montreal, Que., died suddenly in January, 1950.

Mr. Mitchell was born in 1888 at Port Hope, Ont. He was educated at the Port Hope Collegiate Institute, and McGill University, receiving a B.Sc. degree in 1913 and an M.Sc. in 1914. In 1913 he was with the Tunnel & Terminal Co., Montreal, and in 1914-1916 he was with Forest Products Laboratories of Canada, Montreal. From 1916 to 1919 he was mining engineer with R. Martens & Co., Ltd., London, England, engaged in investigation of the timber and mining industries in Scandinavia, Finland, European Russia, Siberia and Manchuria. In the early part of 1919 he did independent engineering work in Canada and United States, the latter part he was engaged with Canadian Export Paper Co. Ltd., to investigate technical and economic conditions of pulp and paper industry in Norway, Sweden, Finland, Russia, Poland and Germany. In 1921 he joined Price Bros. & Co. Ltd., Kenogami, Que., where he remained for eleven years. From 1932 his work was partly in the United States and partly in Canada, and related principally to the wood using, mining and metallurgical, and hydro-electric fields.

Mr. Mitchell joined the Institute in 1920 as a Member. He was the first chairman of the Saguenay Branch in 1920 and was vice-president of the Institute from 1926 to 1930.

Major R. C. Farrow, M.E.I.C., of Victoria, B.C., who was comptroller of water rights for British Columbia, died in February, 1950.

He joined the staff of the Water Rights Branch of the Department of Lands, British Columbia, as hydraulic engineer in the power investigation division in 1928. He became chief hydraulic engineer in 1938. His activities were interrupted in 1940 when he offered himself for active service in World War II. In 1945 he resumed his duties with the Branch.

Previous to his appointment with the B.C. Government, and after returning from World War I, he was in private practice in Vancouver until 1923 at which time he joined the staff of the Southern California Edison Co. at Los Angeles, remaining with them in hydraulic engineering until 1928. Major Farrow saw service in both World Wars. In World War I he went over with the Canadian Field Artillery and became attached to the Royal Flying Corps (becoming Royal Air Force in 1918) serving in the United Kingdom, France and Belgium. In World War II he served with the Royal Canadian Engineers and Royal Canadian Artillery, seeing service in the United Kingdom and North West Europe. In recognition of the service rendered his country in World War II, he was made a Chevalier of Order of the Crown with Palm (Belgium) and was awarded the Croix de Guerre with Palm (Belgium).

Major Farrow was born at Hornsey, Middlesex, England, in 1892. He was educated in Vancouver and served an articled apprenticeship with Humphreys & Tupper, Vancouver land surveyors and engineers.

Major Farrow joined the Institute as an Associate Member in 1933, transferring to Member in 1938. He served as chairman of the Victoria Branch of the Institute in 1947, and had been elected councillor for 1950. He was a B.C. Land Surveyor; a registered Professional Engineer of B.C.; chairman of the Pacific Northwest section of the Western Snow Conference, and vice-chairman of the Committee on the Hydrology of Snow of the American Geophysical Union.

NEWS of the BRANCHES

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

Border Cities

J. K. Ronson, M.E.I.C.
Secretary-Treasurer

J. A. MacGibbon, M.E.I.C.
Branch News Editor

President John E. Armstrong, Vice-President J. A. Vance and General-Secretary L. Austin Wright visited the Border Cities Branch on January 25, 1950.

A branch executive meeting attended by members of the presidential party was held during the afternoon and several matters of business of interest to the Institute at large were discussed.

A reception and banquet attended by branch members and their wives was held at the Prince Edward Hotel in honour of the presidential party.

The president expressed the opinion that, in view of a large Membership widely scattered, there is need for close exchange of information between the branches and headquarters. Such an exchange could best be accomplished through personal contact and he has asked that vice-presidents call annually upon the branches. In addition, one or more visits by the field-secretary will be made.

He explained that the Institute is primarily neither a social organization nor a technical organization. It is a professional organization, as compared to the provincial professional organizations which are licensing bodies whose purpose is to assure the public that he who purports to be an engineer is qualified to act in an engineering capacity. Professional status cannot be legislated into existence and to attain professional status the engineer must first attain professional consciousness. The Institute assists in developing in its members a professional consciousness and there is no conflict between the basic aims and purposes of the Institute and the provincial professional organizations. They are complementary bodies.

The Institute is a Canadian organization. It promotes and supports those things which it believes to be for the good of the Canadian engineer and Canada. It believes in the Canadian engineer and in his ability to do the engineering jobs that have to be done in Canada. It is opposed to the employment of engineers from other countries, either individually or collectively, to do work in Canada for which Canadian engineers are available. It has been pressing this view in many quarters where there still seems doubt of the Canadian engineer's ability. The standing of the Institute is such that its efforts on behalf of the Canadian engineers are not ignored. These efforts are having a cumulative effect and the tendency to consider other engineers first is not now

Photographed at Border Cities Branch meeting in January, were (left to right) S. M. Kennedy, J. A. McGibbon, Dr. L. Austin Wright, J. G. Hoba, H. P. Dial, G. W. Lusby, James A. Vance.

as prevalent as it was some years ago.

The President reviewed the good works of the Employment Service of the Institute and had words of praise for the Library which has grown considerably and which is now operating under difficulties in cramped quarters.

In closing, the president explained that the engineer needs those things the Institute can do for him, and the Institute needs his best effort as a help in guiding it to act for the best interests of the engineering profession. As long as the Institute successfully implements its policy to do those things which are good for the engineer and for Canada, the Institute will rate high in the eyes of the Canadian public, and the members of the Institute will share in this rating.

The President was introduced by P. E. Adams, chief engineer of the Canadian Bridge Company, and J. B. Dowler, Ford Motor Company, expressed the thanks of the branch members.

Dr. Wright addressed the banquet gathering and reviewed several subjects of wide interest to all members. He advised that the membership now stood at 12,566 and stated that a large number of young engineers were joining. He suggested that we promote this trend and that our activities be directed toward holding the interest of these young engineers so that they would continue their membership.

He reviewed the magnitude of the task of publishing the *Journal* and advised that for the first time the *Journal* had paid for itself. This was in large measure due to the support of advertisers and he suggested that *Journal* advertisers be patronised whenever possible.

He stated that the directory of members had been finally edited and was in the hands of the printers.

He also expressed regret about the condition whereby construction projects have been granted to foreign contractors when Canadian engineering ability was available and competent. He reviewed the work being done to prepare a directory of Canadian consultants in the hope that this directory would be consulted and that Canadian contracts would be let to Canadian contractors.

It was interesting to note that with the appointment of Gen. A. G. L. McNaughton to the International Joint Commission, Canada was now represented by a competent engineer.

Cornwall

L. H. Snelgrove, Jr.E.I.C.
Secretary-Treasurer

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

On February 14, 1950, President J. E. Armstrong visited the Cornwall branch, with Mrs. Armstrong and Dr. L. Austin Wright, general secretary. In honour of the occasion, a dinner was held at the King George Hotel. Other special guests included Major-General G. R. Turner and J. L. Shearer representing Ottawa branch, Mr. and Mrs. J. B. Sterling from Montreal branch, as well as wives and friends of Cornwall members. Approximate attendance was 53.

In his address, Mr. Armstrong reminded his listeners of the aims of the Institute, in fostering high ideals among its members. He also stressed the policy of encouraging employment of Canadian engineers for Canadian projects.

Dr. Wright supplemented the preceding address with details on Institute membership and facts about the *Journal*.

Branch Chairman G. G. M. Eastwood introduced the speakers and thanked Dr. Wright. R. Wallace, past chairman, expressed appreciation of the President's visit and address.

On February 15, Mr. Armstrong and Dr. Wright met with the following members of the branch executive—D. Ross-Ross, G. G. M. Eastwood, R. Wallace, H. W. Nickerson, P. H. Nasmyth, L. H. Snelgrove, L. P. Stidwill, F. E. Trewartha and A. A. B. McMath. This informal meeting took place at the Cornwallis Hotel where luncheon was served. Many interesting topics on proposed changes to by-laws, news from other branches, and local problems were discussed.

Kingston

D. L. Rigsby, M.E.I.C.
Secretary-Treasurer

James T. Provan, Jr.E.I.C.
Branch News Editor

On February 13, 1950, the Kingston Branch had the pleasure of greeting the president of the Institute, Mr. J. E. Armstrong and Mrs. Armstrong, accompanied by Dr. L. Austin Wright, the general secretary.

The programme of the day consisted of an executive lunch and business meeting at the Royal Military College, Kingston, after which the president went to Queen's University to address the undergraduates. In the evening the annual branch dinner was held at the Aluminum Company of Canada. Mrs. L. F. Grant entertained the wives of members at tea in the afternoon in honour of Mrs. Armstrong.

The dinner was well attended by members and their wives and friends of the Kingston Branch. Dean D. S. Ellis introduced Mr. Armstrong, who gave an excellent talk on the aims and objectives of the Institute. The large number of members in all fields of engineering was pointed out, and it was mentioned that Canada should not, and has no need to, bring in from outside consulting engineers for Canadian purposes. Dr. R. D. Bennett thanked the president.

Dr. Wright was introduced by the branch chairman, Professor J. W. Brooks, and he also mentioned the fact that Canadians should consult Canadian engineers, who are fully qualified in all phases of engineering work. He said a catalogued index is now being prepared by the Institute, for the use of industrial organizations.

Guests at the head table were the president and Mrs. Armstrong; Professor and Mrs. Brooks; Dean and Mrs. Ellis; Mr. and Mrs. G. T. L. Andrews, Dr. and Mrs. Bennett; Mr. Denis Barford, secretary to Mr. Armstrong; Dr. Wright; Mrs. L. F. Grant, wife of Past-President L. F. Grant, who was unable to attend; and Mr. and Mrs. M. G. Saunders.

Lethbridge

D. Cramer, M.E.I.C.
Secretary-Treasurer

J. T. Dokken, Jr.E.I.C
Branch News Editor

Members and guests of the Lethbridge Branch of the Institute met at the Marquis Hotel on January 21, for a dinner meeting presided over by chairman R. D. Livingstone. Mr. G. Eckenfelder of the Calgary Power Company gave a very interesting address on the Spray River power development.

During dinner, music was supplied by the Browns' Instrumental Trio. Community singing led by R. S. Lawrence, and vocal solos by Miss Jackie Boyle, accompanied by Mrs. Katherine Brown, were very enjoyable. P. E. Kirkpatrick introduced the speakers.

Mr. Eckenfelder, resident engineer of the Spray Project, outlined the extreme shortage of water for power and thus the need for added storage and power facilities. The Spray project was first planned in 1911 and various surveys and explorations were carried out until 1947 when the final surveys and designs were completed. There is a difference in elevation of 1130 feet between Spray Canyon and the end of the development at Canmore and this drop is the "key to the project". The Spray River is a small river with a maximum recorded flow of 4,500 and a minimum of only 60 cubic feet per second.

The overall project consists of three dams.

A dam in Spray Canyon diverts the water from the channel, raising the water level 170 feet and forming a reservoir 13 miles long. This earth fill dam is 192 feet high and has a crest length of 640 feet. Over a million cubic yards of materials were used in its construction.

A 40-foot-high earth fill dam and small powerhouse is located at the foot of Three Sisters Mountain. Because of very poor foundation materials at this site it was decided to use a flexible steel conduit through the dam since there may be appreciable settlement of the whole structure.

An earth fill dam at Goat Pass diverts the water into a long side hill canal to Whiteman's Pass where it drops 905 feet through a very steep tunnel into the Main Spray Power House, a 62,000-horsepower plant which will generate 47,500 kva. of electricity.

A great deal of the construction has been carried out under harsh winter conditions. The first problem was the necessity of building a heavy-duty road on a very steep grade through rough country for 20 miles from Canmore to Spray Canyon under the severest winter conditions.

All the power stations will be remote-controlled and will require only a maintenance crew at each.

Mr. Eckenfelder illustrated his talk with very illuminating slides depicting the type of country and the construction to date.

R. C. Bell moved a vote of thanks to Mr. Eckenfelder on behalf of the Branch and guests.

London

D. D. C. McGeachy, M.E.I.C.
Secretary-Treasurer

Robert G. Code, M.E.I.C.
Branch News Editor

The annual meeting of the London Branch was held on Monday, January 23, at the Wolseley Barracks Reserve Officers' Mess on the occasion of the annual visit of the President, John E.

Armstrong, chief engineer of the Canadian Pacific Railway.

Mr. E. V. Buchanan, president of the Ontario Association of Professional Engineers spoke a few words of introduction to Mr. James Vance of Woodstock, who introduced Mr. Armstrong.

After Mr. Armstrong's talk, A. L. Furanna called upon some of the members present to take part in a discussion of problems of interest to engineers.

George Humphries commenced the discussion on a very controversial subject, namely the importation of engineering drawings from the United States G. N. Scroggie talked about the promotion of engineering officers in the Canadian Army receiving professional rates of pay in accordance with those presently received by officers in the Dental and Medical Corps.

Don McGeachy spoke about the Memorial Fund available to young engineers.

Ken Clawson thanked Mr. Armstrong on behalf of the London Branch.

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The February meeting of the London Branch took place on the 16th of the month and was in the form of a panel discussion between Dr. R. D. Macdonald of Queen's University and Dr. E. G. Pleva and Dr. G. G. Suffel, both of the University of Western Ontario.

Proved iron ore bodies along the Quebec-Labrador border are now in the neighbourhood of 355,000,000 tons, Dr. R. D. MacDonald said.

Dr. Macdonald has done exploration work in the area for Labrador Mining Explorations, a subsidiary of the Hollinger interests which were given exploration concessions in a large area about 350 miles north of the St. Lawrence River mouth.

"Deposits Northern Ontario miners would drool over are not even counted in the estimate," Dr. Macdonald told the group. He said the problem of drifting snow might make open-pit mining difficult. A 360-mile railway must be built before ore can be shipped, he said.

"Natural market for the ore is the United States," he stated. He did not attempt to compare possible production costs in Labrador with costs of production in Northern Ontario and the Mesabi range.

Dr. Suffel outlined the history of iron deposits and mining in Northern Ontario, particularly Steep Rock and Michipicoten. Between 1923 and 1938, he said, there was no iron ore produced in Canada.

He described the development of the Steep Rock mine, reviewing the diversion of the Seine River, and the drainage of Steep Rock Lake.

After large areas of the lake were pumped out, open pit mining started "Eventual production in this area is expected eventually to reach 5,000,000 tons a year," Dr. Suffel said.

"Ontario is in the iron ore business for many years to come — and on an increasing scale," he told the engineers.

Dr. Pleva told of the Mesabi range which he described as a long, narrow raisin cake, with sugar on the raisins. "So far," he said, "all that has been touched is the sugar on the raisins."

Reserves of top grade ore, over 50 per cent iron, are about 900,000,000 tons, he said. Reserves of ore 40 to 50 per cent iron are about one billion tons. Reserves of ore 30 to 40 per cent iron are about 61 billion tons.

But, he added, it is not at present economical to process ore under 50 per cent iron. Techniques have been developed, but such ore is not being worked.

He said the Mesabi range has produced half the iron ore for both world wars.

A discussion followed talks by the three speakers.

Ottawa

J. C. Elliott, m.e.i.c.
Secretary-Treasurer

A. J. Bernard, m.e.i.c.
Branch News Editor

The final luncheon meeting of the Ottawa Branch of the year was held on December 8, at the Chateau Laurier, a joint meeting with the Engineer's Wives Association. The guest speaker John Fisher, C.B.C. Commentator, was ably introduced by Mr. Blair Fraser of the C.B.C.

Mr. Fisher (the wandering reporter) observed that engineers can contribute greatly to the progress of Canada and of the world. Engineers contribute in some way to practically all activities, but sometimes a very important phase—Human Engineering, is neglected.

The speaker stated that too little is being done to sell Canada abroad. More of our brains and products should be sent abroad to advertise our culture.

A general disinterested atmosphere sends some of our brains to fields outside Canada. We should do everything possible to advertise and to educate our young people on the possibilities of Canada, particularly the far north. The undeveloped resources of our country are a challenge to our young engineers.

Our forests are good examples of natural resources which are being poorly engineered. Reforestation and fire-prevention, for example, have been only touched on in our forests, yet depleted

At the Ottawa Branch annual meeting in January, the photographer grouped (top left to bottom right): T. Foulks, J. C. Elliott, M. C. S. Brown, G. R. Davis, J. L. Shearer, L. A. Wright, J. J. Green, A. A. Swinnerton, Gen. G. R. Turner, W. J. W. Reid, A. C. Ross, H. E. Treble.—*Photo by T. B. Little.*

and barren lands can affect the whole economy of our country.

Engineers can do much in selling themselves to the public. Their public relations leave much to be desired. They know what is good for the country, and the public should be educated along these lines.

The speaker concluded by saying that we should not hinder progress by small time provincialism, and on a larger scale there should be closer co-operation between countries if we are to have a progressive Canada and a progressive world.

Mrs. H. E. Treble, president of the Engineer's Wives Association, thanked Mr. Fisher.

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The annual business meeting of the Ottawa Branch was held at the Chateau Laurier on January 5, 1950. A report of the membership committee was given by the committee chairman. This report indicated a steady increase in the branch membership after decreases, due to transfers, etc., had been made up by new members.

The financial statement brought favourable comment from all, particularly the slight deficit on the year's operations. This was taken by all as a good sign that the Branch funds were being put to active use and that no dormant surplus was being built up.

The general secretary, Austin Wright, commented favourably on the branch activities, particularly the deficit, and introduced Mr. William J. W. Reid, vice-president for our zone.

Bill Reid addressed the members, giving a comparative outline of the functions of the Institute and of the Professional Associations. The speaker emphasized the necessity of selling our profession to the public and the valuable work that can be accomplished by good public relations. He stated that the Ontario Association is now organizing a publicity campaign in which John Fisher, well-known Canadian commentator, will take part.

Mr. Reid's remarks were much appreciated by all members.

As a result of a ballot vote the following officers were elected for the coming year: A. C. Ross, chairman; H. E. Treble, secretary-treasurer; G. R. Davis and J. J. Green, were elected to the management committee.

The out-going chairman, A. A. Swinnerton, thanked all committee members and members generally for their splendid co-operation during what had been a very successful year for the Branch.

The new chairman then spoke briefly, the meeting adjourned to a very enjoyable buffet supper and smoker in the banquet room. This was thoroughly enjoyed by all. A particularly fine piano and singing act rounded out a fine evening.

Junior Section

M. L. Narraway, jr.e.i.c.
Secretary-Treasurer

The Annual Meeting of the Junior Section of the Ottawa Branch took place on January 17, 1950, at the Chateau Laurier.

Gordon McRostie, retiring chairman of the Section turned the meeting over to John Watt, the new chairman. Results of elections were announced, and members of the new executive, in addition to Mr. Watt, are Messrs. Keith Gordon, vice chairman; Gordon McRostie, William Meredith, Gordon Shorter, Gordon Bird, Don Farmer, Ron Carwadine, Terry Lagrave, Eric Norse, Paul Brunelle; and the secretary-treasurer, Maxwell Narraway.

Members and guests were invited to introduce themselves to the meeting, and were asked to wear name tags. Mr. Narraway outlined the programme for the coming year, receiving an enthusiastic response.

Films dealing with co-axial cable, radar, solonar and television, supplied by the Bell Telephone Company of Canada, were shown; and the meeting terminated with the showing of a technicolour film of a Montreal-Ottawa football game. This film was supplied by the Ottawa Rough Rider Quarterback Club.

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Attendance at the Ottawa Junior Section Smoker on January 31, 1950, taxed the capacity of the R.C.E. Officers Mess. Entertainment was supplied by Harvey Barbeau, and a singsong was led by Mr. McQuitton.

It was of interest to observe from name tags collected after the meeting that all branches of engineering were represented, from civil to aeronautical. Also represented were fourteen universities from all across Canada.

It was announced that the Junior Section would meet again at the dance at the Assembly Hall, Lansdowne Park, on February 21st.

Peterborough

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

J. C. Allan, m.e.i.c.
Branch News Editor

James M. King of the Canadian General Electric Company was elected chairman of the Peterborough Branch of the Institute at the annual meeting of the Branch on January 30, at the Kawartha Golf and Country Club. He succeeds A. R. Hailey, the 1949 chairman.

The recommendations of the nominating committee were accepted unanimously, with the result that the 1950

The Peterborough Branch annual meeting. Seated, left to right, are: G. R. Langley, John E. Armstrong, L. Austin Wright, A. L. Malby, F. R. Pope, S. D. Shields, C. B. Muir. Standing, left to right: D. A. Drynan, A. J. Bonney, A. R. Hailey, G. W. Herzog, H. R. Sills, R. T. Bogle, J. M. King, M. M. Uloth, R. L. Dobbin.

executive also includes Messrs. R. T. Bogle, A. J. Bonney, A. R. Hailey, C. W. Holman, J. L. McKeever, G. B. Muir, M. E. Uloth, and the secretary-treasurer, G. W. Herzog. A. L. Malby is the branch councillor; F. R. Pope represents the Ontario division; G. R. Langley heads the Institute committee on student guidance, and H. R. Sills heads the Institute membership committee.

Guests of honour at this meeting were the president of the Institute, John E. Armstrong, and Mr. L. Austin Wright, the general secretary. They addressed the meeting on Institute affairs, commenting also on the recent satisfactory appointment of General A. G. L. McNaughton to the International Joint Commission. Mr. Wright also talked of his contention that Canadian engineers should be consulted on Canadian engineering projects, wherever possible. He conceded that in some cases American engineers have been the only ones competent to perform a specific assignment, and that private companies from south of the border with branches in Canada have a right to choose their own men. He remarked on instances, however, where federal and provincial governments have called in American engineers when native professional engineers could have been hired equally as well. He remarked that the Engineering Institute is compiling an index of Canadian engineering services.

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On February 21st, E. S. Lee, executive engineer, General Engineering & Consulting Laboratory, General Electric Company, Schenectady, N.Y., spoke to the Peterborough Branch on **What is New in Science Engineering.**

Mr. Lee at first outlined the organization of the General Engineering Laboratory at Schenectady, defining its functions and stating its relationship to the Research Laboratory and to other engineering divisions in the General Electric Company.

He then indicated that the title of his talk was perhaps a little misleading in its scope, in that he intended to speak on developments in the field of measurements, an all important subject in the continued progress of science and engineering.

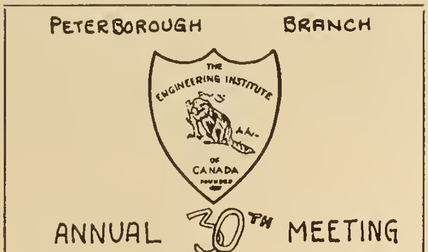
He related the initial experiences of the Laboratory in the development of electric gauges of the inductance type which were first applied to the inspection of mass produced parts for the sealed refrigerator unit. This application of the electric gauge then was extended to the steel mill industry, where speeds in the rolling of steel sheet had been limited to about 300 f.p.m. by existing measurement techniques. The introduction of the electric gauge had then led to increases of speed up to 1500 f.p.m. and ultimately to 4000 f.p.m., the latter due to an extension of the function of the electric gauge from measurement to control.

The need for still higher speeds then led to the development of the X-Ray gauge, the operation of which is derived from the fact that when X-Rays are projected through the steel sheet, the amount of absorption varies with the thickness of the sheet. This development has led to speeds of 5000 f.p.m. in the hot strip mills, and 6000 f.p.m. in cold strip mills, the X-Ray apparatus operating most effectively under extremely adverse conditions.

The most recent development is the Nuclear or Beta-Ray Gauge, a peaceful application of the products of the Atomic Energy Commission which can be used to measure, record or control the thickness of rubber, paper, textiles, metals and other materials during processing.

Another interesting development is the eddy current gauge developed to control the processing of aluminum foil to very close limits.

Mr. Lee then introduced the subject of calculating machines, referring briefly



to network analyzers, in which complex problems arising from the arrangement of distribution circuits in electric power supply systems may be quickly solved.

He discussed at more length the development of the digittal computer in complex mathematical problems; the mass spectrometer in the oil industry; the freion or halogen leak detector in pressure systems; and the mercury vapor detector.

An electric device has been designed to give a direct reading of the dew point of vapours, and subsequently a recording device of this nature was developed. In this connection Mr. Lee pointed out the difficulties involved in developing devices to record rather than to indicate a measurement.

X-Rays have been applied in the case of the X-Ray photometer to chemical analysis and electron beams applied to the development of a surface quality instrument. Mr. Lee also mentioned some of the applications of high speed photography.

The need for analysis of vibration problems led to the development of the vibration velocity meter, which by the addition of an integrating unit could measure displacement and by the addition of a differentiating unit could give an indication of acceleration. This found an important field of application in the development of the gas turbine.

The laboratory is also working in the field of ultrasonics on high frequency sound waves and has developed ultrasonic generators utilizing a quartz crystal capable of generating frequencies up to a million cycles per second with extremely high energy outputs.

Some years ago important work has been done on the effect of lightning on transmission lines, using early designs of cathode ray tubes and photographic methods. In contrast to the apparent crudity of this early work, Mr. Lee described the latest combined cathode ray oscillograph and photographic unit, from which a finished photographic record could be obtained in 26 seconds from the occurrence of the event to be recorded.

Mr. Lee then described the attempts made over some years with final success to measure the shaft horse power of large marine power installations by electrical means.

In conclusion Mr. Lee described in lighter vein the "opinion meter" devised to enable broadcast companies to evaluate studio audience reactions to talent shows and the like.

Mr. Lee's talk was illustrated throughout with many slides and a short discussion period followed.

Saguenay

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

On Monday, January 30, 1950, a smoker was held in the Assembly Room of the Saguenay Inn for members to welcome Messrs. R. E. Heartz and A. Lariviere, vice-presidents of the Institute, Vice-Chairman J. F. Braun presided and introduced the speakers and explained to the group that the main purpose of the vice-presidential visit was personal contact with the men of the branch.

Mr. Lariviere spoke at length on the duties performed by the Council of the Institute illustrating the complexity of topics discussed at a normal meeting of the Council. Topics covered at a recent Council meeting included grades of membership, medal distribution and awarding, employment of engineers from outside Canada, the means of forwarding the work of the Wartime Bureau of Technical Personnel which was recently closed, resignations, transfers, new members, new branches, etc. Mr. Lariviere explained that the meeting place of the Council of the E.I.C. varies, council meetings having taken place recently in Toronto, Vancouver, Ottawa, Quebec, Sydney and Kitchener. He drew attention to the recent appointment of Gen. A. G. L. McNaughton to the International Joint Commission. It had been gratifying to have the views of the Institute recognized in this case.

Mr. Lariviere discussed the membership of the E.I.C., stating that there are 12,566 members of which about forty-five hundred are students. He emphasized the importance of the E.I.C. as the only organization in Canada which encompasses all branches of engineering, and he stated that it is the most important society for engineers to join.

Mr. Braun then introduced Mr. R. E.

Heartz, who discussed the Finance Committee and explained that it was composed of five members. The treasurer, presently Mr. A. W. Whitaker, Jr., is appointed by council and is not an elected member. He explained the purpose of the Bennett Fund of the E.I.C. which is set up to provide loans to students requiring them. This fund is handled by three trustees remote from council. Mr. Heartz stated that the Building Fund now stands at $17,000 as opposed to the $150,000 to $175,000 which Council feels is needed. At the end of 1949, reserves and surplus funds amounted to approximately $60,000. The bulk is invested in bonds. Mr. Heartz stated that in future it may be the policy of the Council to invest the surplus money in preferred stock and he named the Aluminum Company of Canada and the B.A. Oil with holdings in oil fields of Alberta as two outstanding money earners in this class.

Mr. Heartz then went on to discuss the young engineer and how he fits into the E.I.C. He said the first responsibility was the Branch's, to make work for him and to make him feel truly a member. Mr. Heartz drew attention to the excellent library available to all members at headquarters. He emphasized the point discussed by Mr. Lariviere that all engineers in Canada regardless of specialty should belong to the E.I.C. He mentioned that the social aspect of the E.I.C. is even more important than the technical. Council, he said, has been repeatedly advised by societies in the United States that the all encompassing society is much more efficient and desirable than a group of specialized societies. Mr. Heartz concluded with a few remarks on the international as well as the national aspects and duties of the E.I.C.

The two gentlemen were then thanked by Bruce Davis.

Two Canadian General Electric films were shown, one "The Light of Your Life" illustrating the manufacture of all types of electric light bulbs and a film on jet propulsion which illustrated the principles behind the jet engine. Following the films refreshments were served.

St. Maurice Valley

J. B. Edwards, m.e.i.c.
Secretary-Treasurer

"Junior Night," held by the Branch on January 19, 1950, at the Chateau de Blois, Trois-Rivières, consisted of papers delivered by six Junior members, three each from Trois-Rivieres and Shawinigan Falls. The papers, of ten to fifteen minutes duration, were judged and winners declared as follows: first, D. G. Demianiw; second, T. P. Hayes; third, T. F. Scott.

George Bond, jr.e.i.c., spoke on **Canada's Oil Boom.** He covered the recent discoveries made in Alberta and referred to the possibility of further finds making Canada an oil exporting country. The completion of the Edmonton — Lake Superior pipe line was expected to accelerate production.

Ernie Penrose, jr.e.i.c., spoke briefly on recent developments in the television field in the United States, stressing particularly the recent rapid growth of interest in full-colour transmission. He then outlined the R.C.A. System of full-colour T.V. transmission, in simple terms, concluding with a few words on other recent colour sending and receiving systems.

Jean Carpentier, jr.e.i.c., a parlé en français de la "Distribution dans la Compagnie Shawinigan Water and Power". Il a donné un resumé historique des cinquante années de l'entreprise électrique; quelques mots sur l'organisation du département Commercial et Distribution; un élaboré des systèmes de distribution d'énergie tant urbains que ruraux avec application particulière au district de Trois-Rivières.

T. F. Scott, jr.e.i.c., of Canadian Industries Ltd. discussed **Traps,** giving a description and explanation of the operating principles of several different kinds of traps or automatic valves. By means of illustrations several types of fluid traps, such as float, bucket, inverted bucket and impulse were described, together with their applications. The different methods of piping traps were considered, together with some of the common faults encountered.

T. P. Hayes, jr.e.i.c., Canadian Industries Ltd., described **The Manufacture of Cellophane.** Cellophane is essentially cellulose, the source of which is woodpulp. By treating woodpulp with Sodium Hydroxide and Carbon Bisulphide, a Xanthote is formed which, when dissolved in NaOH, gives a liquid called "viscose". This "viscose" is extended into a sulphuric acid bath which coagulates and regenerates it back to cellulose in another form. Once the impurities have been removed, a softening agent added and the film dried, a tough, transparent greaseproof sheet known as cellophane is obtained. If so desired, the film may be given a moistureproof coating.

D. G. Demianiw, jr.e.i.c., Shawinigan Chemicals Ltd., discussed **Some Applications of the Fluidized Solids System.** The fluidizing of solids technique has been used extensively in the petroleum industry in the fluid catalytic cracking process which produced much of the aviation gasoline used during the recent war. Another probable application, as demonstrated by scientists at the National Research Council, may be in the recovery of bitumen from the Alberta tar sands. The main advantages of a fluidized solids bed are the excellent heat transfer characteristics and the intimate mixing obtained between solids and gases.

Trois-Rivières Junior Section

Jacques Pichette, jr.e.i.c.
Secretary-Treasurer

The TroisRivières Junior Section of the St. Maurice Valley Branch held the first meeting of the 1949-50 season on November 2, at Le Voyageur Hotel. A new slate of officers was chosen for the coming year and a programme of future meetings was drawn up.

The new officers elected include Walter Seline as chairman; Dennis Catford, vice-chairman; Jacques Pichette, secretary-treasurer; and Dave Webster, committee-man.

At a regular meeting of the Section on November 29th, Dr. Conrad Godin, well-known dentist in the Valley spoke on the **St. Maurice Valley, Past, Present and Future.**

Dr. Godin divided the Past into three phases, the fur period when the nearby Indian tribes in the N.E.S. & W. both endangered and supported the settlement; the lumber period when our forests were really destructively handled, and finally the power-development period in which we find ourselves today.

For "the Present" Dr. Godin pointed out the recent development in the valley and gave his own view on the tourist trade.

For "the Future" of this region he showed great optimism which certainly inspired the group of engineers. He pointed out that much power is yet to be harnessed on the St. Maurice and that already the Chambers of Commerce of the towns in the Valley have been trying to interest industries in coming to this region from as far away as Europe.

Besides their value as power sites Dr. Godin indicated these rapids and falls are also prospective tourist sites especially due to the proximity of hills and forests. He pionted out that it was in every Canadian's interest to see that tourists were cordially treated.

In a general discussion, it was pointed out that a uniform flag for all of Canada would go a long way towards focussing tourist interest. This furthered the point that many tourists prefer a novel atmosphere and that Quebec would do well to feature its old outdoor ovens, French names of towns and eating places built along the design of manoirs and seigneuries.

With the speaker's ready wit, discussion was frequently along a lighter vein and Dr. Godin proved his gift for storytelling when the group gathered informally after his lecture.

Saskatchewan

D. W. Houston, m.e.i.c.
Secretary-Treasurer

R. Bing-Wo, m.e.i.c.
Branch News Editor

The annual dinner meeting of the Regina Branch was held at the Hotel Saskatchewan on February 17, 1950. Dr. N. H. Smith spoke to about eighty members on the subject of **Industrial Medicine.**

Dr. Smith recommended that all employees be given medical examinations periodically. For example, those employed in office work would not need examinations as often as those engaged as sand blasters. Any deviations from the normal should be brought to the attention of the worker.

Dr. Smith pointed out that physically handicapped persons are as efficient at certain types of work as those without handicaps, and in many cases are even superior.

The industrial physician must study working conditions and, in cases where hazards to health are discovered, cooperate with the safety supervisor in its removal. The industrial doctor may be called upon to treat emergency cases arising in a plant. Such services are a benefit to both employer and employee, as a healthy worker is more efficient.

Dr. Smith recommended that the rehabilitation of employees disabled at work be started as early as possible, so that he may not lose confidence in himself. Even minor injuries have led to a loss of confidence. This could be overcome by returning the man to light duties until he is ready to accept his former position.

Mr. E. J. Durnin moved a vote of thanks to the speaker.

Principals photographed at the organizational meeting of the Sudbury Branch on December 9th, 1949: W. D. Laird, assistant general secretary; James A. Vance, vice-president; M. D. Stewart, provisional chairman of the branch; James F. MacLaren, chairman Toronto Branch; L. R. Brown, past chairman, Sault Ste. Marie Branch; C. O. Maddock, Copper Cliff, Ont.—*Photo by Sudbury Daily Star.*

and pointed out the location of Vancouver telephone exchanges, describing the operation of manual exchanges in the city. He outlined to the audience the intricate details following the simple act of placing a telephone call; a thorough knowledge of his subject was demonstrated.

Mr. Neil MacDougall, a fourth year chemical engineering student, spoke on **The Boeing '502' Gas Turbine** and explained the construction and operation of the gas turbine with the aid of charts and diagrams and clearly recounted the work being done by Boeings on the Boeing '502' Gas Turbine.

The judges for the contest were Mr. T. Crosby, Mr. T. Berry and Mr. W. N. Kelly, branch councillor. Dean Finlayson of the University of British Columbia presented the winners with their prizes which had been donated to the Branch through the courtesy of Canadian Sumner Iron Works, Limited, Vancouver Iron Works, Limited, and Canadian Liquid Air Company, Limited.

The large and most interested audience was unanimous in its approval of the vote of thanks given by Mr. "Dutch" Macpherson to the student contestants for their most capable presentations.

Sudbury

W. G. Burks, jr.e.i.c.
Provisional Sec.-Treas.

A general meeting of the Sudbury Branch of the Engineering Institute of Canada was held on Friday evening, February 3rd at the INCo Club in Sudbury, with twenty members in attendance.

Provisional Chairman M. D. Stewart brought the meeting to order and the minutes of the last general meeting were read by W. Burks.

M. D. Stewart read correspondence with the Sault Ste. Marie Branch which dealt with the proposal to include the districts of Sudbury, Nipissing and Manitoulin in Branch areas.

A discussion followed concerning the use of the INCo Club as the location for future meetings.

E. R. Eaton told of talking to Dr. L. Austin Wright at Headquarters, when Dr. Wright had mentioned April 1st as a possible date for a regional meeting in Sudbury. It was moved and seconded that the secretary-treasurer, advise Headquarters of the decision to hold the Regional Meeting and Inaugural Meeting on April 1st.

The by-laws set up by the executive committee were read and discussed. Various amendments were decided upon and corresponding changes made in the existing set of by-laws.

M. D. Stewart announced the offer of the Falconbridge Nickel Mines to entertain out-of-town guests at the proposed Regional Meeting.

The expenses to date were presented by M. D. Stewart and were approved.

The present executive were appointed to make arrangements for the Regional Meeting of council.

Vancouver

A. Fletcher, jr.e.i.c.
Secretary-Treasurer

Stuart S. Lefeaux, jr.e.i.c.
Branch News Editor

The Annual Students' Night of the Vancouver Branch of the Engineering Institute of Canada was held on February 16th in the Medical Dental Auditorium. The three speakers were chosen from a field of fourteen who entered a preliminary contest at the University of British Columbia for the honour of speaking at the Annual Students' Night.

Mr. Norman Worsley, a fourth year civil engineering student, spoke on **Surveys and Studies for a Proposed Hydro-Electric Development on the Quesnel River** and described the surveys for possible dam sites, explaining in detail the reason for the choice of the selected site.

Mr. Edward Hird, fourth year electrical engineering student, spoke on **Manual and Automatic Telephone Exchanges**

Winnipeg

G. W. Moule, m.e.i.c.
Secretary-Treasurer

R. T. Harland, m.e.i.c.
Branch News Editor

On February 16, a joint meeting of the Winnipeg Branch of the Institute and the Association of Professional Engineers of the Province of Manitoba heard a very interesting and instructive paper by Mr. C. J. Pimenoff, assistant engineer of the Dominion Bridge Company at Montreal. Mr. Pimenoff spoke on the design and construction of the aluminum bridge at Arvida, stressing primarily the different design, fabrication and erection techniques required by the characteristics of the material as compared with structural steel. He mentioned some of the experimental work necessary before such a design could be undertaken, and emphasized the close co-operation required between the design staff, fabrication shop, and erection crew.

A lively discussion ensued, during which several of the members expressed the opinion, concurred in by Mr. Pimenoff, that, with the exception of special structures in which its lower weight or finer appearance are governing factors, it seems unlikely that aluminum can, in the immediate future, compete favourably with steel as material for bridge construction.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

March 20th, 1950

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 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

ALLAN—LESLIE B., of Toronto, Ont. Born at Pilot Mound, Man., March 22, 1889. Educ.: B.A.Sc., Toronto, 1912 R.P.E., Ontario; 1912-13, hydrographics survey, Dominion Government; with City of Toronto, as follows: 1913-14, asst. to divn. engr., roadway section, 1914-16, asst. supt. of constrn., roadway section; 1916-19, Overseas, with rank of Major; City of Toronto, 1920-26, supt. of day labour, roadway section, 1926-29, asst. engr. roadway, 1929-46, eng. i/c, roadway section, 1946-47, principal asst. engr., 1947 to date, deputy city engr.

References: M. A. Stewart, H. W. Tate, A. U. Sanderson, D. D. Whitson, J. F. MacLaren F. E. Wellwood, W. Storrie, A. E. K. Bunnell, T. R. Loudon, O. Holden, R. L. Hearn.

CAREW—STANLEY JAMES, of St. John's, N'fld. Born at Bell Island, N'fld. Dec. 31, 1914. Educ.: B.Eng., (Mining), Nova Scotia Tech. Coll., 1938; 1931-37 (summers), clerk in cost dept., training as jr. engr., Dominion Steel & Coal Co.; 1938, (summer), instru'man., geological field party, N'fld. Geological Dept., St. John's; 1938-41, training as jr. engr., underground foreman, Dominion Steel & Coal Co., Wabana; 1941 to date, Head of Engrg. Dept. (Professor), Memorial University, St. John's, N'fld. (During summers, 1941-43-44-45-46-47-48-49, i/c aerial survey ground control party, Dept. Natural Resources, N'fld.; field engr., Ft. Pepperrell; field work, layout including layout of sewerage tunnel; i/c survey of Bonavista Breakwater & Harbour, Dept. Public Works, N'fld.; summer school teaching maths.

References: J. B. Angel, J. M. Hopkins, E. Dickinson, A. D. Foulis, M. L. Baker, A. E. Cameron, F. H. Sexton, H. R. Theakston, G. D. Stanfield, R W. Wright.

CRAM—JOHN NORSWORTHY, of Halifax, N.S. Born at Swift Current, Sask., July 1, 1915. Educ.: B.Sc., (Chem. Engrg.), Saskatchewan, 1937; R.P.E., Ontario; 1936, asst. chemist, British American Oil Co., Moose Jaw, Sask.; 1937-38, asst. chemist, Imperial Oil, Regina, Sask.; 1938-40, asst. plant engr. & master mechanic, Swift Canadian Co., Ltd., Moose Jaw, Sask.; 1940-45, Ordnance Mech. Engr. & Ordnance Officer, R.C.E.M.E. with rank of Capt. & Major 1945-47, plant engr. & master mechanic, Swift Canadian Co., Ltd., Moose Jaw, Sask.; 1947, (7 mos.), O.C. 211 Base Workshop, Regina; 1947-48, O.C. 2 Coy., R.C.E.M.E., Malton, Ont.; 1948 to date, Resident Staff Officer, Halifax Universities.

References: H. G. Thompson, J. W. Bishop, C. R. Boehm, M. L. Baker, K. C. Graham.

CRAWFORD—HOWARD GERALD, of London, Ont. Born at Winnipeg, Man., Oct. 13, 1926. Educ.: B.Sc., (Mech.), Manitoba, 1949; 1946, (summer), drilling machine helper (underground), Cochenour Willans Gold Mines; 1947 & 1948 (summers), Officers Training Corps, R.C.E.M.E., graduated as Lieut., R.C.E.M.E., (Reserve); 1949, (5 mos.), mech. engr. i/c of artificial refrigeration plant constrn., foundation design, constrn., supervision, machine placement, planning & genl. liaison duties between office and constrn.; at present attending graduate course in intensive business, Univ. of Western Ontario, London, Ont

References: N. M. Hall, W. F. Riddell, J. Hoogstraten, O. Marantz.

DUNCAN—NORMAN EDWARD, of Dorval, Que. Born at Edinburgh, Scotland, March 4, 1928. Educ.: B.Sc., (Eng.), Univ. of Edinburgh, 1948; Student, I.C.E., London; 1946 & 1947 (summers), student engr., (1 summer); 1948-49, survey engr., i/c of party surveying existing roads and layout and surveying proposed new highways and revisions, Department of Highways, Ontario; 1949 to date, struct. engr., detailing and checking structural steel, Dominion Bridge Co., Ltd., Montreal, Que.

References R. S. Eadie, R. M. Robertson, P. G. A. Brault, C. J. Pimenoff, D. B. Armstrong, W. G. H. Holt.

GALPIN—ROBERT RONALD, of Sarnia, Ont. Born at London, Ont., Aug. 21, 1926. Educ.: B.A.Sc., (Engrg. Physics), Toronto, 1948; R.P.E., Ontario; 1946 and 1947, (summers), student and engrg. student. Polymer Corporation, Sarnia; May 1948-Aug. 1949, instrument engr., Longlac Pulp & Paper Co.; 1949 to date, project engr., Holmes Foundry Co., Sarnia, Ont.

References: J. Guthrie, J. W. Graeb, G. Henderson, E. Dill.

HASSILEV—LEONIDE, of New York, N.Y. Born at Kichinev, Russia, January 22, 1902. Educ.: Civil Engr., Ecole Nationale des Ponts et Chaussees, Paris, 1924; A.M., A.S.C.E.,; 1924-27, field & office engr., Societe Hydro-electrique de la Cire, France; 1927-28, design engr., concrete structures, Sainrapt & Brice, Paris, France; 1928-30, asst. chief design engr., concrete structl. design, Foundation Co., Brussels, Belgium; 1930-41, chief design engr., heavy constrn. projects, tunnels, subways, sewers, etc., on several of these projects was assigned to responsible positions, either for design, estimating, constrn. equipt. planning, etc.,, Desplats & Lefevre, Paris, France; 1942, designer, structl., The Foundation Co., New York; 1942-44 designer structl. Gibbs & Hill New York; 1944-45, executive sec., French Mission of Public Works, Washington, preparation of procurement programme for $30,000,000.; 1945-49, chief, Public Works Divn., French Supply Council, Montreal, i/c of $12,000,000 procurement of equipt. for French harbours and inland waterways; 1949 to date, engineer i/c of coordination of foreign projects, design and procurement of equipt. for power plants in France and Italy, Gibbs & Hill, New York, N.Y.

References: D. B. Carswell, R. S. Eadie, J. M. Fairbairn, H. H. German, E. W. Izard, R. C. Flitton, W. H. Milnes, R. M. Robertson.

HOBBS—GEORGE PUGH, of Corner Brook, N'fld. Born at Hearts Content, N'fld., June 22, 1917. Educ.: B. Eng., (Elect.), McGill, 1940; M., A.I.E.E.; Defence Industries Limited, as follows: 1940-42, elect. engr., Nobel, 1942-45, elect. supt.; 1945-46, elect. design engr., Marathon Paper Mills of Canada; with Bowaters N'fld. Pulp & Paper Mills, Ltd., Corner Brook, N'fld., as follows: 1946-47, elect. engr., 1947 to date, asst. chief engr.

References: E. Hinton, G. J. T. Gunn, I. R. Tait, C. H. S. Venart, W. Hughson, M. C. Collins, J. M. Hopkins, J. R. Auld, R. W. Emery.

JAMIESON—DICK, of Sydney, N.S. Born at Glasgow, Scotland, Aug. 17, 1926. Educ.: Royal Technical College, 1943-48; Licentiate, Institution of Metallurgists, London; Member, American Society for Metal; with Wm. Beardmore & Co., Ltd., Glasgow, (steel mfrs.), 1943-47, metall. apprentice, 1947-48, jr. metall.; 1948 to date, jr. metall. engr., Dominion Steel and Coal Corporation, Sydney, N.S.

References N. A. Parlee, E. J. Prince, J. R. Wallace, C. N. Murray, G. W. Ross.

LANG—EDWARD JOHN SAMUEL, of Quebec, Que. Born at Devonport, Eng., May 2, 1911. Educ.: Plymouth Tech. College, 1927-30; City & Guilds Engrg. College, London, 1930-31; 1926-31, apprentice, machine shop, fitting & erecting shop, pattern shop and foundry, Bickle Engrg. Co., Ltd., Plymouth, Eng.; 1932-34, dftsman., plant design and layout in soap and dry goods factories, Cooperative Wholesale Society, London; 1934-35, dftsman., machine design & plant layout during reorganization of factory, all types of machinery connected with rubber industry, Avon India Rubber Co., Eng.; 1936-46, sr. dftsman, design of guns & carriages incl. stressing, theoretical analysis of complete equipts. to obtain optimum solution, major share in design of gun and breech mechanism, responsible for design of explosion unit on latest catapult, Armaments Design Dept., Ministry of Supply, London; March 1948 to date, design engr., sole responsibility for design of ordnance projects and design of specialized research equipt., Canadian Armament Research and Design Establishment, Valcartier, Que.

References: H. J. Butterill, B. O. Baker, C. B. Bate, C. Craig, P. E. Gagnon.

LANGINS—ERNESTS ADOLFS, of Corner Brook, N'fld. Born at Vilkene, Latvia, July 2, 1912. Educ.: Chemical Engr., Univ. of Latvia, 1941; 1941-45, sulphite alcohol plant supt., Baltic Wood-Pulp & Paper Mills, Sloka-Latvia; 1945-46, project engr., Gebr. Avenarius, Berlin; 1946-48, working on doctor's degree, Pulp and Paper Institute, Darmstadt, Germany.

References: E. Hinton, W. Hughson, A. Pakalnins, H. Drupals, V. M. Sulcs, H. Romans, A. Vikmanis.

LUCKETT—HUBERT WILLIAM, of Toronto, Ont. Born at Toronto, Ont., Nov. 3, 1920. Educ.: B.A.Sc., (Mech.), Toronto, 1944; 1941, (summer), mtce on high pressure pumps and presses, C.I.L., Nobel, Ont.; 1942, (summer), machine shop, Aluminum Co. of Can., Ltd., Toronto; R.C.E.M.E., 1943, (5 mos.), 2/Lt., Workshops, Kingston, 1944-46, Lt., Kingston and Toronto; 1946 to date, sales and engrg. dept., Whiting Corporation (Canada) Limited, Toronto, Ont.

References: C. G. Ericson, J. W. Falkner, G. R. Lord, R. C. Wiren, E. A. Allcut.

McGOVERN—MICHAEL JOSEPH, of Montreal, Que. Born at Newry, Ireland, Feb. 22, 1920. Educ.: B.Eng., University College, Dublin, 1946; 1944-45, (9 mos.), designer & dftsman., i/c layout, design & trades, Neon Signs Ltd., Uxbridge, England; engr., Geo. Wimpey & Co., Ltd., Uxbridge, England (at London Airport); and at Steel Strip Mill, Abbey Works, Port Talbot, S. Wales; eng. on runways, sewers, various types of piling, tunnels, service tunnels, furnace and mill foundations; 1949, (7 mos.), quantities and site engr. on Army warehouse and R.C.A.F. hangar (mech. engrg. sections), Foundation Co. of Canada, Ltd., Montreal & Ft. Churchill; 1949 to date, engr., estimating & site engr. on bldgs. in Montreal.

References: R. F. Shaw, L. Barron, E. V. Gage, H. G. Ott, J. C. Loiselle.

MACNUTT—E. GERRARD, of Montreal, Que. Born at Montreal, Que., Feb. 16, 1914. Educ.: B.Eng., (Mech.), 1937; R.P.E., Quebec; 1932 & 1933, (summers), chemist, C.I.L., Windsor, Ont.; with Steel Co. of Canada, as follows: 1934, (summer), combustion engrg. dept., 1935, (summer), open hearth dept., 1937-39, graduate training course; 1939-40, No. 7 Armament Officers course, R.C.A.F., Trenton; 1940-42, Armament Staff Officer, No. 1 Training Command R.C.A.F.; 1943-45, Officer Commanding Air Armament School; 1945-47, asst. to president, Steel Co. of Canada Ltd.; 1947-48, staff enrg., Stevenson & Kellogg Ltd.; 1948 to date, sales engr., steel & malleable foundry divn., Canadian Car & Foundry Co. Ltd., Montreal, Que.

References: C. H. Drury, R. H. Mulock, E. F. Viberg, R. Lanctot, L. S. Cossitt.

MOSS—HARRY, of Montreal, Que. Born at Montreal, Feb. 1916. Educ.: B.Eng., (Met.), McGill, 1940; 1936 & 1937 (summers), student, Consolidated Mining & Smelting Co., Kimberley, B.C.; 1938, (summer), student, Hollinger Gold Mines Ltd.; 1939. (summer), student, International Nickel Co., Sudbury, Ont.; 1940-41, aircraft inspector, British Air Commission, Montreal, Que.; 1941-42, dftsman. & metallurgist, Canada Foundries & Forgings, Welland, Ont.; 1942-45, mech. engr. estimator, Dominion Wheel & Foundries Ltd., Toronto, Ont.; 1946 to date, mech. engrg. estimator, Canadian Vickers Ltd., Montreal, Que.

References: R. K. Thoman, P. W. Gooch, R. C. ˜itton, S. Fromson, O. Duskes.

POTTER—CHARLES EDWARD, of Toronto, Ont. Born at Buffalo, N.Y., Aug. 10, 1902. Educ.: B.A.Sc., (Civil), Toronto, 1925; R.P.E., Ontario; 1925-26, instru'man., Geodetic Survey of Canada; 1926, instru'man., Wayagamac Pulp & Paper Co.; 1926-27, dftsman., Toronto Transportation Commission; 1927-30, structl. designer, Roy H. Bishop, Architect; with A. W. Robertson Ltd., Toronto, as follows: 1930-37, estimator, 1937-47, project mgr., 1947 to date, asst. mgr. & director.

References: R. W. Teagle, D. Shepherd, E. A. Cross, W. H. M Laughlin, C. D. Carruthers. P. D. Dalton.

SPENCE—GEORGE, of Regina, Sask. Born at Birsay, Scotland, Oct. 25, 1879, 1896-1899, (Elect. Engrg.), Leith Academy & Technical College; 1899-1900. North British Railroad; 1910-14, Canadian Pacific Railroad, 1927-29, Minister of Highways; 1934-38, Minister of Public Works; 1938-47, Director of Rehabilitation, P.F.R.A.; at present, Commissioner, Canadian Section, International Commission. (Asks for Affiliate).

References: C. D. Howe, C. J. Mackenzie, J. B. Challies, T. H. Hogg, G. A. Gaherty.

STOTT—JOHN ELWOOD, of Wallaceburg, Ont. Born at Wyevale, Ont., July 22, 1914. Educ.: B.A.Sc., (Mech.), Toronto, 1938; R.P.E., Ontario; 1935, summer), Canadian Cycle & Mtr., Weston, Ont.; 1936, (summer), Spencer Stove & Foundry, Penetanguishene; 1938-39, test course, Canadian General Electric Co.; 1939-40, demonstrator in thermodynamics, Univ. of Toronto; with Wallaceburg Brass Limited, Wallaceburg, Ont., 1940 mtce. engr., 1941, chief engr., responsible for plant engrg., production engrg., 1941, (June), made responsible for all inspection, 1942-49, made responsible for plant mtce., engrg. inspection, tool design, tool room, 1949 to date, relieved of above except in an advisory capacity and made full time directing new product development.

References H. B. R. Craig, R. Neave, J. W. Graeb, F. F. Dyer, T. S. McKechnie.

SUTTIE—PETER, of Baie Comeau, Que. Born at Edinburgh, Scotland, Feb. 11, 1913. Educ.: Associateship, Heriot Watt College, Diploma in Mech. Engrg., 1933; Higher National Certificate in Mech. Engrg., (Inst. M.E., London), 1933; 1929-36, indentured apprent'ship. dftsman, designer, Bertrams Ltd., (paper mill engrs.) Edinburgh, Scotland; 1936-37, sr. dftsman., Thames Board Mills, Purfleet, Essex, Eng.; with J. Dickinson & Co., Ltd., (paper mills) Watford, Eng., as follows: 1937-38, chief dftsman., 1938-46, asst. chief engr.; 1946-49, leading designer, Bertrams Ltd., Edinburg; at present mtce. & constrn. engr., Quebec North Shore Paper Co., Baie Comeau, Que.

References: M. H. Jones, C. Miller, F. McInnis, J. G. Love, F. Hornby, J. Simons.

TARANDI—LOUIS EGON, of Montreal, Que. Born at Tarivere, Estonia, March 26, 1911. Educ.: Diplom Engr., Tallinn Technical University, 1935; with Ministry of Communications, Estonia, as follows: 1934-38, roads and bridge engr., Dept. of Highways, 1939-41, field supvr. of public works, schools, hospitals, etc.; 1938-42, structl. designer, A. Komendant, consultg. engr.; 1942-44, structl. engr., dept. of engrg., Estonian Self-Administration; 1942-44 (simultaneously) own consulting office, industrial bldgs., power plants, bridges; 1944-49, structl. engr., AB Skanska Cementgjuteriet, general contractors, Stockholm, Sweden; at present structl. engr., engrg. dept., Canadian Industries Limited, Montreal, Que.

References: I. R. Tait, A. B. McEwen, C. H. Jackson, B. A. Evans, Z. J. Zolkiewicz, I. T. C. Larnder.

WATT—WALTER HERBISON, of Winnipeg, Man. Born at Winnipeg, Man., March 22, 1903. Educ.: B.Sc., (Elect.) Manitoba, 1931; 1926-27, instru'man., transmission lines, Canadian Engineering & Construction Co., Winnipeg; with Manitoba Power Co., as follows 1928-29, resident engr., 1929-30, field engr., (Northwestern Power Co.); 1930-31, engr. i/c transmission line, Canadian Engineering & Construction Co.; with City Hydro, Winnipeg, as follows: 1939-49, power engr., 1949 to date, asst. sales mgr., Winnipeg, Man.

References: C. V. Antenbring, E. V. Caton, H. L. Briggs, F. V. Seibert, A. E. Macdonald, J. W. Greenlaw.

WILLIAMS—GERALD ARCHIBALD WALLACE, of Montreal, Que. Born at Swansea, S. Wales, Feb. 28, 1919. Educ.: B.A., 1940; M.A., (Natural Science & Engrg. Science), 1947, Univ. of Oxford; A.M., I.E.E., London; 1940, summer student, R.A.E., Farnborough; 1942-44, F/L R.A.F., attached R.C.A.F., responsible for installing, operation & mtce. of beam approach systems; 1944-45, attached Ministry of Aircraft Production, London; 1946, summer student, Bristol Aeroplane Co.; 1947-49, technical supervisor, Aluminum Co. of Canada, Ltd.; 1949 to date, engr., with Canadian General Electric Co., Ltd., Montreal, Que.

References: R. A. Phillips, F. T. Boutilier, F. E. Hogg, J. T. Nichols, B. E. Bauman, F. A. Dagg, G. V. Meagher, F. J. Sauder.

ZOLDNERS—NIKOLAI GEORGE, of Montreal, Que. Born at Tallinn Estonia, Feb. 24, 1909. Educ.: Civil Engr., Univ. of Latvia, Riga, 1940; 1930-34, student-practitioner, hydrograph & hydrometr. research work on rivers and sea as technician on constrn. & mtce. work, Riga Harbour; 1934-35, deputy engr. in constrn. of 180 ft. lighthouse in reinforced concrete; 1935, (summer), training work in engrg., roads, bridges, civil constrn. in concrete, Sweden; 1936-38, supt. of constrn. & fitting work of new Portland cement plant, Broceni, Latvia; 1939-40, supt. of constrn. & fitting work on a new asbestos cement tile plant, Broceni; 1940-41, supt. of constrn., hangars, rollfields, bldgs., on airport at Libau, Latvia; 1941-44, genl. contractor on constrn. & modernization of Portland cement plant, erection of new Gypsum and wallboard plant, Rigaer Baustoffwerke, Riga; 1945, (summer), supt. with British Air Divn. on reconstrn. of hangars & rollfields, R.A.F., Detmold, Germany; 1946-8, F/Wks and Civil Engr., Royal Engineers and 1st Royal Tank Regt., Detmold, Germany; 1949, (summer), supt. Ross-Meagher Limited, Ottawa, genl. contractors, Ottawa; at present concrete engr., & inspector of tests, Mt. Royal Paving & Supplies Ltd., Montreal, Que.

References M. F. Macnaughton, J. D. P. McPherson, A. Pakalnins, A. Vikmanis, H. Romans, H. Drupals.

FOR TRANSFER FROM THE CLASS OF JUNIOR

BALSHAW—FRANK EWART, of Calgary. Born at Balton, England on Feb. 5, 1917. Educ.: Admission to E.I.C. (Junior) by examination; 1935-38, laborary Imperial Oil Refinery, Calgary; 1939, furnace erection; 1940-41, City of Calgary, engrg. dept., installn. sewage systems and pumping station; with Calgary Power Ltd., as follows: 1941-42, Cascade Develpt., Lake Minnewanka, general survey, topography, layout, constrn. of control dam and pumping station; 1942-46, water works system, Wetaskiwin, Camrose and Lacombe including experimental work, installn. of improved water treatment process; 1946 to date, water works engr., Calgary office; design, estimates, mtce. of waterworks systems, design main substations. (Jr. 1946).

References: R. T. Hollies, H. Randle, W. E. Robinson, P. J. Maggs, D. A. Hansen, A. W. Howard, D. R. Stanley, R. M. Hardy.

BROWN—JAMES ALEXANDER, of Toronto. Born at Davenport, Iowa on Oct. 14, 1918. Educ.: B.Sc. (Mech.) Queen's, 1944; R.P.E. Ont. summers, 1940, mining, Garson Mine, Inco.; 1941, 4 mos., mech. dept., Copper Cliff Smelter, with Ford Motor Company, Windsor as follows: 1941-42, design engr., 1943, (6 mos.), design engr.; 1944-46, Engrg. Officer, Marine and Aeronautical, RCNVR.;

with Spruce Falls Power and Paper, 1946-47, design engr.; 1947-49, purchasing engr.; at present, mgr., design, production of all types of fabricated welding, sales and management, Dominion Welding Engineering Co. Ltd., Toronto, (St. 1944. Jr. 1945).

References: C. W. Boast, A. D. Harris, D. S. Ellis, W. Huggins, J. W. Brooks, J. Hall.

COULTHART—ELDRED NORMAN, of Arvida. Born at Monklands, Ont., on July 27, 1912. Educ.: B.Sc. (Mech.) Queen's, 1941; R.P.E. Que.; 1933-35 mtce. mechanic, D. I. Coulthart; 1935-37, electrician, L. H. Coulthart; 1941 (7 mos.), production engr., Gutta Percha and Rubber, Toronto; 1941-42, naval service, National Defence; with Aluminum Co. of Canada Ltd., as follows: 1942-44, mtce. Jr. engr.; 1945-46, senior mech. engr.; 1947-48, resident engr.; 1948 to date, asst. supt., Rod Rolling Mill, Fabricating Division, Arvida (St. 1941. Jr. 1946).

References: A. W. Whitaker, G. T. Malby, B. E. Bauman, M. G. Saunders, J. T. Nichols, J. F. Braun, F. T. Boutillier.

GRAVEL—CHARLES EDOUARD, of Laval, Que. Born at L'Abord-a-Plouffe, on Feb. 19, 1918. Educ.: B.A.Sc. (C.E.) Ecole Poly, 1945. R.P.E. Que,; 1945-46, engineer, Fabius Ruel; 1946 to date, engineering consulting practice, L'Abord-a-Plouffe, Que. (St. 1943. Jr. 1947).

References: T. J. Lafreniere, I. Brouillet, H. Gaudefroy, P. Vinet.

JONES—ROBERT J., of Ottawa. Born at Montreal on July 31, 1918. Educ.: B.Eng., McGill, 1941; 1938, summers, miner, McIntyre Porcupine Gold Mines; 1939, miner, International Nickel Co.; 1940, miner, Dome Mines Ltd.; 1941-45, Royal Navy and Royal Cdn. Navy, Chief Engr. of two ships, i/c engine room during shifts in another ship; 1945 to date, engr., Dept. of Mines & Resources, Ottawa. (Jr. 1945).

References E. S. Martindale, W. H. Norrish, A. A. Swinnerton.

McEOWN—WILBERT R., of Fort Garry, Man. Born at Bracebridge, Ont. Educ.: passed Jr. E. I.C. examination, 1942 Member, E.I.C. examination, schedule C, 1945; 1935-39, apprentice, Leeders Ltd.; 1939-40, electrician, Canada Packers Ltd.; 1940-43, inspector of electricity and gas, Dept. of Trade & Commerce; 1943-45, base compass office, R.C.N.V.R., Halifax Trade & Commerce; 1945-47, inspector of electricity & gas; 1947-48, inspector of standards, Grade 2, 1948 to date, inspector of standards, Grade 3, Dept. of Trade & Commerce. (St. 1941. Jr. 1943).

References: I. W. Beverly, D. A. McCuaig, C. P. Haltalin, R. Houlihan.

McQUARRIE—ALEXANDER M., of Sillery, Que. Born at Edson, Alberta on Aug. 16, 1914. Educ.: B.Sc. (Elec.) Alberta, 1941; R.P.E. Que,; Member A.I.E.E. with Canadian General Electric as follows: 1940-41, test course: 1941 (4 mos.), engrg. service dept., switchgear installn. for Quebec Streams Power Comm., Rapid No. 7 Power Plant; 1941-47, asst. engr., meter and instrument engrg. dept., 1947 to date, works engr., Quebec Works. (Jr. 1942).

References: G. R. Langley, R. D. Mackimmie, J. Mercier, J. C. Allan, M. M. Uloth, J. King, B. O. Baker.

STURDY—FERRIS DURNIN, of Victoria, B.C. Born at Sask on July 31, 1920. Educ.: B.Sc. (Mech.) Univ. of Sask., 1941; 1941-43, Engr. Officer, i/c engine room watch aboard, H.M.C.S. Prince Robert, special duties, includ. mtce. of engine and boiler; 1943-45, H.M.C.S. Uganda, similar duties; 1945-46, lecturing in descriptive geometry and instructing dftg. to 1st. year engrg. students, Univ. of Sask.; 1946-48, assisting in mtce. of refining machinery, supervn. of new bldg. constrn., design, writing for heating, ventilating systems with supervision of installn., Toronto Refinery, McColl Frontenac Oil Co. Ltd.; 1948 to date, mech. engr. Dept. of Public Works, B.C. (St. 1941, Jr. 1946).

References R. A. Spencer, I. M. Fraser, A. L. C. Atkinson, N. B. Hutcheon, H. C. Anderson, K. Moodie.

TIBBO—GORDON TUCKER, of Corner Brook, Nfld. Born at Grand Bank on Nov. 5, 1915. Educ.: B.E. (Mech.) Nova Scotia Tech. Col., 1941; summers, 1938 & 39, asst. chemist, Colas Nfld. Ltd.; 1940, helper, installing anti-magnetic mine devices to ships, Nova Scotia Light & Power Co. Ltd.; 1940-41, Engr. Sub/Lt. R.C.N.V.R.; 1942-44, chief chemist, i/c manfg. of asphalt emulsions, Flintkote Co. (Nfld.) Ltd.; 1944-45, asst. engr., subsequently chief engr., Geophysical Survey Party, Geological Survey of Nfld.; 1945-47, branch accountant, War Assets Corp., St. John's, Nfld., 1947-48, constrn. engr., design and field work, Nfld. Engrg. & Construction Co. Ltd.; at present, steam power plant technical supervisor, Bowater's Nfld. Pulp and Paper Mills Ltd. (St. 1940. Jr. 1946).

References: E. Hinton, W. R. Hughson, M. L. Baker, G. A Myers, J. M. Hopkins.

FOR TRANSFER FROM THE CLASS OF STUDENT

HULL—WILLIAM F., of London, England. Born at Winnipeg on April 19, 1920. Educ.:: B.A.Sc. (Civil) Toronto, 1949; 1936 (7 mos.) engrg. asst., Balfour Beatty & Co. Ltd. Jerusalem, Palestine; Royal Cdn. Armoured Corps, 1941, (4 mos.) Sgt.; 1941-42, 2nd Lieut.; 1942-45, Lieut, 9th Armoured Reg't. (BCD) 1946, transitman, road location, water and sewer profiting, estimating materials, dftg., Township of Perth, Ontario; 1947, dftsman, structural design, heating and ventilation design, General Engineering Co. Ltd., Toronto; 1949 to date, asst. engr., design of highway bridges, site engr. for a steel and reinforced concrete jetting, reinforced concrete design and detailing, develptg. erection methods for storage tanks, ordering, inspection of erection plant, Braithwaite & Co. Engineers Ltd.; London, England. (St. 1948).

References: M. W. Huggins, R. F. Legget, C. F. Morrison, T. R. Loudon, W. L. Sagar.

WHITTLES—HAROLD MELVYN, of Sudbury, Ont. Born at Wilkie, Sask. on Feb. 20, 1913. Educ.: B.Sc. (Mining) Univ. of Alta. 1949, with International Nickel Co. as follows: 1947, underground survey; 1948, drafting; 1949-50, underground survey (transit man) Sudbury. (St. 1948).

References: F. J. DeStefano, G. M. Smith, M. D. Stewart, E. R. Eaton, G. Benjafield.

Overdue Fees

The sending of second notices to members whose fees are overdue requires a diversion of time and money from activities in the interest of the profession, and is thus a direct loss to the common effort.

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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.

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

Situations Vacant

CIVIL

CIVIL ENGINEER required by firm located in Montreal. Applicant should have some structural steel experience. Salary open. Apply to File No. 1373-V.

GRADUATE CIVIL ENGINEER with about eight years experience in structural steel required by firm engaged in the manufacture and sale of prefabricated steel structures in Toronto. Salary open. Apply to File No. 1375-V.

GRADUATE CIVIL ENGINEER reqired by large pulp and paper mill in Ontario. Recent graduate preferred with at least two years experience in structural design. Future promising for right man. Salary open. Apply giving full particulars of education and experience to File No. 1389-V.

ELECTRICAL

ELECTRICCAL ENGINEER recent graduate required by large firm in Montreal. Applicant should specialize in D.C. Power Plants and Control Devices for transportation equipment. Salary open. Apply to File No. 1386-V.

GRADUATE ELECTRICAL ENGINEER required in Ontario for design and development of instrument transformers and watthour meters. Two or more years experience necessary. If satisfactory position is permanent with future prospects excellent. Apply to File No. 1388-V.

MECHANICAL

MECHANICAL ENGINEER required for Toronto office of a firm of Power House and Dust Collection specialties. This position will entail sales as well as supervision of fabricating fly ash collectors. Salary open. Apply to File No. 1368-V.

MECHANICAL ENGINEER required by firm located in Province of Quebec, conversant with machine shop grey iron foundry, light structural steel and sheet metal work, bilingual, to take charge of production. Apply in writing giving qualifications and references, stating remuneration expected to File No. 1378-V.

MECHANICAL ENGINEER required by Montreal firm, manufacturers of all types of sheet metal works. Applicant would be obliged to spend about two months in plant, then position would lead to sales in the Montreal area. Three to four years experience in industry or pulp and paper desirable. Salary open. Apply to File No. 1383-V.

MECHANICAL ENGINEER, recent graduate required by large firm in Montreal. Applicant to specialize as calculator and designer for transportation equipment. Apply to File No. 1386-V.

MINING

MINING ENGINEER required by a large company in the Province of Quebec. Preferably with two years experience in underground mining, his duties will be to make engineering and time studies of underground operations with the purpose of improving mining methods and installing wage incentives. Firm will train the engineer in time study. Good opportunities for advancement. Starting salary $3,000.00 to $3,500.00, age 25 to 30 years. Apply to File No. 1376-V.

MISCELLANEOUS

MECHANICAL OR ELECTRICAL ENGINEER required in Ontario, or electrical engineer holding a first class stationary engineer's certificate, to take charge and supervise the operation and maintenance of a steam heating plant of 1020 H.P. and low temperature refrigeration equipment of 1000 H.P. A person with three or five years experience is desired. Salary open. Apply to File No. 1369-V.

DESIGN AND DETAIL ENGINEER or draughtsman, one that has had a combination of mechanical and light structural experience required. This is an opening for a fully experienced and capable man with an old, well established firm of engineers and manufacturers in Ontario. Salary open. Apply to File No. 1370-V.

SENIOR SALES ENGINEER reqired by firm located in Toronto, manufacturers of heating equipment. Applicant should be bilingual, with sales experience. Territory covers Quebec and Maritimes. Salary open. Apply to File No. 1372-V.

MECHANICAL OR MINING ENGINEER required by large firm in the Province of Quebec. Three or four years experience in methods engineering either in mining or other type of industry. Duties include studies of milling and mining operations with the purpose of improving operating methods, equpment materials handling, layout, etc. Good opportunity for advancement. Salary range $3,500.00 to $4,000.00 to start. Apply to File No. 1377-V.

DESIGN ENGINEERS, chief draughtsman and detailers required by large Western Canadian steel fabricating shop. Must be experienced in design and detail of boilers and pressure vessels, material handling equipment, structural steel and/or mechanical design and details. A knowledge of design of oil refinery equipment would be an asset. Apply giving full particulars of education and experience to File No. 1379-V.

MECHANICAL AND STRUCTURAL DRAUGHTSMAN experienced in factory building design, draughting and construction including electrical heating and drainage services and machinery layouts, for expanding rubber and plastics industry in Niagara Peninsla. Work will last at least one year. Salary open. Apply to File No. 1380-V.

ELECTRICAL OR MECHANICAL ENGINEER required by Montreal firm, manufacturers of machine products and sheet metal stampings. Applicant should be between 25 and 30 years with some experience in industry and willing to complete training period with parent company located in the U.S. Position will eventually lead to sales. Excellent opportunity for advancement offered. Apply to File No. 1381-V.

ENGINEERS: electronics and radar fields, with considerable experience in inspection methods and organization. Salaries $3,480.00 to $4,480.00 depending on qualifications. Positions in Ottawa, Toronto and Montreal. Apply to File No. 1382-V

SALES ENGINEER required by Montreal firm of inspection engineers. Applicant should have preferably a civil background. Territory would consist of mainly Quebec. Age 30 to 35 years. Salary open. Apply to File No. 1385-V.

JUNIOR ELECTRICAL AND MECHANICAL ENGINEER required by large firm located in Montreal. Applicant should have at least one year's experience in diesel engine industry. Salaries open. Apply to File No. 1386-V.

SENIOR DRAUGHTSMAN experienced in making full size layouts from automotive body parts drawings; knowledge of body fixtures design desirable. Apply by letter stating experience, age, education, employment references to File No. 1387-V.

ASSISTANT PLANT ENGINEER is required for a kraft pulp and paper mill making specialties in Eastern Canada. Mechanical engineer preferred, coupled with a good knowledge of electrical maintenance practice and some knowledge of electrical engineering generally. A knowledge of French is desirable. Age between 30 to 40 years. Salary open. Apply to File No. 1390-V.

ENGINEER not over 33 years required by Canadian owned hydro electric utility company operating in Bolivia. Must have at least 5 years experience in this field. Salary open. Excellent opportunities. Apply to File No. 1391-V.

YOUNG MECHANICAL OR ELECTRICAL ENGINEER required by pulp and paper company located in Montreal. Some experience in industry desirable. Excellent opportunity for advancement. Salary open. Apply to File No. 1392-V.

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

CHEMICAL

CHEMICAL ENGINEER required to take charge of process development group. Applicant should have at least five years development and production experience in chemical industry. Position in Ontario. Salary open. Apply to File No. 1335-V.

CHEMICAL ENGINEER recent graduate is needed for production work by chemical manufacturing firm situated in the Province of Quebec. Some experience in chemical production or synthetic resin manufacture would be advantageous. Salary open. Apply to File No. 1336-V.

CHEMICAL ENGINEER required in Ontario. Some experience in industrial and control departments with somewhat a mechanical background desirable. Salary $300.00. Apply to File No. 1350-V.

CIVIL

CIVIL ENGINEER with at least two years practical experience required by a large inter-municipal corporation in Western Canada. Under supervision and direction applicant must be able to assist and perform technical engineering works, prepare plans, perform field duties in connection with the construction and maintenance of simple structures, to install equipment and supervise and direct small groups of men. Salary $235.00 up. Apply to File No. 1144-V.

CIVIL ENGINEER five to ten years experience in hydraulic testing to do turbine testing required by large public utility in the province of Quebec. Good future for the right man. Applicant should state age and experience. Salary open. Apply to File No. 1364-V.

ELECTRICAL

GRADUATE ELECTRICAL ENGINEER. Immediate opening in Montreal with Canadian General Electric for graduate electrical engineer. Sales experience desirable but the essentials are some years experience in application of motor, control switchgear, etc., a definite liking for sales work and a desire to make this a long term arrangement. Reply stating background. Apply to File No. 1299-V.

GRADUATE ELECTRICAL ENGINEER, required by firm in Montreal manufacturing electrical equipment. Applicant should have some experience in communication radio, telephone, etc. Salary open. Apply to File No. 1346-V.

ELECTRICAL ENGINEER with experience in the Public Utilities field, as engineer in the electric department of a public utility in a medium size Western Ontario city. Give details, references, salary expected. Apply to File No. 1351-V.

ELECTRICAL ENGINEER required by textile firm located in Montreal. Excellent opportunity offered to the right man with ability. Salary open. Apply to File No. 1354-V.

ELECTRICAL DRAUGHTSMAN required in Montreal who is familiar with explosion proof installations. The work consists principally of wiring motors and lighting. Salary open. Apply to File No. 1363-V.

MECHANICAL

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for ordinary collier plants screening equipment. Hoists, simple steel structures, etc. Salary open. Apply to File No. 1332-V.

MECHANICAL ENGINEER with experience mainly on hydraulic pumping equipment is required for test work in the field. Applicants should have a reasonably wide experience in handling different types. The work will involve travelling throughout southern Ontario. Please apply in writing, stating all relevant particulars. Salary open. Apply to File No. 1337-V.

MECHANICAL ENGINEER with experience in woodworking or plywood industry. Experience in machine and fixture design would also be useful. Position is one of responsibility in a large growing concern. Work would be varied including everything from product design through manufacturing to sales. Age under thirty. Salary $225.00 to $275.00. Apply to File No. 1338-V.

MECHANICAL ENGINEERS required in Ontario. The qualifications of the more senior of these positions are those of a person of considerable experience on machine design, the special machines as found in the tool Engineering Department of the Automotive industry. The other positions require the qualifications of a body layout engineer. Salaries open. Apply to File No. 1359-V.

SENIOR MECHANICAL ENGINEER required in Ontario to assist in layout and design of petroleum refining equipment and facilities. Must be qualified in this field. Age 30 to 35 years. Salary open. Apply to File No. 1360-V.

MINING

MINING ENGINEER required in Quebec with eight to ten years experience, the work to consist of underground production and engineering work, using the block caving method of mining. Salary open. Apply to File No. 1352-V.

MISCELLANEOUS

SALES ENGINEER (Representative) required by an old established firm supplying the paper industry. Must be willing to travel up to 6 months per year, throughout the Canadian Pulp and Paper Mills. Preference for single man with pulp and paper mill experience. Good future assured. Asking salary of interest. Apply to File No. 1406-V.

RECENT GRADUATE in engineering required by national beverage company. Duties include general plant maintenance and production. Must be able to deal with personnel. Training period in Montreal eventually for Quebec City. Salary up to $3,000.00 to start. Apply to File No. 1069-V.

CIVIL OR SANITARY ENGINEER with a number of years experience required by a large intermunicipal corporation in Western Canada. Must be able to assume responsibility in design, detailing, estimating, preparing specificatons to layout and supervise the construction, repairs and maintenance of sewage collection system and treatment plant. Salary $325.00 per month up. Apply to File No. 1144-V.

DRAUGHTSMEN REQUIRED by General Electric Company, Switchgear Dept., Engineering Works, Witton, Birmingham 6, England. Must have good experience in any class of switchgear design or layout. Permanency and good opportunities for capable men. Apply stating age, experience and technical qualifications. Apply to File No. 1157-V.

SALES ENGINEER, around 30 years of age, preferably electrical background and experience with a utility or an electrical contractor or consulting firm. Should be familiar with transmission and distribution practice. Working knowledge of French. Location Montreal. Salary open. Apply to File No. 1261-V.

GRADUATE ENGINEER with specialized training in trolley coach maintenance required by an Eastern Canadian Public Utility. State age, experience and qualifications in first letter. Salary open. Apply to File 1263-V.

STRUCTURAL STEEL DRAUGHTSMAN and checkers, preferably graduate engineers are required for a steel fabricating company in Manitoba. Salaries open. Apply to File No. 1285-V.

GRADUATE ENGINEER required as sales representative for a manufacturer of industrial conveyors. Location Montreal and area. Age 30 to 40 years. Salary $500.00 per month including expenses. Apply to File No. 1329-V.

CHEMICAL OR MECHANICAL ENGINEER required for food industry located in Western Canada. 30 to 35 years of age. Some experience in labour relations and production methods required. Position offers excellent future. Salary open. Apply to File No. 1330-V.

GRADUATE ENGINEER, with municipal experience to act as assistant to the city engineer. Location Western Canada. Salary based largely on experience and qualifications, minimum of $4,000.00 per annum. Apply to File No. 1347-V.

STRUCTURAL STEEL detailers and checkers required in Windsor, Ontario by established fabricating firm. Salaries open. Apply to File No. 1357-V.

FIELD ENGINEERS required by Provincial Capitals and principal cities throughout Canada. Salary ranges from $3,840.00 to $6,300.00 per annum depending on experience and qualifications on highway and road construction. Apply to File No. 1358-V.

RUBBER CHEMIST required by large firm in Montreal. Must have minimum of five years experience in compounding, developing and factory processing. Salary according to qualifications. Apply to File No. 1361-V.

ELECTRICAL OR MECHANICAL ENGINEER required in Ontario with broad experience in design of electrical appliances and/or small fractional h.p. motors. A good knowledge of production and tooling practices in the appliance field desirable. This is a new position in an expanding program. Salary open. Apply to File No. 1365-V.

ESTABLISHED MANUFACTURER of domestic appliances requires two or more engineers for development of major household appliances, electric refrigerators, ranges and allied lines. Knowledge of manufacturing processes desirable. Will also consider one or two recent graduates. Personal and business history, salary requirements, etc., to be contained in first letter. Location Western Ontario. Apply to File No. 1366-V.

FIVE APPOINTMENTS for operational research on problems of defence at initial salaries of $2,580 to $6,300 dependent on qualifications. First appointment for one year, subsequently by three-year terms. Superannuation provisions. Applicants with post graduate training in applied mathematics and mathematical statistics, biology, physical science, economics or engineering, may obtain further information from: Apply to File No. 1367-V.

Situations Wanted

MECHANICAL ENGINEER (Sask. 1947). Age 28, married, family 1. At present employed near Montreal desires position with good future, in Western Canada. Five years varied experience including sound background in maintenance engineering. Interested in plant or shop design, engineering and development or sales and service. Willing to undergo training period with Eastern company with good prospect of eventual employment in Western Canada. Apply to File 60-W.

ELECTRICAL ENGINEER, S.E.I.C., A.I.E.E., B.Sc., in E.E. (Power Option). University of New Brunswick, '49. Service with R.C.A.F. as Aircraft Electrician. Experience during summer includes plant maintenance and telephone installation. Age 27, single, bilingual. Desires work in power or sales. Available immediately. No location preference. Apply to File No. 79-W.

MECHANICAL ENGINEER, S.E.I.C., graduating from University of British Columbia May, 1950, desires permanent employment. Two years experience on bench work and machine tools. Practical knowledge of operation and maintenance of internal combustion engines. Summer jobs, estimating and inspection work with a construction company, and capital equipment inventory for a process industry. Apply to File No. 373-W.

GRADUATE CIVIL AND STRUCTURAL ENGINEER, S.E.I.C., B.Sc. (Eng.) Hons. 1949, University of London. Veteran, age 28, seeks interesting work with progressive firm in Montreal. Design, stress analysis, research, etc., preferred. Field work and design experience. Available on fortnight's notice. Apply to File No. 383-W.

ELECTRICAL ENGINEER, M.E.I.C., aged 35, English graduate B.Sc. (Eng.). First class honours, A.M.I.E.E., M.E.I.C., apprenticeship and three years construction experience with large electrical manufacturing company, 8 years experience in charge of the electrical departments of large industrial companies. Desires change, preferably in Ontario or B.C. Apply to File No. 391-W.

BILINGUAL MECHANICAL ENGINEER, graduate 1949, B.Sc. (Arts & Science) McGill 1947, age 24. Summer work includes 6 months in machine shops, and ten months as fitter's helper, mechanic & mechanic's helper. Business and selling experience. Would like engineering work where initiative and application will bring advancement. Apply to File No. 512-W.

PETROLEUM ENGINEER, S.E.I.C. University of Alberta, 3rd year undergraduate, age 26, married. Experience in surveying and operation of underground mining machinery. Desires connection with engineering concern in oil field development, control or production. Edmonton area preferred. Apply to File No. 543-W.

CHEMICAL ENGINEER, S.E.I.C., graduating in May, 1950, desires permanent position in which good prospects would reward initiative and hard work. Interested in production, sales or public relations. Age 22. Single, and willing to go ovrseas. Experience includes three years in sales, administrative and public relations work. Now part-time overseas correspondent for British technical journal. Apply to File No. 582-W.

CIVIL ENGINEER, S.E.I.C., will graduate from N.S. Tech. in May, 1950. Age 23. Single. Summer experience with the N.S. Dept. of Highways, an electric public utility, and office routine. Apply to File No. 583-W.

PROFESSIONAL ENGINEER wishes part time consulting work. Plans made for new jobs, alterations in existing layouts, Montreal area. 12 years experience in electrical and general projects. Apply to File No. 565-W.

CIVIL ENGINEER, M.E.I.C., P.Eng. (Alberta), age 41, married, wishes to consider change of employment with degree of permanancy, Alberta or B.C., preferred. Wide experience asphalt and concrete pavement construction, soil compaction, etc., also buildings, sewer and water lines, etc. Presently employed as Resident Engineer in charge of Airport development, with ten years experience in this field. Apply to Filc No. 634-W.

SALES ENGINEER, Civil Engineering graduate, University of New Brunswick 1950, B.Sc., S.E.I.C. Age 32. Married. R.C.A.F. veteran. Experience: 5 years with Bank of Nova Scotia, 1 year on radar, 3 years in electrical machine shop, one summer as rodman on highway, one on hydrographic survey, and one as inspector on asphalt road. Available May 22 or shortly later. Apply to File No. 688-W.

ELECTRICAL ENGINEERING STUDENT, S.E.I.C., graduating in May 1950, from McGill University. Age 22. Single. Three summers with local electrical firm. Desires employment in power field. No objection to travel. Available after May 15, 1950. Apply to File 730-W.

GRADUATE CIVIL ENGINEER, Jr.E.I.C., B.Sc. (Civ.Eng.) (Edinburgh) 1949, ex-serviceman, age 27. Some experience in surveying, soil mechanics, organizations and setting out of engineering works and hydraulic models. Desires employment preferably in hydraulic or structural engineering field. Arriving Canada end of April. Will consider any type of work with reliable concern. Apply to File No. 746-W.

GRADUATE CIVIL ENGINEER AND LANDSURVEYOR with proven ability to carry out responsibilities and to increase profits and lower expenses. Available on short notice. Over 25 years of wide experience on four continents. Experience includes design layout and field supervision of: roads, dams, buildings, drainage, irrigation works and all kinds of surveying and topography. Veteran CRE and EAE, married, bilingual. Situations held in Canada: chief of survey parties, resident engineer. Abroad: as district and assistant chief engineer for over 19 years in the British, Turkish, Iraqui Government Services. Apply to File No. 763-W.

CHEMICAL ENGINEERING GRADUATE, S.E.I.C., Jr.C.I.C., B.E. (Chem.) N.S. Tech. '49, age 24, single. Experience: summer work in aluminum, petroleum, rubber and steel industries; 7 months in pulp and paper industry. Desires permanent position and will consider any reasonable offer either sales or where background can be used to best advantage. Available immediately. Prefer to locate in Eastern Canada or U.S. Apply to File No. 775-W.

GRADUATE ENGINEER, M.E.I.C., with thorough management experience in large industrial plant, desires position with good money making possibilities. Apply to File No. 852-W.

METALLURGICAL ENGINEERING STUDENT, S.E.I.C., Queen's, veteran, age 28, single, graduating this spring. Desires metallographic work with research firm or production plant. No limit as to location. Experienced in metallography, welding, sheet metal work. Apply to File No. 854-W.

GRADUATE ENGINEER, Jr.E.I.C., P.Eng. Age 28, married, two children. Experience includes 2½ years Naval, installation and maintenance of electrical equipment. 2 years general construction work, piping layouts, reinforced concrete, surveying etc. 2 years maintenance work, assisting in installation of a maintenance control program. Desires position in maintenance field, available on two weeks notice. Apply to File No. 855-W.

MINING ENGINEER, Jr.E.I.C., Jr.M.E.I.C., P.Eng. Quebec. Montreal 1948. Married. Bilingual. Canadian. Age 28. Past experience in nickel and gold mines prospection and exploration on a big ilmenite project. Past two years with an iron ore company in Michigan. At present in charge of engineering work at two important underground producers; layout, estimating, surveying, mapping, geology. Desires position in Quebec or Ontario. Available on reasonable notice. Apply to File No. 957-W.

PATENT LAWYER desires position with company. Experienced in patent, trade mark, corporation and court practice. B.A.Sc., registered patent attorney in Canada and U.S.A. Apply to File No. 958-W.

GRADUATE CIVIL ENGINEER, S.E.I.C., University of Manitoba, 1949, age 22 unmarried. Experience includes two summers land surveying as chainman and levelman on townsite and section linc surveys; eight months collecting hydrological data and water power control work. Interested in gaining experience in municipal foreign or domestic. Apply to File No. 961-W.

MECHANICAL ENGINEER, Jr.E.I.C., P.Eng. (Ontario), Saskatchewan 1947. Age 23, single. Varied experience in production research, development, design and plant layout. Desires position in municipal engineering or field work in exploration, development and surveying. Prefer Western Canada. Available on short notice. Apply to File No. 1014-W.

GRADUATE CIVIL ENGINEER, S.E.I.C. (B.Sc. Mount Allison 1947); (B.E. Nova Scotia Tech. College 1949). Age 23, single. Two summers installation and maintenance automatic signal equipment. C.N.R.; two summers hard rock mining in Northern Manitoba; 3 months bridge baseline and topographic surveys; 3½ months field engineer 150 housing project; 8 months of general municipal work. Desires opportunity in sales or municipal engineering. Available on short notice. Apply to File No. 1028-W.

MECHANICAL ENGINEER, S.E.I.C., A.S.M.E. Age 34, married, graduating from The University of British Columbia, May 1950, desires permanent employment. Three years experience maintenance of concentrator and crushing plant equipment. 6 years service with R.A.F., R.C.A.F. operation & maintenance of aircraft engines. Interested in maintenance and installation of mechanical equipment. Willing to undertake any required training, will work anywhere in Canada. Apply to File No. 1032-W.

ELECTRICAL ENGINEERING STUDENT, S.E.I.C., graduating in May 1950 from the University of Alberta, age 25, married, veteran. Electrical experience with R.C.A.F. (4 years). Desires employment in power or electronics. Apply to File No. 1033-W.

GEOLOGICAL ENGINEER, B.Sc., shall graduate in April 1950. Experienced in exploration, detail mapping and property examination. Also experienced in general construction and civil engineering. Single status, 25 years and bilingual. Seeks position in mining industry or in sales engineering. Apply to File No. 1034-W.

MECHANICAL ENGINEER: M.E.I.C. graduate, McGill, age 33, married, seven years practical experience in machine design. Speaks, reads and writes Spanish fluently. Available on May 1st. Apply to File No. 1039-W.

ENGINEERING PHYSICIST, S.E.I.C., graduating from the University of Toronto, April 1950. Age 27. Married. Ex-R.C.A.F. Officer. Experience includes design of experimental electrical instruments and circuits. Interested in development or production in electronics, radio, or communications field. Location immaterial. Apply to File No. 1046-W.

GRADUATE CIVIL ENGINEER, B.Sc. (Manchester '46) Stud. M. Inst. C.E. (1946). British subject now in England, requires position as assistant; executive or sales. 2 years experience, building, civil engineering. Knowledge of mechanical side and some electrical. Ex-R.E. Apply to File No. 1070-W.

MECHANICAL ENGINEER, S.E.I.C., graduating from University of British Columbia, May, 1950, desires permanent employment. Three years experience as underground mechanic in coal-mine on compressed-air machines. Five years in R.C.A.F. as pilot and navigator. Single and with desire to travel. Apply to File No. 1071-W.

GRADUATE MECHANICAL ENGINEER '48, desires part time work for evenings and week-ends. Experience in preparing maintenance schedules for large trucks or car fleet. Also consider surveying, calculations, draughting, etc. Apply to File No. 1073-W.

ELECTRICAL ENGINEER seeks opportunity with a consulting or electrical contracting firm preferably in the West. Age 29, 7 years post graduate experience, test course, extensive training in illumination field, 3 years university teaching, 2 seasons resident engineer on heavy power line construction. For details apply to File No. 1084-W.

ELECTRICAL ENGINEER, S.E.I.C., Manitoba 1950. Age 24. Three summers experience in field of electronics and communications with R.C.A.F. Interested in technical and business aspects of communications field. Desire to locate in Montreal, Quebec. Available May 1st, 1950. Apply to File No. 1091-W.

ENGLISHMAN, 35, D.F.H., A.M.I.E.E., now concluding contract Malaya as chief electrical engineer for agents of large group British electrical and diesel manufacturers, prior arrival Canada April, desires responsible position. Experienced sales, service, administration technical staff. 3½ years pre-war at present employers' U.K. factory. 6 years electrical officer R.N.V.R. Wife Canadian. Apply to File No. 1093-W.

MECHANICAL ELECTRICAL ENGINEER, age 27, Jr.E.I.C., Polytechnique '48, fluently bilingual, presently employed since graduation with large industrial firm in Montreal. Experience includes planning, design of steel and reinforced concrete, piping, heating and ventilating, lighting layouts. Supervision of construction, installation of industrial equipment, general plant maintenance and operation. materials handling. Thorough knowledge of mechanical refrigeration, design and operation. Four summers employed with Hydro Electric Engineering Dept., experience in generation and distribution, protection equipment and industrial electronics. Ability and initiative to get things done. Desires a good opening preferably with construction contractors or consulting engineers for both design and field work and where a wide experience is a definite asset. Willing to travel and available at a month's notice. Apply to File No. 1097-W.

EXECUTIVE, M.E.I.C., P.Eng., civil and mechanical engineer. Graduate 1929. Married, three children. Age 42. Past 14 years in pulp and paper industry. Experience covers construction, maintenance, plant engineering, purchasing, mill design and management. Employed in Ontario location. Available shortly. Apply to File No. 1384-W.

MECHANICAL GRADUATE, M.E.I.C., P.Eng. Ontario. Early forties. With experience in mechanical design and plant maintenance pulp and paper industry. Office administration and planning. Practical work in mining, machine shop and electrical installation. Presently fire prevention engineering. Desires position having variety and scope. Ontario location preferred. Apply to File No. 1543-W.

EXECUTIVE AVAILABLE, University graduate, M.E.I.C., Professional Engineer. Wide experience in management, production, organization, purchasing, materials handling, expense control, construction, etc. Diplomatic and ability to get things done. Can be available on reasonably short notice. Apply to File No. 2216-W.

CIVIL ENGINEER, M.E.I.C., McGill '44, P.E.Q., veteran R.C.E., single, 32, car available, reasonably bilingual. Four years experience in woodlands engineering work, for two large paper companies, including two years surveying and two years general work in connection with location design and estimation of roads, bridges, dams, conveyors, depot buildings, etc. Past six months spent as resident engineer on job opening a new district, including construction of flume, wharf, houses, small powerhouse, roads and bridges, etc. Also have one year's experience in paper mill, three years in design and draughting of small tools, and two summers in a granite works. Will be available February 1st, 1950. Apply to File No. 2897-W.

MECHANICAL ENGINEER, Jr.E.I.C., P.Eng. (Que.). University of Saskatchewan, 1944, age 28, married, with 6 years experience in cost control, material and equipment ordering and scheduling, and supervision of skilled trades, and labor; in connection with mill maintenance and construction; in the pulp and paper, textile and oil industries. Desires permanent position with responsibility and opportunity for advancement. Available on short notice. Apply to File No. 2928-W.

EXECUTIVE ASSISTANT ENGINEER, M.E.I.C., P.Eng., age 31, married, engineering and business administration degrees, nine years experience in the electrical industry holding responsible positions in manufacturing engineering, sales management, and marketing research. A greater opportunity is desired to earn advancement in an aggressive organization. Apply to File No. 2946-W.

CIVIL ENGINEER, B.E. (N.S. Tech. '46), S.M. (M.I.T. '48), P.E.Q. Jr.E.I.C., Jr.A.S.C.E., young, single. One year in railway maintenance, two years in general structural design, limited experience in steel erection Good knowledge of structural design and soil mechanics. Willing to go anywhere on permanent assignment or to travel. Apply to File No. 2965-W.

NOVA SCOTIAN desires employment in Nova Scotia. Professional Engineer (Electrical) but wide range of interests. Present salary $3,100 two years after graduating from Nova Scotia Technical College. Presently located in Montreal. Available beginning July or August, 1950. Apply to File No. 3156-W.

ELECTRICAL ENGINEER, S.E.I.C., B.Sc. (Alberta '49), single, ex-Naval Officer. Five years commercial radio operating experience. Hydro-electric and plant maintenance experience. Familiar with general business and accounting procedure. Evening student conversational French and Spanish. Interested in estimating and sales engineering. Desires employment which might lead to foreign service. Available on reasonable notice. Apply to File No. 3236-W.

ELECTRICAL ENGINEER, S.E.I.C., Sask. 1949. Age 26. Married. Experience includes: Operation and maintenance hydro-electric plant, electrical repair and contracting, wireless and radar (R.C.A.F.) also very wililng to learn and take an active interest in his work. Apply to File No. 3238-W.

ATTENTION EMPLOYERS!

The Employment Service of the Institute has available a list of student members who anticipate graduation, this spring, in all branches of engineering.

Interested employers are invited to advise the Institute as to the type of engineering graduate they wish to interview. Complete details will be furnished on receipt of your request.

Address Enquiries To:

EMPLOYMENT SERVICE

The Engineering Institute of Canada

2050 Mansfield St., Montreal 2, Que.

Assistant Plant Engineer

Assistant Plant Engineer is required for a Kraft Pulp and Paper Mill making specialties in Eastern Canada. Duties of the Assistant Engineer include supervision of Draughting Office, laying out pulp and paper mill equipment, design of equipment where necessary, technical investigations in the mechanical field in connection with problems affecting production, studies of maintenance cost and the like. He must be sufficiently competent to assume the responsibilities of the Plant Engineer in the latter's absence.

Preferred qualifications are a Mechanical Engineering degree, coupled with a good knowledge of electrical maintenance practice and some knowledge of electrical engineering generally. Paper mill experience is desirable. A knowledge of French is also desirable, but fluency in this language is not necessary.

Preference will be given to a candidate from 30 to 40 years old, other things being equal. Salary will be determined in relation to the experience and qualifications of the successful applicant.

In your application please give full details of educational background, age, experience, both military and civil, and expected salary. File No. 1390-V.

CHIEF DRAUGHTSMAN AND DESIGN ENGINEERS

Large Western steel fabricating shop has opening for chief draughtsman, design engineers and detailers. Must be experienced in design and detail of boilers and pressure vessels, material handling equipment, structural steel and/or mechanical design and details. A knowledge of design of oil refinery equipment would be an asset. Apply giving full particulars of education and experience to File No. 1379V.

INTERVIEWS

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

This will result in a better service to everyone concerned.

TELEPHONE PLATEAU 5078

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

CHEMICAL ENGINEERS

Chemical Engineers with experience in any of: Applied Chemistry; Chemical Engineering Design; Process Development; Chemical Production. Salary from $2900.00 to $5100.00 depending upon qualifications.

Also one Senior Chemical Engineer with a minimum of ten years experience to supervise Chemical Engineering Development work. Salary range from $5300.00 to $6300.00 depending upon qualifications. State particulars, including age, marital status, and qualifications in first letter to National Research Council, Atomic Energy Project, Chalk River, Ontario. Please quote File 2-C.

OPPORTUNITY FOR ENGINEER AS PRODUCTION MANAGER

One of Canada's most progressive companies urgently needs a first-class engineer to head up production for a new division. This company has adequate finances, a splendid record and offers a genuine future to a capable man. Location western Ontario, salary open. Need urgent. Replies treated with full confidence. Outline your experience, please include age. Reply to

JOHN CAMBRIDGE, Vice-Pres.,
Spitzer & Mills Ltd., 50 King St. W., Toronto

Library Notes

Additions to the Institute Library
Reviews — Book Notes — Abstracts

BOOK REVIEW

RAHMENFORMELN AND MEHRSTIELIGE RAHMEN*

Adolf Kleinlogel. New York, Frederick Ungar Publishing Co., c1943 and c1948.

Reviewed by I. F. Morrison, M.E.I.C.†

Under the authority of the Attorney General of the United States Prof. Kleinlogel's Mehrstielige Rahmen has recently been reproduced by Frederick Ungar Publishing Company as a companion volume to Kleinlogel's Rahmenformeln produced in 1943. Both of these books are remarkable for their contents. They contain many hundreds of formulae which give the bending moments and reactions on rigid frames of various forms and support conditions. These volumes will be found to be very useful to the practicing engineer who is engaged in the continual design of rigid frames of various sorts.

The Rahmenformeln deals with structures having but one span but includes polygonal as well as triangular and rectangular frames. They are cases which at most are indeterminate to the third degree. The Mehrsticlige Rahmen (Frames with several columns), as the title implies, deals extensively with multiple span girders with column supports and also multiple span polygonal frames and multistorey bents.

Perhaps the best brief description of these two volumes can be given by quoting directly from the title pages. In the Rahmenformeln there appears 114 frames illustrated by 1643 figures showing the bending moment curves, and in the Mehrstielige Rahmen there appear 15 principle frame forms with 17 special cases. There are given 190 influence lines, 109 general cases of loading, 75 special loading cases, 95 temperature change cases, 95 support displacement cases as well as 2 detailed numerical examples. In all, there are 650 diagrams. This is indeed a most remarkable collection of formulae, the equivalent of which is not to be found elsewhere.

A most interesting form of index is to be found in these books. It is pictorial in character and enables one to select rapidly the particular case at hand. Thus, the various cases are classified as to form and character of support and both symmetrical and unsymmetrical cases are treated in great detail.

It has been shown by the writer in a recent paper§ on the Extended Use of Kleinlogel's Rahmenformeln, that the usefulness of these books can be considerably extended beyond that of being a very useful compilation of formulae by recognizing that the cases given in them can be used as elements of the primary structure for more highly indeterminate cases. For example, Rahmenform X on page 157 of the Mehrstielige Rahmen is the case of a three span girder supported on two intermediate columns and one abutment at each end. One hinged abutment support does not admit of horizontal displacement. On page 172 the bending moment diagram for the case of a couple applied at the fixed hinge supported end is given, and on page 36, Rahmenform II, a girder having two spans supported on two abutments and one column is given. These two cases may be combined by the usual process, treating each part, in itself indeterminate, as one element of the primary structure. Thus, one obtains a five span girder supported on two abutments, one pier and three columns, (a structure indeterminate to the seventh degree) but there is only one redundant equation to be solved. This fact well illustrates the great usefulness of these books.

It is not necessary that one be able to translate any of the German text because the publishers have issued, with each volume, a translation key to the brief text which forms an introduction and explanatory note, thus making it easily used and completely understood by any one capable of applying the theory of structures to practical problems.

**Rahmenformeln; Gebrauchsgfertige Formeln. A. Kleinlogel. New York, Ungar, c1943. 460 pp., illus., cloth, 9¼ x 6¼ in., $7.50.*

...Translation Key. F. S. Morgenroth. New York, Ungar, c1945. 49 pp., cloth, 9¼ x 6¼ in., $1.75.

Mehrstielige Rahmen; Gebrauchsgertige Formeln. Adolf Kleinlogel. New York, Ungar, c1948. 291 pp., illus., cloth, 9½ x 6½ in., (2 volumes in 1). $12.50.

...Translation Key. Fred Blum. New York, Ungar, c1948. 51 pp., cloth, 9¼ x 6 in., $2.00.

†Professor of Applied Mechanics, Dept. of Civil and Municipal Engineering, University of Alberta, Edmonton, Alta.

§On the Extended Use of Kleinlogel's Rahmenformeln—Canadian Journal of Research. December 1948.

STANDARD FOR UNIFIED AND AMERICAN SCREW THREADS

Canadian Standards Association. Ottawa, C.S.A., 1949. 99pp., illus., cardboard, $3.00.

Reviewed by G. M. Foster*

Those interested in the subject have undoubtedly read many of the articles in technical journals describing the need for and action taken to provide a common or unified screw thread standard for Great Britain, the United States and Canada.

After preparatory study and discussion between standardizing bodies representative of the three countries, a declaration of accord was signed at Washington on November 18th, 1948 in which it was agreed that their respective published standards would "fulfill all of the basic requirements of general interchangeability of threaded products".

The American and Canadian standards have now been published, are identical, and include both the new Unified thread and the American and Canadian National Screw Thread.

The British Standard has also been issued but covers Unified threads only.

The new Canadian Standard includes: historical notes on the development of the basic design of the modern screw thread; terminology; tables of diameter and pitch combinations; thread form and derivatives formulae; classes of fit; dimensions and tolerances; general symbols used, in formulae and to designate the thread; and tables of hole sizes before tapping.

C.S.A.—B 1.1 1949 will replace the data on threads shown in several C.E.S.A. standards on threaded products and the U.S. Department of Commerce Handbook H No. 28-1944, which have been commonly used in Canada, all of which have been or are being revised or supplemented.

The standard contains many tables of recommended pitch and diameter combinations for the ready selection of those suitable. Should none of these be found applicable, complete formulae are given from which dimensions and tolerances may be calculated for any desired thread.

The tables of diameter and pitch combinations range from .060 in. to 6 in. in diameter and from 80 to 4 threads per inch in pitch.

**Assistant Superintendent, Manufacturing Engineering, Telephone Division, Northern Electric Company Limited, Montreal, Canada.*

LIBRARY REGULATIONS

Hours

	Oct.-Apr.	May-Sept.
Mon.-Fri.	9– 6	9– 5
Thurs. (Oct.-Mar.)	9– 8	9– 5
Sat. (closed Jy.-Sept.)	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.

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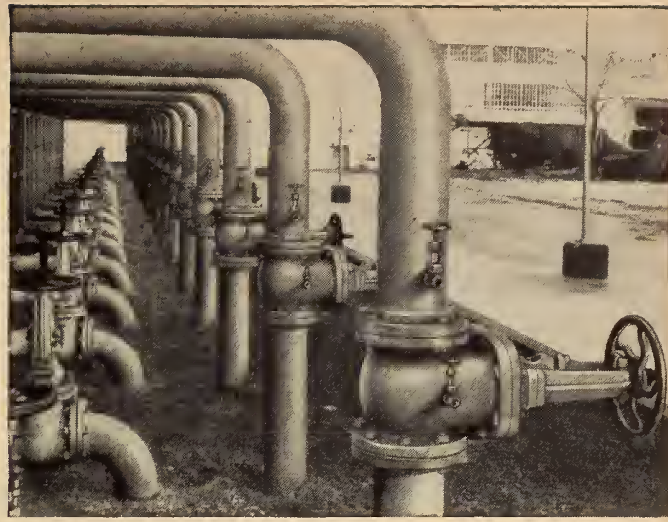

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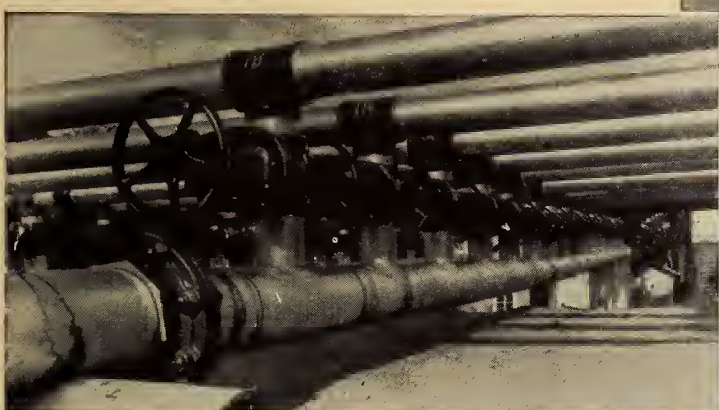

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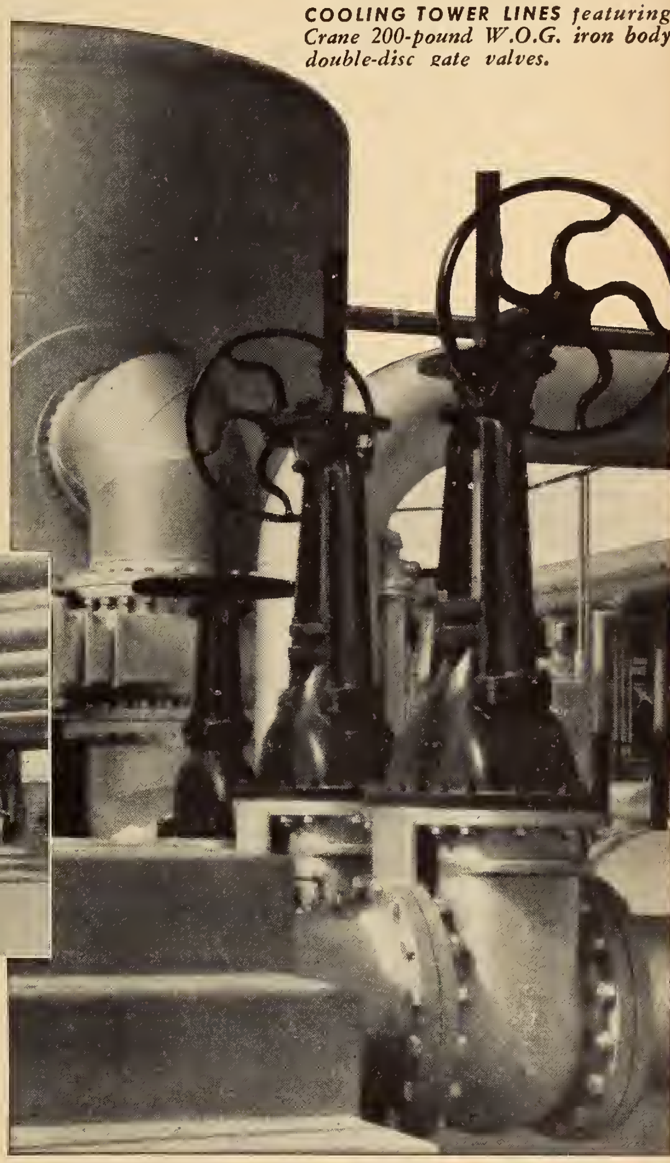

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The standard includes both external and internal threads and those designated as Unified have been adopted by the armed services of all three participating countries for war material.

The United States Fastener Manufacturers are preparing to supply products with the Unified thread and the Quartermaster-General, Canadian Army, has issued Q.M.G. instruction No. 162 which reads in part: "It is expected that Canadian manufacturers will be in a position to meet demands for this item in the near future."

It is recommended that Canadian engineers concerned become familiar with this new standard, copies of which may be obtained from the Canadian Standards Association, Ottawa.

ABSTRACTS

INSTITUTION OF ELECTRICAL ENGINEERS. PAPERS:

FACTORS INFLUENCING THE DESIGN OF A RUBBER MODEL:

G. B. Walker.

Discusses principle causes of error in the Rubber Model. Shows that errors due to the configuration of the membrane and ball spin can be reduced without limit by decreasing the scale of deformation of the membrane.

RADAR ECHOES FROM PRECIPITATION:

J. E. N. Hooper and A. A. Kippax.

Describes experiments with radar sets operating on 9.1, 3.2 and 1.25 cms wavelengths, results of which confirm the theoretical dependence of radar echo power on drop size distribution, pulse energy and wavelength.

SOME PROBLEMS IN AIRCRAFT MAGNETO DEVELOPMENT:

R. T. Coe and D. F. Welch.

Discusses the elementary principles of magneto operation, including low speed performance, and presents arguments to explain the discrepancy found in the magnetic circuit between theory and practice. Some developments, including special circuit and transformer design that aim at increasing the output beyond that possible with conventional design.

DESIGN, SPECIFICATION AND PERFORMANCE OF HIGH VOLTAGE SURGE DIVERTERS:

H. F. Jones and C. J. O. Garrard.

Describes characteristics of lighting surges and system insulation and electrical characteristics of systems which influence the design of surge diverters consisting of spark gaps and non-linear resistors. Methods of making and evaluating tests upon surge diverters are considered, and details of the circuits and adjustment of the test equipment are given.

SPECIAL ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Canadian Income Tax Act, 15th ed.:

C.C.H. Canadian Ltd., Toronto, 1950. 296 pp., paper.

...1950 Supplement; Depreciation and Depletion Regulations:

C.C.H. Canadian Ltd., Toronto, 1950. 14 pp., paper.

Carbide Cutting Tools:

Warren Baker and Joseph S. Kozacka. Chicago, American Technical Society, 1949. 416 pp., illus., cloth.

Cylinder Pressures and their Influence on Diesel Engine Efficiency:

D. D. Cook and others. Chicago, Cooktite Ring Sales Co., c1949. 96 pp., illus., cloth.

Development of Aircraft Engines and Development of Aviation Fuels:

First part by Robert Schlaifer and second part by S. D. Heron, Boston, Harvard University, Graduate School of Business Administration, 1950. 754 pp., cloth.

Elements of Patent Law:

Fred H. Rhodes. Ithaca, Cornell University Press, 1949. 189 pp., cloth.

Engineering Economic Analysis, 2nd ed.:

Clarence E. Bullinger. New York, Toronto, McGraw-Hill, 1950. 397 pp., illus., cloth.

Engineering Mechanics:

Archie Higdon and William B. Stiles, New York, Prentice-Hall, 1949. 505 pp., illus., cloth.

Factory; Fundamental Problems of Materials, Labour, Overhead, Plant, Manufacture, Management, and Economic Control:

G. Schlesinger. London, Pitman, 1949. 300 pp., illus., cloth.

Farm Structures:

H. J. Barre and L. L. Sammet. New York, Wiley, 1950. 650 pp., illus., cloth.

Guide for Foreman Training Conferences:

Donald F. Lane. Chicago, American Foundrymen's Society, 1950. 131 pp., illus., paper.

Lexique Technique Français-Anglais et Anglais-Français concernant le Matériel de Travaux Publics:

Institut Technique du Batiment et des Travaux Publics, Paris. 176 pp., cloth.

Mathematics Dictionary, rev. ed.:

Glenn James and Robert C. James editors. New York, Toronto, Van Nostrand, c1949. 432 pp., illus., cloth.

Matrix Analysis of Electric Networks:

P. Le Corbeiller. Cambridge, Mass., Harvard University Press, New York, Wiley, 1950. 112 pp., illus., cloth. (Harvard Monographs in Applied Science No. 1).

Mehrstielige Rahmen (Multi-Column Frames), 6th ed.:

Adolf Kleinlogel, New York, Frederick Ungar, 1948. 291 pp., illus., cloth.

...Translation Key to Kleinlogel's Mehrstielige Rahmen, vols. 1 and 2:

Fred Blum. New York, Frederick Ungar, 1948. 51 pp., cloth.

Oil Engine Manual, 5th ed.:

D. S. Dodsley Williams editor, and staff of the Oil Engine and Gas Turbine. London, Temple Press, n.d. 334 pp., illus., cloth.

Principles and Practice of Prestressed Concrete:

P. W. Abeles. New York, Frederick Ungar, 1949. 112 pp., illus., cloth.

Principles of Petroleum Geology:

Cecil G. Lalicker. New York, Appleton-Century-Crofts, c1949. 377 pp., illus., cloth.

Protection of Transmission Systems Against Lightning:

W. W. Lewis. New York, Wiley, c1950. 418 pp., illus., cloth.

Manufacturing Processes; Materials:

S. E. Rusinoff. Chicago, American Technical Society, 1949. 393 pp., illus., cloth.

Manufacturing Processes; Production:

S. E. Rusinoff. Chicago, American Technical Society, 1949. 500 pp., illus., cloth.

New Depreciation System; C.C.H. Editorial Explanation and Simplification:

C.C.H. Canadian Ltd., Toronto. 56 pp., paper.

Radio Operator's Licence Q & A Manual:

Milton Kaufman. New York, Rider, c1949. 608 pp., illus., cloth.

Rahmenformeln (Rigid Frames):

Adolf Kleinlogel. New York, Frederick Ungar, c1939. 460 pp., illus., cloth.

..Translation Key to Kleinlogel's Rahmenformeln:

F. S. Morgenroth. New York, Frederick Ungar, c1945. 49 pp., cloth.

Rarer Metals:

J. de Ment and H. C. Dake. London, Temple Press, c1949. 345 pp., illus., cloth.

Report Upon the Reclamation of Water from Sewage and Industrial Wastes in Los Angeles County, California:

Los Angeles County. County Sanitation Districts. Board of Engineers. Los Angeles, The Board, 1949. 135 pp. illus., cloth.

Recording and Reproduction of Sound:

Oliver Read. Indianapolis, Howard W. Sams, 1949. 364 pp., illus., cloth.

Stahlbetonbau:

Rudolf Saliger. Vienna, Franz Deuticke, 1949. 644 pp., illus., cloth.

Traité Théorique et Pratique des Engrenages; Volume 2, Etude complète du Matériel:

G. Henriot. Paris, Dunod, 1950. 335 pp., illus., cloth.

Weld Design:

Harry D. Churchill, and John B. Austin. New York, Prentice-Hall, 1949. 216 pp., illus., cloth.

ANNUALS, ETC.

Electrical Yearbook, 1950:

Emmott, London, 1950. 360 pp., illus., cloth.

FBI Register of British Manufacturers; 1948-9:

Federation of British Industries, London, 1949. 752 pp., illus., cloth.

Mechanical World Yearbook, 1950:

Emmott, London, 1950. 360 pp., illus., cloth.

Radio Amateur's Handbook, 27th ed.:

American Radio Relay League, West Hartford, 1950. 605 pp., illus., paper.

Smithsonian Institution, Annual Report of the Board of Regents, for year ended June 30, 1948:

Washington, U.S. Govt. Printing Office, 1949. 466 pp., illus., cloth.

Technion Yearbook, 1948:
New York, American Technion Society, 1948. 249 pp., illus., paper.

TECHNICAL BULLETINS, ETC.

American Society for Engineering Education. Engineering College Research Council. Proceedings, 1949:
Roundtable on "Research Policies and Pitfalls".

American Society for Testing Materials. Special Technical Publications:
No. 86—Symposium on Metallography in Colour. No. 95—Symposium on Insulating Oils.

California Institute of Technology. Industrial Relations Section.
Bulletin: *No. 17—Survey of Selected Personnel Practices in Los Angeles County, as of April 1, 1949. R. D. Gray. No. 18—Expanding Role of Government and labour in the American Economy, Waldo E. Fisher.*
...Circulars: *No. 18 — Selected Personnel Practices of large Employers in Los Angeles as of April 1, 1949, Robert D. Gray.*

Canadian Government Specification Board; Specifications:
Schedule of Metallizing Symbols; 1st ed., 1949.

Engineering Societies Library. Bibliographies:
No. 4—Bibliography on Pallets used in Modern Materials Handling.

Engineers' Council for Professional Development. Selected Bibliographies:
Section 2—Aeronautical Engineering. Section 3—Civil Engineering.

Harvard University. Graduate School of Engineering. Publications:
No. 474—System of Bio-Precipitation of Organic Matter from Sewage, Daniel A. Okun. No. 475—Equilibrium Studies on N-Chloro Compounds 2. the Base Strength of N-Chloro Dialkylamines and of Monochloramine, Ira Weil and J. Carrell Morris.

Institution of Electrical Engineers. Papers:
No. 821—Factors Influencing the Design of a Rubber Model, G. B. Walker. No. 846—Radar Echoes from Meteorological Precipitation, J. E. Hooper and A. A. Kippax. No. 848—Relative Merits of Presentation of Bearings by Aural-Null and Twin-Channel Cathode-Ray Direction-Finders, S. de Walden and J. C. Swallow. No. 868—Some Experiments on the Accuracy of Bearings Taken on an Aural-Null Direction-Finder, F. Horner. No. 907—Some Problems in Aircraft Magneto Development, R. T. Coe and D. F. Welch.

Institution of Mechanical Engineers. Advance Papers:
Caustic Cracking: Stress-Corrosion Tests in Sodium Hydroxide Solutions at Elevated Temperatures, C. D. Weir. Lost Wax Process of Precision Casting, J. S. Turnbull. Some Factors Governing the Performance of Crankcase Lubricating Oils, A. Towle. Use of Mild Steel for Service at Sub-Zero Temperatures, F. H. Keating and E. V. Mathias.

Iowa Engineering Experiment Station. Bulletin:
No. 166—Mechanical Device for the Solution of Equations Involving the Laplacian Operator, Glen Murphy and J. V. Atanoff.

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Development of the Doxford Engine During the Last Decade, W. H. Purdie.

Princeton University, Industrial Relations Section. Selected References:
No. 31A—Outstanding Books on Industrial Relations, 1949.

Svenska Forskningsinstitutet for Cement Och Betong.
Proceedings: *No. R 13—Investigation of Wheel Load Stresses in Concrete Pavements, Sven G. Bergstrom and Others.*
...Bulletin: *No. R 18—La Vibration du Béton, Recherches Expérimentales, Sven G. Bergstrom and Sven Linderholm.*

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No. 23—Compaction of Soil.

PAMPHLETS, ETC.

Apprentice Training Standards for the Foundry Industry:
American Foundrymen's Society, Chicago, c1949.

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Howard F. Taylor and Charles L. Register Chicago, American Foundrymen's Society, 1949.

Composition and Property Variation of Two Steels:
C. J. Osborn, and others. Reprint from The Welding Journal Research Supplement, May, 1949.

Conservation is Your Business Tool:
C. Gordon O'Brien. Reprint from The Agricultural Review, January, 1950.

Corrosion:
R. S. Peoples and F. W. Fink. Reprint from Metals Review, 1949.

Ductile Equilibrium Column Theory:
J. A. Van den Broek, M.E.I.C. Lecture delivered before the members of the Royal Society of Engineers in the Hague, Holland, and published, in English, in Voordrachten No. 5, 1949, K.I.V.I. Rerprints are available from the author at Ann Arbor, Michigan.

Effect of Plastic Strain and Heat Treatment:
C. J. Osborn and others. Reprint from The Welding Journal Research Supplement, August, 1949.

Effect of Welding on Pressure-Vessel Steels:
A. F. Scotchbrook and others. N.Y., American Society of Mechanical Engineers, 1949.

Fluid Couplings and Torque Converters for Industrial Equipment:
Lubrication. N.Y., Texas Co., 1950.

Fusible Alloys Containing Tin:
Tin Research Institute, Greenford, Middlesex, 1949.

Stresses in Hot Metal Ladles:
K. E. Knudsen and others. Reprint from Iron and Steel Engineer, Dec., 1949.

Theater Sites:
E. G. Faludi. Society of Motion Picture Engineers, 1949.

Torsion Testing Machine of 2,000,000 Inch-Pound Capacity:
F. K. Chang and others. Reprint from A.S.T.M. Bulletin No. 160, Sept., 1949.

What About Friction?
Frederick Palmer. Reprint from American Journal of Physics, v. 17, n. 4, 181-187, April, 1949.

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.

ADVANCED ORGANIC CHEMISTRY, 2d ed.:

G. W. Wheland. N.Y., Wiley, London, Chapman, c1949. 799 pp., illus., 9 x 6 in., cloth, $8.00.

This textbook is designed for students who have had previous training in both elementary organic chemistry and elementary physical chemistry. Stress is laid upon the theoretical and empirical generalizations that have been found to be most widely applicable. Some elementary facts and theories are not stressed, except in so far as they may be profitably reviewed from a more advanced and more critical point of view.

REVIEW OF CURRENT RESEARCH AND DIRECTORY OF MEMBER INSTITUTIONS:

American Society for Engineering Education. Engineering College Research Council, Iowa City, Iowa, 1949. 186 pp., 9 x 6 in., paper, $1.75.

Entries in this publication, from 82 educational institutions which hold membership in the Research Council describe administrative policies for engineering research, list responsible personnel, research expenditures, short courses, conferences, and the titles of all engineering research studies currently active at each institution.

APPAREILS ELECTRIQUES CONNECTEURS ET DECONNECTEURS:

J. Saint Germain. Paris, Gauthiers-Villars, 1949. 419 pp., 10 x 6½ in., illus., paper, 1500 fr.

This book is concerned with "Electrical apparatus that have a connecting or disconnecting purpose", or switchgear equipment. It is intended for the builders of such equipment, as well as for its installers and users. After a general study of the classification and nomenclature, each piece of switchgear is dealt with in details.

BRITISH STANDARDS

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

B.S. 408:1949—Ships' Cargo Lifting Blocks and Typical Derrick Rigs. *5/–.*

This standard deals with blocks for use with wire rope and also with materials, head fittings, sheaves, strength of beckets, and proof load on beckets. A table of coefficients for estimating rope tensions, and a nomenclature of head fittings as well as of derrick tackle when rigged should be found of considerable service.

B.S. 545:1949—Bevel Gears. *7/6.*

In this edition the definitions have been revised, and the overlapping ratio of helical bevel gear teeth comes into prominence because it is now rightly used in assessing load capacity. The basic tooth form is defined more accurately and the method of determining appropriate addendum modification covers every case likely to occur in normal practice. A "life factor" is now used to take into account the length of life expected from the gears under consideration.

B.S. 1133:1949—Section 15:—Tensional Steel Strapping. *2/–.*

The new section gives guidance on the use of tensional steel strapping for all types of containers and packages.

B.S. 1563:1949—Cast Iron Sectional Tanks (Rectangular). *5/–.*

The Sectional assembly tanks included in the standard are made from 2, 3, or 4 feet square unit plates bolted together, giving depths of 2, 4, 6, 8, 10 and 12 feet with capacities from 280 to 75,000 gallons. The tanks are with external or internal flanges. Dimensions and thicknesses of unit plates and flanges stayings by means of tie rods and turnbuckles and struts and cast on connections are specified.

B.S. 1568:1949—Sound-Recording and Reproduction: Magnetic Tape Systems for Broadcasting. *2/–.*

Specifies requirements essential to secure satisfactory interchange or recordings on magnetic tape for broadcasting. The Standard also provides definitions and deals with dimensions of tape, tape guides, tape speed, sense of winding, types and playing time of reels; it also specifies requirements for reels, for programme identification, and for checking frequency response.

B.S. 1571:1949—Acceptance Tests for Positive-Displacement Compressors and Exhausters. *2/6.*

These British Standard acceptance tests lay down the conditions under which reciprocating and rotary compressors and exhausters shall be tested in order that guarantees made by manufacturers in regard to output, power consumption or speed may be verified. Every endeavour was made to minimize the corrections which have to be applied to the test results to provide for the deviation between the test and the guarantee conditions.

B.S. 1580:1949—Unified Screw Threads. *7/6.*

This new British Standard furnishes all the technical data necessary to ensure the interchangeability of threaded products made to this standard and to the corresponding American and Canadian standards. Explanations are included regarding the various formulae and on the relationship between the effective diameter tolerances and pitch and angle errors. For the convenience of users in countries in which the metric system of measurement has been generally adopted, the metric equivalents of all the tables of dimensions and tolerances are given in an appendix.

CANADIAN STANDARDS

Canadian Standards Association, Ottawa, 1949.

C.S.A. A100:1949—Specification for Asphalt Floor Tile. *50c.*

Minimum quality requirements in addition to standard sizes are specified. The specifications cover the composition of the tile, its surface characteristics, its dimensions, methods of testing (indentation, examination, impact, flexure), and packing and marking.

C.S.A. B62:1949 — Specification for Welded Genuine Wrought-Iron Pipe. *50c.*

Covers "Standard weight", "Extra strong" and "Double extra strong" welded genuine wrought-iron pipe both black and galvanized. It deals with the making process, the chemical composition and the physical properties (Under test) of the afore-mentioned types of pipe. Also weights, dimensions and permissible variations, finish, workmanship, inspection and rejection.

C.S.A. B63:1949 — Specification for Welded and Seamless Steel Pipe; 2d ed., *50c.*

Deals with black and hot-dipped galvanized, welded and seamless steel pipe. Standard weights with the corresponding wall thicknesses for pipe of various normal inside diameters are given in table form. Specifications for Hydrostatic test, flattening test, and bend test are given in details.

C.S.A. B89.2:1949—Specification for 2½-inch Fire Hose Couplings and Fittings. *50c.*

This specification covers a standard 2½-inch screw thread for general use in fire protection equipment, including hose couplings, hydrant outlets, all fire stream accessories, pumping engine discharge outlets, outside siamese water inlet connections on buildings protected by automatic sprinkler or standpipe systems. The specification also covers the design and essential dimensions for at sandard 2½-inch hose coupling, such data being applicable to other fittings used in connection with these couplings.

C.S.A. C22.2, No. 17:1949—Construction and Test of Cable for Luminous-Tube Signs and for Oil-Burner Ignition Equipment, 2d ed. *50c.*

This specification applies to single-conductor insulated cables intended for use at a maximum working temperature of 60°C (140°F) with gas-tube systems for signs, outline lighting, interior lighting, and for use with oil-burning equipment in accordance with the Rules of Part 1 of this Code.

C.S.A. C22.2, No. 45:1949—Construction and Test of Rigid Conduit, 2d ed., *50c.*

Applies to rigid conduits fabricated from mild steel, aluminum, copper, or copper-silicon alloy approved for use as a metal race-way for the installation of wires and cables in accordance with the rules of Part 1 of the Canadian Electrical Code.

DISTRIBUTION OF DEFORMATION (A NEW METHOD OF STRUCTURAL ANALYSIS):

C. V. Kloucek. Prague, C. V. Kloucek, 1949. 510 pp., illus., 9½ x 6½ in., paper.

A comprehensive treatise on yet another method of analysing statically indeterminate structures without the tedium of solving many simultaneous equations. Indeterminate structures are solved through consideration of their joint rotations. The theory is illustrated with numerical examples. Some useful short cuts of the general theory are also included. The exclusion of deformation equations has been achieved by the introduction of the new conception, "Distribution of Deformation", for which regular and generally valid relations have been derived. C.J.P.

INDUSTRIAL GRINDING AND REDUCTION PLANT:

C. S. Darling. Manchester, Emmott, c1949. 76 pp., illus., 7½ x 5 in., paper, 3/–. (Mechanical World Monographs No. 53).

Written for engineers who have to purchase, install or operate such plants, this monograph includes chapters on typical ball mills, ring roll mills, rotary impact machines, steam and jet fluid mills, micronised fuel system, fine grinding. For each type of machine, there are definitions, examples, illustrations, explanations as to function, etc.

INSTALLATIONS ELECTRIQUES A HAUTE ET BASSE TENSION; Tome 1:

A. Mauduit. Paris, Dunod, 1949. 443 pp., illus., 10 x 7 in., paper, 2450 fr.

After a chapter on fundamental generalities, the author makes a study of high tension buried cables, of electric and magnetic properties of surface transmission lines, of potentials, dangers and drops of voltage. Many particular aspects of electric installations are treated, such as defects in networks, calculation of currents, and some resonance phenomenoms.

IRON AND STEEL INSTITUTE. SPECIAL REPORTS.

No. 41. Corrosion of Iron and Steel by Industrial Waters and Its Prevention.

56 pp., illus., 8½ x 5½ in., cloth, 5/–.

The Report is divided into four sections. The first is introductory, and describes the theory and mechanism of corrosion and the types of corrosion. The second deals with the causes of corrosion and the many factors involved. The third deals with the occurrence of corrosion, while the fourth outlines methods of prevention. Included are a short bibliography and a list of nearly 100 references to papers in the English language.

No. 42. Report on the Bessemer Process.

80 pp., illus., 11 x 8½ in., paper, 25s.

This report is in three main parts, which deal respectively with British, foreign and future Bessemer practice. There are also eight appendices, the first six describing in detail particular plants and methods. The seventh appendix consists of abstracts of publications on the subject since 1946.

PRINCETON UNIVERSITY. INDUSTRIAL RELATIONS SECTION: BIBLIOGRAPHICAL SERIES:

No. 80—Trade Union Library 1949, Hazel C. Benjamin.

This is a general bibliography in the field of Trade Unions, useful to people concerned with trade union organizations and labour relations.

...SELECTED REFERENCES:

No. 29—Wages, Prices and Profits.

Bibliography of 16 works on the title subject, with short review for each.

TRAITE THEORIQUE ET PRATIQUE DES ENGRENAGES; Tome 1:

G. Henriot. Paris, Dunod, 1949. 351 pp., illus., 10 x 7 in., paper, 1950 fr.

For engineers and all people dealing with gears, this treatise on gears is a helpful and practical guide. Questions of major importance, such as corrections of teething and modern means of strength calculation are dealt with in a quite elaborate way, and made the objects of special chapters. The most recent theories, formulae and theorems are demonstrated and used.

UNIVERSITY PHYSICS:

Francis Weston Sears and Mark W. Zemansky. Cambridge, Mass., Addison-Wesley, 1949. 848 pp., illus., 9 x 6½ in., cloth, $6.00.

This text is based on Sears' three-volume work, "Principles of Physics". The material covered includes Mechanics, Heat, Sound, Electricity and Magnetism, Optics, and Atomic Physics. It is intended for students of science and engineering who are taking a course in calculus concurrently and to whom calculus is still a new tool. Starting with Chapter 4, calculus is used sparingly and simply in the body of the text and in a few of the problems at the end of each chapter. Three systems of units are used: The English gravitational system, the cgs system, and the mks system.

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.

ACOUSTIC MEASUREMENTS.

L. L. Beranek. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 914 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $7.00.

Intended primarily as a reference work for graduate students and workers in the field of acoustics, this book covers basic facts, gives details of acoustic measuring apparatus, discusses alternate methods, and explains the theory of acoustic phenomena. Topics range from the calibration of microphones and loudspeakers to evaluation of overall audio systems, and to chapters on the audiometer, speech articulation tests and the sound level meter.

AERIALS FOR METRE AND DECIMETRE WAVE-LENGTHS.

R. A. Smith. Cambridge University Press, American Branch, New York; Macmillan, Toronto, 1949. 218 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $3.75; 18s.; $4.00 (in Canada).

Detailed design considerations are given for aerials for wave-lengths from 12 meters to 10 centimeters with the major amount of space devoted to the range from 12 meters to 1 meter. A comprehensive description of all aerial systems has not been attempted, but a limited number of applications have been selected to illustrate general principles. Aerials for wave-lengths below 10 centimeters are dealt with in another book of the series.

AIRPLANE PERFORMANCE, STABILITY AND CONTROL.

C. D. Perkins and R. E. Hage. John Wiley & Sons, New York; Chapman & Hall, London, 1949. 493 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $7.00.

Written to meet the needs of the practising aeronautical engineer, this book presents those elements of applied aerodynamics that bear directly on the problem of airplane design. The first part deals with problems of airplane design for performance in the subsonic, transonic and supersonic ranges; and the second with problems involving the design of the airplane for adequate stability and control characteristics. Only subsonic flight is considered in the second section.

APPLIED HYDROLOGY.

R. K. Linsley, M. A. Kohler and J. L. H. Paulhus. McCraw-Hill Book Company, New York, Toronto, London, 1949. 689 pp., illus., diagrs., charts, maps, tables, 9¼ x 6 in., cloth, $10.30 (in Canada).

This combination text and reference book deals with the factors governing the movement of water in all its phases through the hydrologic cycle. Emphasis is given to fundamental relations and to the development of practical techniques for computing and forecasting streamflow, evaporation, snowmelt, etc. The application of these techniques to the solution of flood control, irrigation, drainage and related problems is discussed in detail. Basic data, techniques and problems are mainly characteristic of hydrology in the United States.

CREEP OF METALS AND ALLOYS.

E. G. Stanford. Temple Press Limited, Bowling Green Lane, London, E.C.1, 1949. 162 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., linen, 15s.

Surveying the published literature on the subject, this book contains a concise account of 1) the technique involved in the measurement of creep, 2) the characteristics of the normal creep curve, 3) the factors which influence creep behaviour of metals, 4) the interpretation of creep test results from an engineering standpoint, and 5) the progress which has been made in the physical study of the mechanism of creep. A bibliography is included.

DIAMOND TOOL PATENTS Ia, for Machining Metals and Non-Metallic Substances.

P. Grodzinski and W. Jacobsohn. 2nd rev. ed., April 1949. Industrial Diamond Information Bureau, 32-34 Holborn Viaduct, London, E.C.I, England. 55 pp., diagrs., tables, 9½ x 7¼ in., paper, 10s.

This publication contains abstracts of the principal British, American, German, French, Australian and Swiss patents on all aspects of diamond tool production and use. An appendix contains specifications on machines and equipment for shaping industrial diamonds.

DUST IN INDUSTRY, Papers read at the Conference at Leeds, 28-30th September, 1948, with discussions which followed.

Society of Chemical Industry, 56 Victoria St., London, S.W.1, England. 175 pp., illus., diagrs., charts, tables, 11¼ x 8½ in., stiff cardboard, £2 2s.

This volume contains twenty-three papers and discussions which were presented at a conference on the subject. The papers cover the problems caused by dust in various industries, dust measurement, hazards and explosions.

FRACTIONAL HORSE-POWER ELECTRIC MOTORS: A Guide to Types and Applications.

E. K. Bottle. Charles Griffin & Company, Limited, London, 1948. 209 pp., diagrs., charts, tables. 15s.

Addressed to the inventor and designer of motor-driven appliances, this book considers fractional horse-power motors from the viewpoint of selection of the best type to suit given requirements. Motors for special duties are discussed, including light-weight, high speed machines for aircraft work, and telemotors. There is also a review of the various types of equipment by which small motors can be controlled.

HANDBOOK OF CHEMISTRY AND PHYSICS, Thirty-First Edition.

Edited by C. D. Hodgman. Chemical Rubber Publishing Co., 2310 Superior Ave., N.E., Cleveland, Ohio. 1949. 2737 pp., tables, 7¼ x 4¾ in., fabrikoid, $6.00.

This standard reference work presents in condensed form some 2700 pages of accurate, reliable, and up-to-date information in the fields of chemistry, physics, and the closely allied sciences. The 180 pages of revised and new material include tables of isotopic masses, emission spectra wave lengths, and mathematical tables useful in curve fitting.

METAL RECTIFIERS. (Monographs on the Physics and Chemistry of Materials).

H. K. Henisch. Oxford University Press, New York; Toronto; The Clarendon Press, Oxford, England, 1949. 155 pp., charts, diagrs., 8¾ x 5½ in., cloth, $3.25 (in Canada).

This book deals with the theory and practice of dry rectifiers, especially those aspects of the subject which are parts of physics rather than of engineering. It is written for practical workers in this field who wish to familiarize themselves with recent advances in the understanding of the subject. Notes are given on future rectifier development, and an extensive chronological bibliography is included.

MODERN TIMBER ENGINEERING.

W. F. Scofield and W. H. O'Brien. 3rd ed. Southern Pine Association, New Orleans, Louisiana, 1949. 147 pp., diagrs., charts, tables, 9¼ x 6 in., fabrikoid, $1.50.

Intended both as a textbook for students and a reference book for practising architects and engineers, this publication deals with the characteristics of wood, fastenings, beams, columns, trusses, floor systems, and other pertinent topics. Diagrams, worked-out examples, and data tables add to the practical value of the work. Specifications conform to standard building codes.

PLAIN CONCRETE.

E. E. Bauer. 3rd ed. McGraw-Hill Book Co., New York, Toronto, London, 1949. 441 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.05 (in Canada).

Giving the undergraduate engineering student a professional background in the field of concrete, this book presents a thorough discussion of the fundamental problems of concrete production together with instructions for the performance of laboratory tests. Changes in this third edition include new material on air-entrained portland cements, air-entraining mixtures, the measurement of the amount of air entrained in concrete, and the latest statistical data and specifications.

POWER CAPACITORS.

R. E. Marbury. McGraw-Hill Book Co., New York, Toronto, London, 1949. 205 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.55 (in Canada).

Of value to both engineers and those with little technical background, this book covers the fundamental working principles, materials used in the manufacture, and the characteristics of completed units of power capacitors. It traces the history and development of capacitors and their applications to power systems. It provides an abundance of detailed data about the installation and maintenance of capacitors, new developments, and accessories.

This Improved PACIFIC METAL BUTT JOINT

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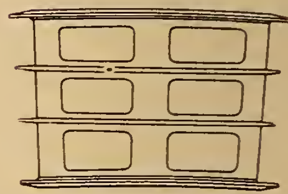
Increases Life of Wood Pipe and Prevents Stave-end Depreciation

Butt Joint pattern. Note shoulder reinforcement, for added strength.



Our double tongue Butt Joint is being used for this 10-foot wood stave pipe with creosoted truss rod cradles, recently constructed in Western Ontario.

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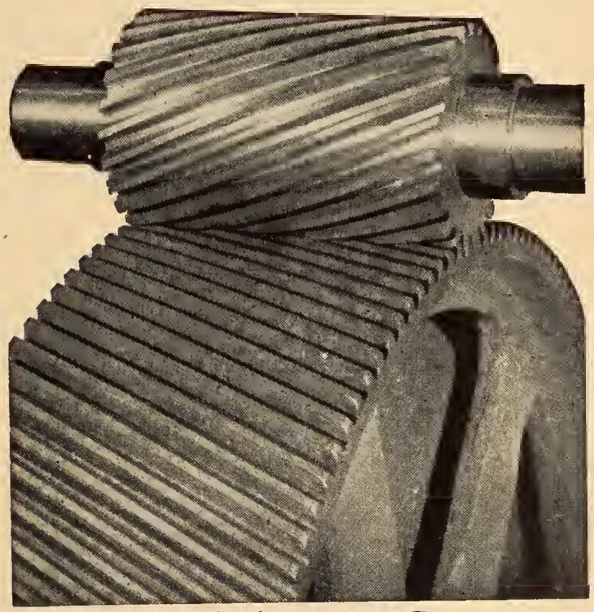

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BUSINESS & INDUSTRIAL BRIEFS

A Digest of Information received by The Editor

New Equipment and Developments

New Hamilton Plant.—Taylor Forge & Pipe Works, Chicago, has announced the formation of Taylor Forge & Pipe Works of Canada Ltd. This new subsidiary is constructing a plant at Hamilton to augment the productive capacity of the company which now has plants at Chicago, Carnegie, and Fontana. The new facilities at Hamilton will permit the company to participate actively in the Canadian market.

•

Motor Starters.—The direct-on-line, oil-immersed motor starters, produced by J. A. Crabtree & Co. Ltd., Lincoln Works, Walsall, England, have recently been approved by the Canadian Standards Association for the control of motors up to 15 horse-power.

With the object of studying the market for both motor starters and wiring devices, and to finalize distribution arrangements, R. H. W. W. Cox, the Company's export manager, will visit Canada in April and will make a coast-to-coast tour. Those wishing to arrange to interview Mr. Cox are advised to communicate with Engineered Equipment Sales Co., 1462 Bishop St., Montreal 2, or with the Victoria Marine Electrical Engineering Co. Ltd., 2022 Douglas St., Victoria, B.C.

•

Size-marked Keys. — Size-marking, developed by Parker-Kalon several years ago to identify P-K Socket Head Cap Screws, has now been applied to P-K Engineered Hex Keys. Clearly stamped on the side of the handle is the key size and the corresponding socket set and cap screw sizes it will fit. Since these sizes can be seen at a glance, guesswork and time wasted in selecting the right key is eliminated. This feature is especially useful in training new help. Parker-Kalon Hex Keys are made of alloy steel and are designed to provide the correct leverage in accordance with size.

•

Moisture-proof Electrodes. — A new series of moisture-proof glass electrodes has been developed for Leeds & Northrup pH electrode assemblies of the pyrex glass and enameled cast iron types. To assure high insulation and low electrical leakage, electrode lead-wires are permanently attached—they are molded into the plastic electrode head.

•

U.K. Exports. — United Kingdom exports to Canada in January, 1950 rose by 2.2 million dollars to 23.5 million dollars—the highest figure reached since devaluation of the pound.

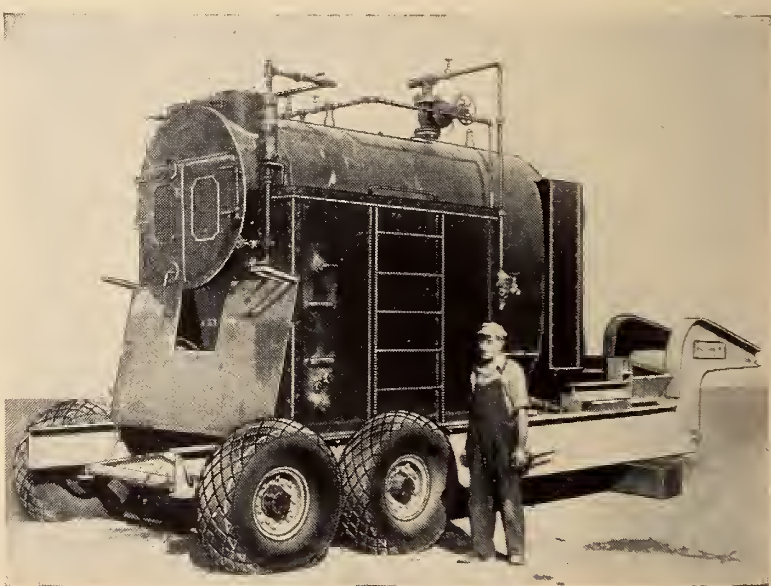
•

Support Columns. — The Akron Products Co. claims to have found a solution to the problem of support column installation in residential and light industrial construction.

The solution is claimed to lie in a dual-purpose steel post, which is designed and manufactured to comply with U.S. housing authority minimum requirements. The post acts first as an adjustable support column during the early stages of construction, eliminating temporary support installation, and eventually is embedded in the concrete floor as a permanent fixture. The post is made of Perma-Tube, a plastic-coated steel tubing. There are no parts to assemble. The support is made of 11 gauge, three inch O.D. tubing. A seven-foot post weighs about 40 pounds. The assembly includes welded plates at the top and bottom and a precision-built jack which is used in making periodic adjustments during early construction stages.

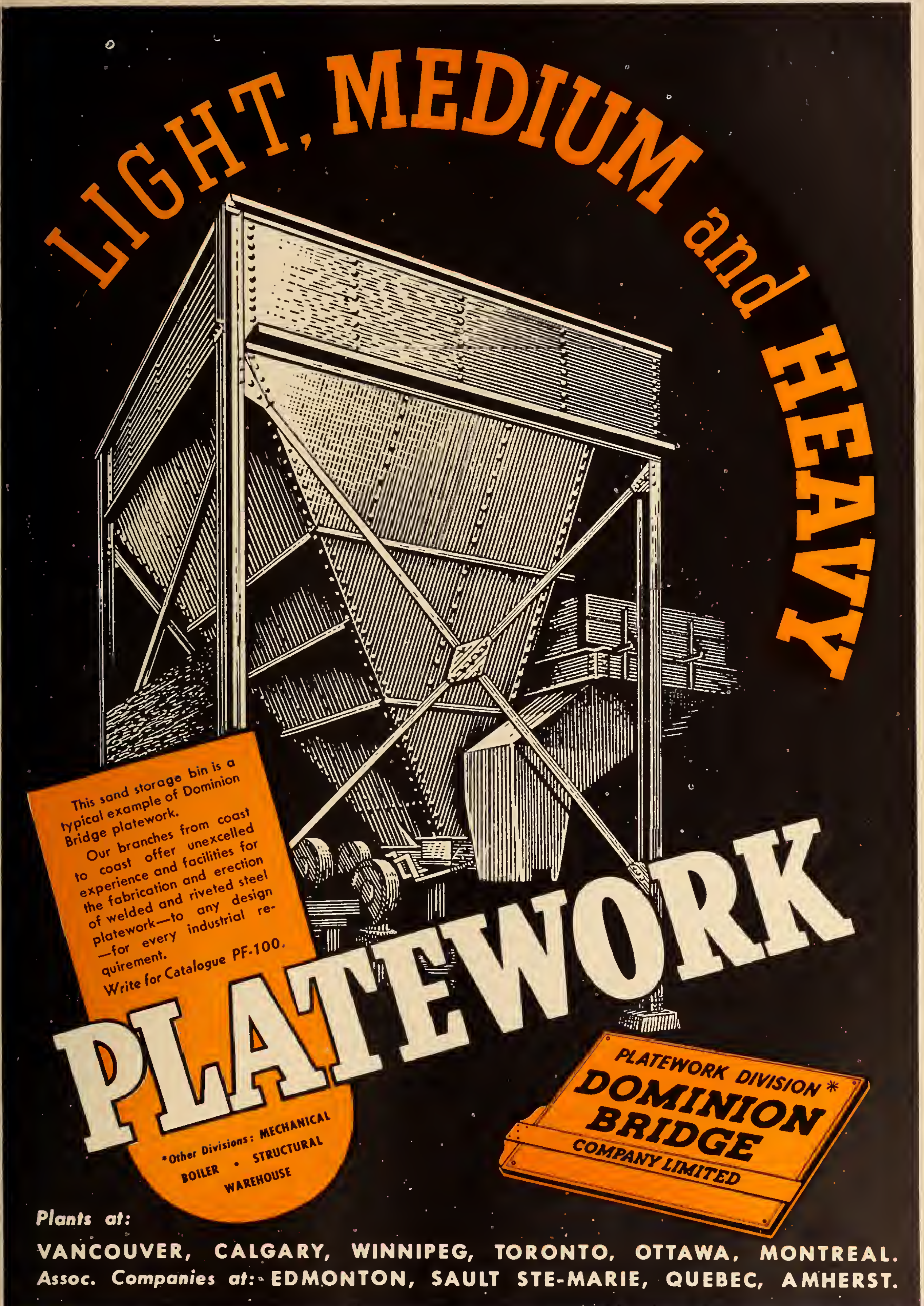
•

Explosives.—Speaking before the members of the Montreal Electrical Club, Dr. Gordon H. Findlay of Canadian



MOBILE BOILER

Shown above is a mobile stoker-fired boiler built by John Inglis Co. Ltd. of Toronto and used by Standard Paving Ltd., also of Toronto, in the manufacture of asphalt for use in highway construction. The boiler operates standing on a specially built trailer that transports it to wherever needed, water being fed from any available source by a small steam-driven feed pump. The stack sections, shown lying on the trailer, are assembled in an upright position when the boiler is to be used. These boilers can also be used in refinery, lumber camp and construction work.



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Industries Ltd. said "Many of Canada's major industrial projects would not have been economically feasible had it not been for high explosives. Our transcontinental railways, the recent iron and titanium developments in the Quebec and Labrador regions, the great hydro-electric dams could not have been advanced without the aid of dynamite."

"While mining requires the largest proportion of explosives produced in Canada," he stated, "road and railroad construction, hydro power projects, and oil exploration also consume large quantities. One little known use is the perforation of oil well casings to increase the flow of oil. This utilizes the same principle which made the PIAT and the bazooka so effective in World War II."

Dr. Findlay said that a recent major development in explosives is the short period delay electric blasting cap. By reducing ground vibrations and air concussion, this device permits large blasts in locations where they never before were considered possible.

●

Adjustable Platform.—William Moss & Sons Ltd. of London, England, announce production of a one-man operated working platform with a height of 17 ft. This height allows the operator to work at positions of 22 ft. to 23 ft. from the ground. Known as the "Beanstalk" this piece of mobile equipment can be lowered to enable the user to push it through an ordinary door. It can be manoeuvred in confined passages and gangways. The main feature of its performance lies in the novel use of a triple hydraulic ram and a tubular framework of sturdy construction. The actual platform is 2 ft. 3 in. square and is provided with toe boards and handrails which fold down for transit and movement under arches 6 ft. 6 in. high. A manual hydraulic pump, actuated by the operator whilst standing on the platform, gives full elevation in two minutes. Descent is effected in 45 seconds. Full particulars may be obtained from the Company, at North Circular Road, Cricklewood, London, N.W. 2, England.

●

Marine Shaft H.P. Meter. — Canadian General Electric have announced a new electric instrument which measures the horse-power transmitted by the propeller shaft of a ship. Called a "marine shaft-horsepower-hour meter" the new device was developed by the G.E's. general engineering and consulting laboratory. It is a self-contained unit which gives instantaneous horse-power readings and horse-power hour totals over a given interval. Resultant readings provide a good indication of the efficiency at which the ship is operating.

It is anticipated that the new instrument will prove valuable in comparing fuel consumption with horsepower output under varying conditions, in checking performance of propulsion equipment over a wide range of speed, and in comparing output of power plant for similar trips and distances. For further details communicate with any C.G.E. office.

●

Plastic Insulation. — K-Shield, a new light-weight pipe and vessel insulation, made from Styrofoam, a product of The Dow Chemical Co., has been developed by Robinson Industries of Michigan and is manufactured in Canada by First Sno Co. Ltd. of Hamilton. The development is especially suited for low temperature pipe insulation, and application consists of a simple covering procedure.

●

High Alumina Cement.—A high alumina cement which combines ultra-rapid hardening with great refractory power and immunity to most kinds of chemical attack is now readily available in Canada according to information received from Ciment Fondu Lafarge (Canada) Ltd., 1405 Peel St., Montreal 2, Que. According to information released by the manufacturer "no other type of structural cement, or cement and admixture, can equal (even after maturing 90 days) the high 24-hour strength of aluminous cement." Concrete made with "Ciment Fondu" is claimed to be far more resistant to chemical attack than ordinary Portland cement concrete. It is not affected by ground waters containing magnesium sulphate, calcium sulphate, gypsum, and anhydrite, and does not disintegrate after long service in sea water since it does not liberate free lime. Many other advantages are claimed for this British product.

●

British Shipbuilding. — British shipyards at the end of 1949 had nearly 2,000,000 gross tons of shipping under construction—45 per cent of the total tonnage built throughout the world. Improvement in the supply of materials is indicated by figures of vessels completed during the year, the best since the war. Lloyd's Register of Shipbuilding Returns shows that during 1949 the tonnage commenced was 1.2 million

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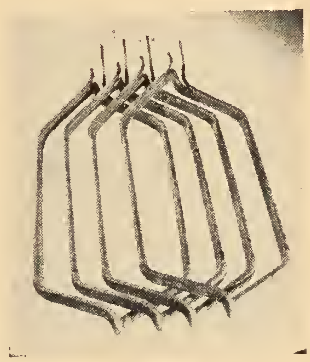

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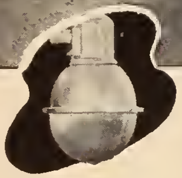

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●

Technical Information Service.—Nearly 400 enquiries per month are being received and answered by National Research Council's Technical Information Service. In this way practical aid is being given to innumerable small industries that have no scientific staffs and whose managers in many cases do not realize that many of their problems are capable of solution by reference to the scientific literature.

This service is essentially an information rather than a research activity. The Technical Information Service maintains representatives in ten centres across Canada. The representatives are not consultants. They cover a wide field and cannot be specialists in all fields. For further information on the services provided by the National Research Council communicate with the headquarters of the Council at Ottawa.

●

New Calcium Chloride Plant.— Brunner, Mond Canada Limited is now engaged in a major expansion of its facilities for the manufacture of calcium chloride at Amherstburg, Ont. The expansion will involve the expenditure of well over a million dollars for building additions and new manufacturing equipment. The principal use of calcium chloride in this Country is for gravel road consolidation and ice removal.

●

Miniature Electric Motor.—An electric motor which is claimed to be the only one of its kind in the world is to be shown at the British Industries Fair in May. It has a shaft speed of 10,000 r.p.m. yet it can be worked on a 3-volt battery. It is reversible and is expected to be useful for driving turntables, for window displays, etc.

●

Welding Course.—In view of the continued interest in the instruction course conducted by the Canadian Welding Bureau the directors of the administrative board have authorized the continuation of the course for another year.

Originally the course was arranged for employees of member firms. However, in view of the interest shown when the course was first announced, others were permitted to participate. According to the new arrangement it is expected that the majority of students will take the course on their own initiative as a means of seeking their own advancement, although, as before, many of those who attend will be sponsored by their employers who will bear some or all of the cost. The course is designed to teach the fundamental principles of arc welding and cutting. It does not teach the actual art of welding although practical supplementary courses were arranged last year in some centres. Essentially the course is planned to give the welding operator or supervisor the theory of practice and design that he may have missed in his practical experience. For full details, which will be available shortly, communicate with Canadian Welding Bureau, 22 College St., Toronto, Ont.

●

Hydraulic Analog Computers. — Electronic computers to "give a television-like picture of how water behaves" may help make possible more efficient use of water supplies and water power, according to engineers at the Massachusetts Institute of Technology. Such developments are of obvious importance to water power development, especially in times of short supply, they point out.

Under a special grant from the Research Corporation of New York, the hydraulics division of the M.I.T. civil engineering department is studying possible applications of so-called analog computers to make hydraulic engineering predictions faster and more accurate.

"Out of this work, one of a number of basic engineering research studies in progress at M.I.T. in the field of hydraulic dynamics, may come new ways of predicting accurately and rapidly the behavior of water in all kinds of complicated systems," said Dr. Arthur T. Ippen, professor of hydraulics.

With these computers it will be possible to demonstrate immediate solutions to several flow problems—the rise in a river below a reservoir when a flood crest enters the reservoir from above, for example. To calculate this flooding effect requires considering the size and shape of the reservoir and its outlet as well as the amount of water coming in. The calculation is performed by an array of inter-connected electronic computers which, connected together in various ways, can be made to give the answers to a great variety of specific mathematical problems. The results are viewed on a screen similar to that of a television receiver.

●

Gear Reduction. — Gear reductions as high as 750,000 to 1 are now practical and available in a line of miniature speed changers announced by Metron Instrument Co., 432 Lincoln St., Denver 9, Col. These special units are made up by adding one or two additional gearing sections to the standard three-section units having ratios up to 3,375 to 1. Input speeds as high as 50,000 r.p.m. and output torques up to 2 pound-inches are permissible. Very high ratios in hobbed gears and "zero back-lash" construction can be furnished at reduced torque rating. Weights of 4 and 5 section units are approximately 6 and 7 ounces, respectively. Body diameter is 1.050 inches; body lengths are 3-15/16 inches for 4 section unit and 4¾ inches for 5 section units.

●

Air Heaters. — The following information was received from the Trane Co. of Canada Ltd., 4 Mowat Ave., Toronto 1: "The new 'Cloverleaf' diffuser is the first completely adjustable air directer for the vertical type unit heater. It can direct the air stream in a virtually horizontal direction and in varying degrees all the way down to the vertical. When the air from the new deflector is projected to the floor, it forms the pattern of a four leaf clover—hence its name."

This new air diffuser is constructed of individual blades hinged together in a cone-like form. The centre of each blade forms a smooth concave surface. The propeller fan of the projection heater moves air in a spiral form outward from its blades. The segments of the diffuser receive the full force of the spiral motion of the air leaving the fan. This action tends to straighten the spiral. By straightening the air stream, at or near the fan, the distance of throw is actually increased.

The "Cloverleaf" diffuser is available in six sizes.

●

Control Instruments.—The Bristol Co. of Canada Ltd., 71-79 Duchess St., Toronto, offers a new line of air-operated control instruments, known as the series 500 controllers. Included are controllers for temperature, pressure, flow, liquid level, humidity, and pH value. The new controllers have calibrated control actions. Reset rate, derivative time, and proportional band adjustments are accurately calibrated and reproducible. They have only one service adjustment. Controllers can be completely disassembled and, after being reassembled with replacement parts, only one adjustment is required to put the system in exact calibration. The new instruments are offered in five types.

●

Plywood Standards. — With the object or organizing the British Columbia Plywood industry for co-operative effort in attaining uniform standards of manufacture and gaining recognition of the qualities of their product in domestic and export markets, B.C. manufacturers of plywood have incorporated a new trade association to be known as "Plywood Manufacturers Association of British Columbia".

●

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This organization has been registered under the Societies Act. W. E. Burns, sales manager, Pacific Veneer Division, Canadian Forests Products, has been elected president. G. H. Tullidge of Western Plywood Co. Ltd. has been elected vice-president. L. R. Andrews has been appointed secretary of the organization and J. O. McCutcheon has been retained to develop engineering data relative to the use of plywood.

●

New Company.—Britenco Ltd. will be the name of a newly-formed organization dealing in power transmission machinery. The Company will be sole Canadian representatives of the British firms Crofts (Engineers) Limited, H. Brammer & Co. Ltd. and Carter Gears Ltd.

●

Rubber Company Branch. — Goodyear Tire & Rubber Co. is opening a branch in Edmonton, Alta. This new branch is designed to serve northern Alberta as well as the North West Territories and some sections of British Columbia. In recent years Goodyear products have been warehoused and distributed in Edmonton by Taylor Pearson & Company.

The unprecedented growth of the oil industry, together with the increase in Alberta's farm acreage have necessitated faster and more economical distribution to Goodyear dealers throughout the province. The Company believes that with its new and enlarged facilities it is now in a position to supply the growing demand for Goodyear products in this important territory.

●

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Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

Material Handling Booklet. — The entire line of Rapistan material handling equipment is presented in a two-colour bulletin published by the Rapids-Standard Co. Inc. of Grand Rapids, Mich. Action photographs show how this equipment speeds up operations and lowers handling costs in many industries.

Included are short descriptions of gravity wheel and roller conveyor, floor and hand trucks, and industrial casters. Ask for bulletin GS-49. Address enquiries to the Rapids-Standard Co. Inc., 342 Rapistan Bldg., Grand Rapids 2, Mich.

●

Ontario Hydro Magazine. — "Hydro News" published by The Hydro-Electric Power Commission of Ontario is an excellent publication of a semi-technical nature. The publication is well produced and carries much information pertaining to H.E.P.C. developments and personnel. Address requests for copies to The Hydro-Electric Power Commission of Ontario, 620 University Ave., Toronto.

●

Couplings & Gear Motors. — Dominion Engineering Co. Ltd., P.O. Box 220, Montreal have available two excellently produced publications "Dominion Gearflex Couplings" and "Dominion Gearmotors". The coupling brochure, which is in two colours, contains 16 pages of data on Dominion couplings. The gearmotor booklet, which contains 28 pages, gives informative data on Dominion Gearmotors which "combine in a single unit a high-speed motor and an efficient speed reducer".

●

Electrical Publications. — Northern Electric Co. Ltd., 1600 Notre Dame St. W., Montreal, offers the following publications "Preset Locked-in Underfloor Electrical Distribution System"; "Jefferson Fuses"; "Electrical Insulation"; "Industrial Signals"; "Mica Insulation"; "Cutler-Hammer Appliance Switches"; "Sta-Kon Pressure Terminals". These publications will be forwarded on receipt of requests.

●

Aluminum Products. — The Aluminum Company of Canada Ltd., 1700 Sun Life Bldg., Montreal, Que., offers a "Directory of Manufacturers of Aluminum Products". This is a 65-page publication which lists over 1,000 firms in Canada making the many and varied aluminum articles marketed in this Country. Printed primarily for the information of buyers of aluminum products, the book contains a wealth of information on what is being made of aluminum and where it may be obtained.

●

C.S.A. Publications. — The following publications may be obtained from the Canadian Standards Association, National Research Building, Ottawa, Ontario:

A-100-1949—"Specification for Asphalt Floor Tile," price 50 cents.

B-89.2-1949—"Specification for 2½ Inch Fire Hose Couplings and Fittings", price 50 cents.

C-22.2 No. 17-1949—"Construction and Test of Cable for Luminous-Tube Signs and for Oil-Burner Ignition Equipment" (this is a second edition) price 50 cents.

C-22.2 No. 45-1949—"Construction and Test of Rigid Conduit" (second edition) price 50 cents.

B-1.1-1949—"Unified and American Screw Thread" price $3.00 postpaid.

A complete list of C.S.A. publications is available without charge.

●

Bridge Flooring. — A new structural plate steel bridge flooring system is described in a 4-page technical bulletin published by United Steel Fabricators Inc. of Wooster, Ohio. Lightweight and quick to install, USF Structural Plate Bridge Flooring is recommended, by the manufacturer, for bituminous surfaced roadways on bridges, viaducts, overpasses and similar structures. For copies of this bulletin communicate with the Company.

●

Chlorine. — Pittsburgh Plate Glass Co., Columbia Chemical Division, Fifth Avenue at Bellefield, Pittsburgh 13, Pa., have produced a 72-page publication entitled "Chlorine".

This interesting book gives highlights in the history and growth of the chlorine industry, a description of the method of the manufacture of chlorine, geographical location of the areas in which chlorine is produced, information on methods of handling and unloading, information on storage, and considerable technical data which will be of use to those who are required to deal with chlorine. Copies of the publication are available.

●

Speed Reducers. — Hamilton Gear and Machine Co. Ltd., 950 Dupont St., Toronto 4, Ont., have produced a new catalogue and data book on helical gear speed-reducing units. This book is designated No. 113, and covers speed increasers and speed reducers with single, double, and triple reduction single helical gears for both low and high speed applications. Besides a complete description of the gear units, with dimensions, there is data for evaluating power requirements of various types of driven loads, and complete rating tables to enable the selection of the correct size of gear. Please make requests for copies on your official stationery.

Combustion Safe Guard.—An explanatory bulletin on the new Flame-otrol combustion safeguard for oil and gas fired furnaces, ovens, boilers, kilns, and other heating equipment, has just been released by the Wheelco Instruments Co., Chicago 7.

Caterpillar Publication.—Prepared for the construction trade is a recent publication by Caterpillar Tractor Co., Peoria 8, Ill., entitled "'CAT' Engines on the Construction Job." The eight-page illustrated booklet discusses power requirements for excavators, compressors, electric equipment, pumps, ditchers, rollers, and movable forms. Specifications on a complete line of Caterpillar Diesel engines are included. Ask for Form 12679.

Diesel Engines. — Nordberg Mfg. Co., Milwaukee 7, Wis., has available copies of bulletin 173, in which is described the type TS and TSM29 Nordberg Diesel engine. It is claimed that this engine is the most powerful, single acting, two-cycle Diesel ever built in the United States. It has a 29 in. bore and 40 in. stroke and is available in a size range from 5 to 12 cylinders with ratings from 3,570 to 8,500 horse power at normal speed of 164 r.p.m. for both stationary and marine service.

Expendable Pallets. — An important step towards the realization of damage-free shipments and standardization of economical materials handling practices in the paper industry is described in a new 36-page manual issued by the Addison-Semmes Corpn. of Racine, Wis. This well-illustrated publication offers valuable information on the use of expendable, corrugated fibreboard pallets in shipping and storing roll and sheet paper stock of various types and sizes. Case histories of actual shipments are accompanied by photographs and mechanical sketches that indicate the palletizing and loading procedures followed for lower shipping costs. Copies are available.

Cement Mixers. — Chain Belt Co. of Milwaukee has just published bulletin 50-10, illustrating and describing Rex horizontal moto-mixers and Rex Adjusta-Hite discharge moto-mixers. This new 16-page bulletin gives detailed descriptions of the many features of the above-mentioned products. The address is 1600 West Bruce St., Milwaukee 4, Wis.

Oil Magazine. — The Imperial Oil Review is an outstanding publication of its type. The December-January, 1949-50 issue features articles dealing with oil pipe lines with particular reference to the existing and proposed Canadian pipe lines. The publishers will be pleased to place readers of the *Journal* on the mailing list for the Review. If the December-January issue is required it is suggested that it be specifically requested. Address requests to Imperial Oil Review, 56 Church St., Toronto, Ont.

Lighting System.—Mitchell Manufacturing Co. Ltd., 11-25 Davies Ave., Toronto 8, have issued a catalogue on the new Mitchell Module Lighting System. The catalogue has twenty 8½-in. by 11-in. pages punched for ring binding. It is printed in three colours.

Basically, this new lighting system consists of four modules or units. These lighting units are called "modules" because all have a single or multiple standard measurement of 16¼ in. Although, previously, lighting installations have been limited to individual units or continuous rows, the new modules may be mounted together end-to-end, side-to-side, or end-to-side, to achieve an unlimited number of lighting patterns.

Complete information is contained in the catalogue No. 360.

Nickel Publications.—Fourteen factors in corrosion, often overlooked in the specification of types of metals to be used for specific purposes, are described in a pamphlet just published and made available by The International Nickel Company of Canada Ltd., 25 King Street West, Toronto. Ask for "Corrosion and the Final Choice".

Cedar Construction.—A new 12-page booklet "Solid Cedar Construction" issued by the B.C. Coast Woods Trade Extension Bureau, 709 Metropolitan Bldg., 837 West Hastings St., Vancouver, B.C., has been published to show the reader how solid cedar building methods offer users direct economies in both time and money. Well illustrated with step-by-step photographs taken during construction of two test homes of solid cedar, it gives complete cost records for both houses. In addition to home building, many other money saving uses for this new construction method are indicated in the booklet. Copies are available.

Welding Review.—No. 4 of volume 24 of "The Welding Review" contains articles on "Modern Maintenance Method for Fire Hydrants"; "Flame Hardening Chisels"; "Rolling Stock . . . Now Is Welded". These items are typical of the content of the issues of the publication which has been published for many years by the Canadian Liquid Air Co. Ltd., 1111 Beaver Hall Hill, Montreal. To be placed on the mailing list for this highly informative publication send your request to the publisher.

Lighting Film.—A film of general interest called "Light in Your Life" is now available on loan from the film libraries of Canadian General Electric Co.

By skilful animation and interesting live-action sequence, this half-hour colour film story revolves around a five year old girl, and a likeable animated character called Professor J. Lumen Lightly who shows her the many varieties of lamps in use today. It is in no sense a technical film, but good, enjoyable, and sometimes whimsical, entertainment. Requests for the film should be made to your nearest C.G.E. office.

Ditching Equipment.—Deep sewer and water ditching equipment is graphically portrayed in the new catalogue published by the Findlay Division of Gar Wood

(Continued on page 251)

A pleasure craft in the Antipodes . . . a Power House in Gaspe, Quebec . . . a tug bringing necessary supplies to the far north are among the thousands of Vivian installations from the South Seas to the Arctic.

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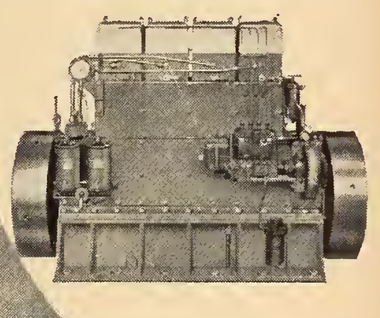

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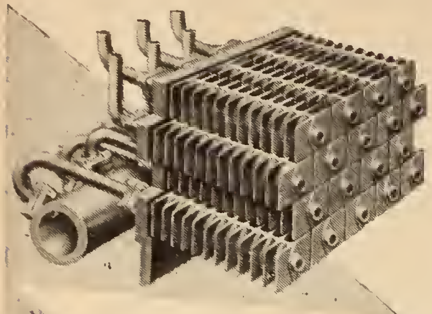
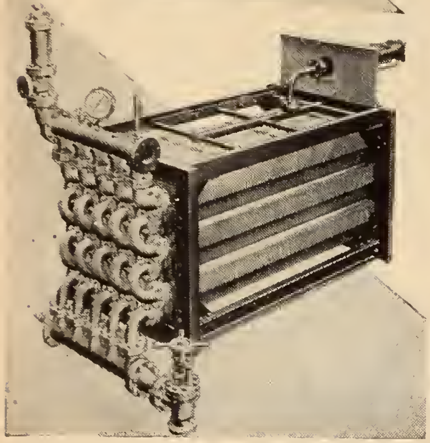
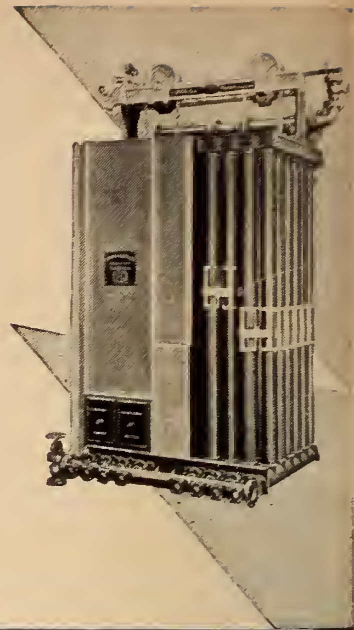




Left: Green's Premier Diamond Economiser (Type 12) with cast iron gilled sleeves shrunk on steel tubes and arranged in shallow tiers. This design combines the advantages of extended and compact heating surface, controlled gas flow and complete facilities for inspection and cleaning, with a steel tube construction suitable for all working pressures.

Right: Green's cast iron Vertical Tube Economiser gives high performance, large water capacity and trouble-free operation under all types of combustion conditions.

Left: Green's Premier Diamond Economiser (Type 25) is eminently suitable for medium pressure installations where the extended heating surface design in compact form is required.



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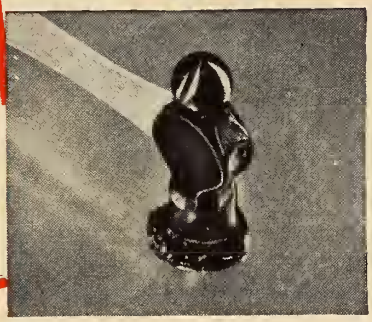

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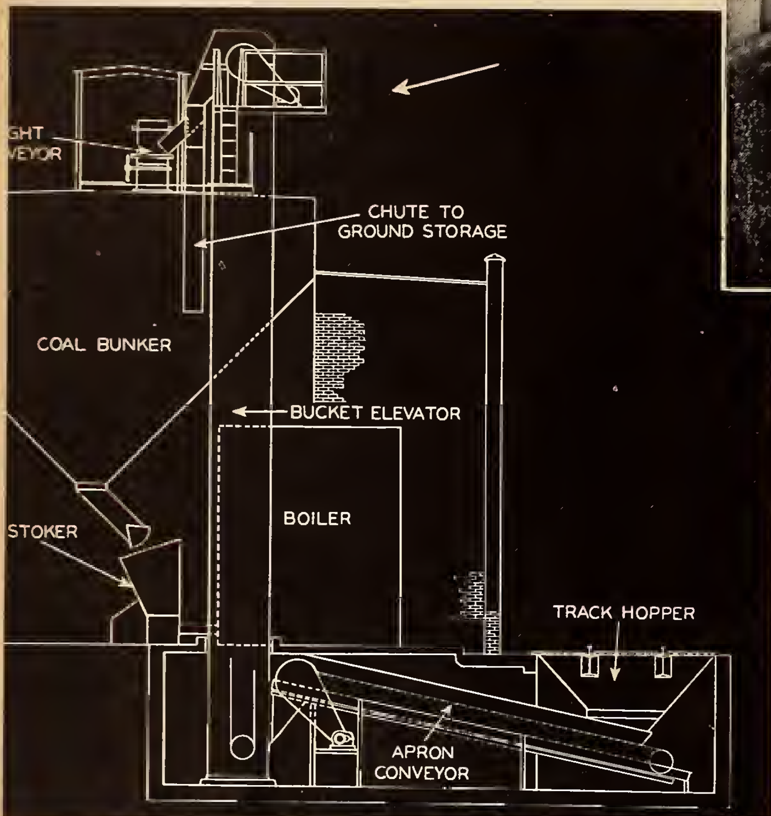

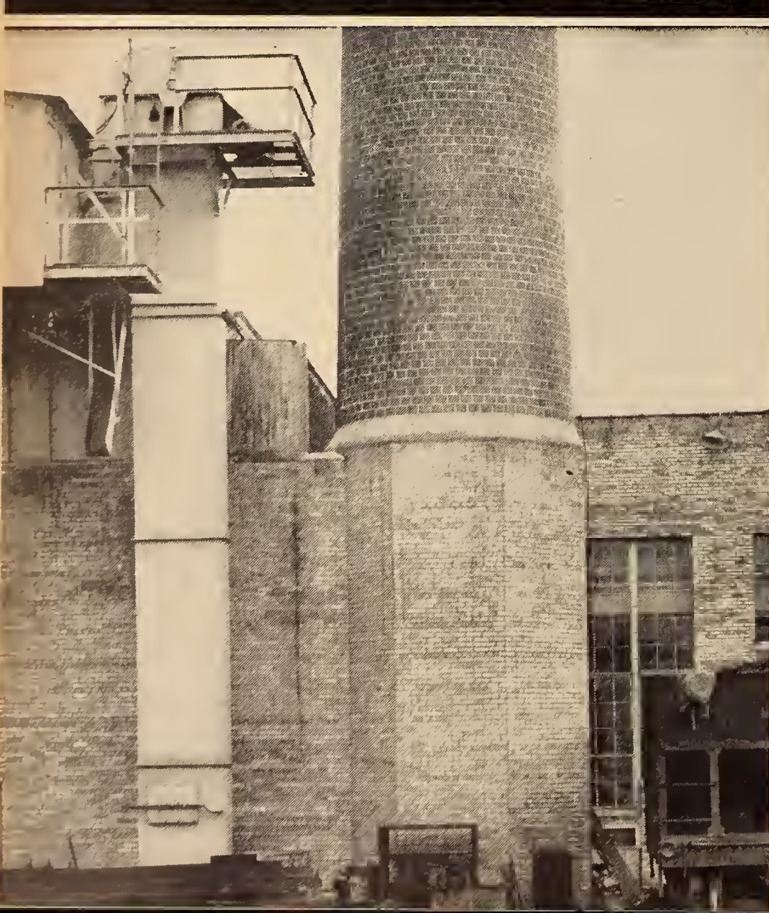

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(*Continued from page 247*)

Industries Inc. This new catalogue fully explains the features and applications of Buckeye Models 120 and 160 Service Ditchers. Write to Department 022, Gar Wood Industries, Inc., Findlay Division, Findlay, Ohio.

Timing Chains.—Chain Belt Co. of Milwaukee has just published bulletin No. 49-5 in which is described the construction and use of Duckworth Automotive Timing Chains. Order the bulletin by number.

Bepco Journal. — The December 1949 issue of "The Bepco Journal", published by Bepco Canada Ltd., 4018 St. Catherine St. W., Montreal 6, contains two highly interesting articles—"A New Impregnating Plant", by P. Huggins and "Selenium Rectifiers", by E. A. Chandler. These articles are highly informative and are recommended reading.

Appointments and Transfers

G. D. Schroeder.—The Barrett Co. Ltd. has announced that G. D. Schroeder, formerly sales manager, has been appointed vice - president, in which,

G. D. Schroeder

position he will be responsible for all Canadian sales of the Company. His office will be at 5551 St. Hubert Street, Montreal.

L. E. Clark. — Leighton E. Clark has joined the sales staff of Brunner, Mond Canada Sales, Limited. He will be attached to the calcium chloride sales and engineering service division of the Company and will operate from Toronto.

Mr. Clark graduated from Toronto University in 1948 with the degree of B.A.Sc. Upon graduation he was awarded the Brunner, Mond Canada Sales, Limited Fellowship in soil mechanics at the University of Toronto which led to the degree of master of science in 1949.

Welding Equipment Sales. — Canadian Liquid Air Co. Ltd. has been appointed Canadian sales agent for the complete line of Amsco Welding Products. Included in the Amsco line are wear-resistant alloys, tungsten carbides, manganese electrodes, plates, and shapes. In addition to distribution through Canadian Liquid Air's coast-to-coast chain of branches the Amsco products will be available from Welding & Supplies Co., Montreal and Toronto; H. E. Brown Supply Co., North Bay, Ont.; S. Norman Sancton, Saint John, N.B.; Foulis Engineering Sales, Halifax, N.S.; and Vulcan Machinery & Equipment Co., Winnipeg, Man.

A. E. O'Brien.—A. E. O'Brien, superintendent at Frood-Stobie Mine, has been appointed to the new post of superintendent of safety for Inco's Mining and Smelting Division. His headquarters have been established at Copper Cliff. C. H. Stewart, superintendent of Frood-Stobie open pits, succeeds Mr. O'Brien as Frood-Stobie mine superintendent.

THROUGHOUT its thirty-one years of existence the *Journal* has been recognized as an outstanding advertising medium by companies with products and services of interest to professional engineers.

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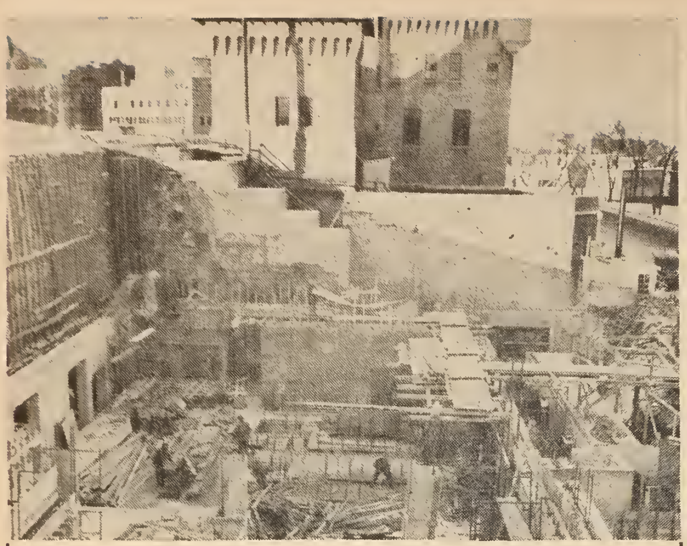

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14,000 copies of this issue printed

Mr. E. Ross Graydon, M.E.I.C., recommends that you plan to attend the 1950 Annual Meeting in Toronto July 12-14. As chairman of the Toronto Branch, he will be your host and he is in a position to know that extensive plans are being made to ensure that the meeting will be of maximum value to you.*

The American Society of Civil Engineers is holding its Annual Summer Meeting concurrently. Joint sessions will be held with the technical divisions of A.S.C.E., and the E.I.C. will hold additional technical sessions covering fields of engineering other than civil.

It is expected that the May issue of the Journal will carry complete programme details and instructions for reservation, registration and transportation.

**N.B. In the March Journal, the dates were listed in error as July 11-13. They are definitely (and as usual) Wednesday, Thursday and Friday.*
JULY 12 — 14, 1950.

The Legal Position *of the* Engineer

by

C. R. Young, Hon.M.E.I.C.

Dean Emeritus, Faculty of Applied Science and Engineering, University of Toronto.

From an address given before the Montreal Branch of The Engineering Institute of Canada, March 9, 1950

Dean Young's qualifications to write on the subject of the engineer's position before the law are well-known to those familiar with his career. Among other accomplishments he has written a booklet on Military Law, collaborated with Hon. Justice R. E. Laidlaw of the Ontario Supreme Court in the authorship of the widely-used textbook "Engineering Law", and has served on a Royal Commission which studied the economics of commercial motor transport in Ontario.

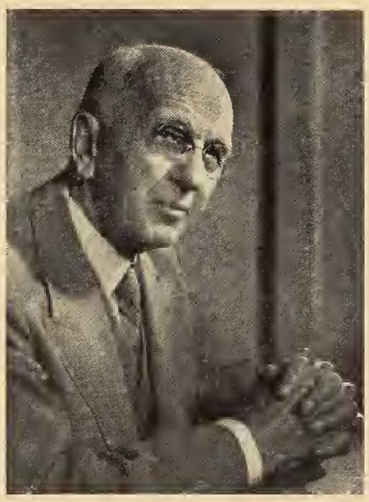
This paper, which will be published in two instalments in this and the May issue of the Journal, outlines the duties, rights, powers, and liabilities of the engineer in his relations with his clients, employers, and associates. Examples of applicable jurisprudence are cited with a listing of reference sources which will appear at the end of the second instalment.

For the sake of protection, comfort, and convenience, men in civilized communities long ago banded themselves into a society and agreed to be governed by rules of conduct of their own formulation. That body of rules is known as Law. It may be defined as a binding custom or practice of a community, arising from observance of rules or modes of conduct that are made obligatory by some imposed sanction, and, on violation, are enforced by a controlling authority. The keystone of that authority is represented by the courts.

The engineer as a member of the society so organized provides implements, equipment, and processes which enable it to function. The services he offers are indispensable in carrying out the policies and regulations that have been formulated by deliberative bodies, and provide a dependable physical basis for the manifold activities of modern life.

Knowledge of Law Desirable

It is desirable, and in certain respects necessary, for the engineer to have a knowledge of the law affecting his profession. He is not expected to make final interpreta-



C. R. Young, Hon.M.E.I.C.

tion of documents or solve problems of complicated human relationships; that is for the lawyer or the courts. Nevertheless, he should inform himself as to the law in its aspect of safeguarding public and private rights and direct his own conduct accordingly.

In many cases the law requires that special notice be given, permits obtained, plans approved and filed, inspections made during construction and before use; and that due precautions be taken regarding safety during construction and during occupancy or use by those who will take over the works when they are completed.

The engineer should be aware of existing restrictions on the use of land, of rights to light and air, and of the right of support to which the owner of adjoining lands is entitled.

It would be evidence of lack of reasonable care if the engineer's works were so constructed as to violate the law, whether its source be in statutes, municipal by-laws, orders, or regulations.

He should be familiar with the character of construction and equipment contracts, not only with the technical specifications, but also the agreement and general conditions. These latter two may be, and frequently are, prepared with the assistance of lawyers, but the engineer should be aware of their purport and of what makes for effectiveness and enforceability. As a matter of personal precaution, he should be aware of his rights, powers, and liabilities in the important and responsible role of an engineer administering a contract between an owner and a contractor.

Applicable Portions of the Law

Every engineer realizes, of course, that as a member of the community, he is subject to the same law as any other citizen. As a citizen, he is liable to the same restraints and penalties as his neighbour for acts or neglects creating public or private wrongs. He enjoys no exemptions and no preferences.

In the practice of his profession, however, he becomes subject to certain enactments, regulations, or customs that are applicable to all those who represent themselves as skilled persons, whether belonging to the so-called professions or not. In general, the engineer is governed by the legal rules that bear on the callings and activities of a host of skilled persons, such as architects, surveyors, physicians, lawyers, dentists, pharmacists, accountants, painters, locomotive drivers, etc. But as a member of a learned profession, and presumably the possessor of a high degree of knowledge and skill, he assumes on behalf of his client or employer much greater responsibility than does a skilled tradesman. Moreover, the engineer s required to perform certain duties as set out in statutes, by-laws, orders, and regulations emanating from governmental bodies or their agencies. Under certain circumstances he may also have to serve in quasi-judicial capacities.

That part of the law which concerns the engineer serving in junior capacities, and generally on a salary basis, has to do with the master-servant relation. His seniors assume overall responsibility for his work and serve as a buffer between himself and those for whom the work is being done and who will be called upon to pay for it. The legal aspects of his employment are the same as for any other worker serving in an analogous role, whether or not he be a member of a professional association or corporation. If he be incompetent or negligent, his employment may be promptly terminated by the master, as is pointed out in a succeeding portion of this paper on liabilities.(1)

The chief or senior engineer holds, however, a much more responsible post in the eyes of the law. It is immaterial whether he serves on a salary basis for a public body or a private corporation, or as a consultant on a fee basis, so long as he is the person who carries the overall technical responsibility. He is "the engineer". The duty recognized by the law is his and the liability will rest on him if the engineer is found at fault. It is consequently the senior or responsible engineer to whom reference is made in what follows.

On work done under contract, and where the engineer prepares plans and specifications and supervises construction or installation, he normally plays a triple role. In preparing plans and specifications, he is simply the skilled servant of the employer or owner and amenable to the law governing such relation. There is on his part an implied warranty that he is of skill reasonably competent to the task that he undertakes.(1)

But in calling for tenders, making outside contacts, assisting in the award of the contract and supervising the operation in the interests of the owner, that is, when on behalf of his employer he meets or does business with a third party, he serves as the agent of the employer. The law of agency recognizes a degree of implied authority as inherent in the work of the engineer in this situation independently of the contract, but it is not unlimited. It cannot bind the employer to every act which the engineer might perform, or every order which he might issue purporting to be done on behalf of the employer. There is no general rule concerning the extent of the authority that may be implied, but it has been held that if an act is absolutely necessary for carrying out the work required by the employer, the engineer may appropriately presume implied authority which he knows is beyond his rights. In any doubtful situation he should consult his employer.

Almost always he is declared in the contract to be the sole judge as between the owner and the contractor in such matters as the interpretation of plans and specifications, quality of materials and workmanship, measurement of quantities, determination of the payments to be made on progress and final certificates, allowances for additions and deductions, and the stage at which the work is completed in full conformity with the terms of the contract. In the discharge of such duties he serves as a quasi-arbitrator occupying the unique role of a judge in matters of possible difference between the contracting parties, while being in the pay of one of them. The fact that, on the whole, the system works satisfactorily is a tribute to the fairness and judicial attitude of the engineer that has been paid by the courts themselves.(45)

It is important to note that the law varies in its impact on the engineer, depending upon his particular role under the contract. Thus, while he may suffer damages for neglect and lack of skill while acting as the owner's skilled servant or agent, his decisions in the role of quasi-arbitrator may not be attacked on such grounds, but only on the grounds of fraud, collusion, or gross unfairness.(2)

Duties of the Engineer

Nature and Source of Duties

Persons of all callings and of every status in society are bound to fulfil such duties as may be imposed on them by the general law of the land. Those engaged in professional activities are, however, subject to additional rules and responsibilities affecting their actions and mode of conduct. The engineer must, like every other citizen, not only perform the duties imposed upon him by his fellow citizens, but he must at the same time conform to other requirements imposed upon him in the exercise of his profession. These amount to duties, which are enforced by sanction of the law. They arise from various sources and may either be expressly set out in a document or, in certain cases, be implied.

Duties arise from performance or conduct required by

(1) express agreement with another person or persons;

(2) statutes of the parliament of Canada or of the various provinces;

(3) orders-in-council, rules, or regulations passed by governments or their agencies;

(4) by-laws of municipalities;

(5) the common law—that is, established custom having the force of law.

The engineer may be subject to duties arising from his relationship to (a) his employer, (b) the contractor, (c) the public, (d) the members of his profession.

Duties to the Employer

Importance of Establishing Nature and Extent of Duties

Since responsibility and liability are directly associated with duty, it is important that the engineer have a clear understanding with his employer covering the nature and extent of the duties expected of him. Liability, if there be such, is associated with failure or neglect to perform duties that are called for by his own written or oral agreement with his employer, or as set out in a contract under which his authority is recognized.

Unless it can be shown that the engineer owes a duty to a complainant he is free of all responsibility for alleged negligence. This matter, of great importance to the engineer, is discussed under the head of Liabilities of the Engineer.

Types of Duty

In serving his employer the engineer may be called upon to perform several types of duties. As has been stated, his responsibility and liability will vary in accordance with the kind of service that he is giving.

As an adviser or designer he is in the position of a skilled servant. He bases his judgment and decisions on the principles of his art or science and furnishes his employer with the benefit of at least ordinary care and skill.

If the engineer is placed in charge of construction, he undertakes many activities in which he serves as the agent of his employer, that is, the owner.

As a quasi-arbitrator the duties of the engineer comprise decisions on matters for which the contract indicates that he is to be the sole judge. In this particular role, as has already been pointed out, he is not bound to act with learning, care, or skill, but must be judicial, impartial, diligent, and scrupulously honest.

It may chance that one or other of the parties to a contract may object to a decision made by an engineer in his quality of quasi-arbitrator and may demand formal arbitration by a person or persons as provided for in the arbitration clause of the contract. An engineer undertaking formal arbitrational duty under such auspices is not in danger of seeing his award, or the award of a board of which he is a member, upset on the ground of lack of learning, care, or skill, on the part of the arbitrators, but only by reason of fraud or collusion, or because the award rests on an assumed legal principle that is obviously erroneous.

Personal Nature of Contract

The employer expects, and is entitled to, the personal services of an engineer in all matters reasonably requiring his personal professional skill or care, rather than that of a subordinate.(3) He cannot delegate such duties to others, although he may employ assistants to gather information or make calculations and designs, provided he assumes responsibility for their acts and retains control of the work. He must exercise his own judgment, care, and skill to see that the employer gets the best advice and services of which he is personally capable.

In detailed work which cannot practicably be performed by the principal engineer, delegation is permitted. If the chief engineer approves and adopts such work, it is as valid and binding as if he did it himself. If, however, some error has crept in, so that the work as performed is not in accordance with the original intention, it will be necessary also for the employer of the engineer to approve and adopt. In an Ontario case a surveyor's apprentice ran a line in one direction, although the surveyor himself had intended it to follow a somewhat different direction. The surveyor adopted the line as his own work, so reported it, and showed it on his plan. It was held that if the surveyor's employer approved of the line as run it was as binding as if the surveyor had run the line himself in accordance with his personal intention.(4)

Action of a subordinate engineer in undertaking to approve of work for which the approval of the chief engineer personally is required may be declared invalid. Thus, in an English case almost a century ago, it was shown that the erection of buildings over a tunnel would be permitted only if approved by the principal engineer himself, who happened to be the celebrated Isambard K. Brunel. The resident engineer had erroneously approved and the court declared that his action was not binding.(5)

Degree of Skill Required

Those who offer professional engineering services to the public must bring to their work a reasonable degree of care and skill, that is, the care and skill which would be exercised by the average person in the branch of the profession in which he practises.(22) In the absence of any special contract the law will demand no more of a practitioner than average care, learning, and skill. He may not be found deficient or negligent because others of greater experience or ability might have used a greater degree of care and skill, or that he himself might have used more of it. It is not required by the law that the engineer should impliedly undertake that the best available methods will be used, nor warrant perfection, any more than a lawyer will bind himself to win a case, or a physician to the curing of a patient.(6) There is, consequently, under usual circumstances, no implied representation by the engineer that the works designed by him can be executed according to his plans or specifications, or that when completed they will give the hoped-for results.

It is important to realize that not only is the engineer required to possess sufficient knowledge and skill to engage in his calling, but that he should not neglect to use the knowledge and skill so possessed. However great his personal attainments might be, they will be valueless unless they have been utilized in connection with the work.

The engineer may voluntarily enter into a special contract to render exceptional services or to ensure a specific result. He may, of course, decline to do so if he chooses. An instance of an undertaking requiring the achievement of a specified result under great difficulties was afforded in an English case of the eighties. A contractor had undertaken to cast hydraulic cylinders to resist a specified pressure to a pattern to be furnished by the purchaser, and in so doing to make sound cylinders. The undertaking proved to be too difficult and the cylinders cracked. It was held that the over-riding stipulation of the contract was that the cylinders were to be sound and they were not. Damages were assessed against the contractor for breach of contract.(7)

Duties to the Contractor

While there is ordinarily no contractual relation between the engineer and the contractor, the engineer nervertheless owes certain duties to the contractor. Although action against him can be brought directly only on the ground of fraud, collusion, or gross unfairness, the engineer may be subject to not a little discomfiture if the contractor has to sue the employer because of some neglect on the part of his engineer.

Typical duties owed the contractor by the engineer would be such ones as acquainting the contractor with all the relevant facts concerning the work to be done so that he may not be led into naming a price for the work that is too low; issuing instructions or directions promptly enough to obviate any delay in the prosecution of the work(43); issuing progress and final certificates within the time specified in the contract and for amounts that fairly represent the value of the work that has been done to date.

It is obvious, then, that the engineer's duties to the contractor consist chiefly of refraining from arbitrary, wilful, unfair, or fraudulent practices in the various roles that he plays as the employer's representative. He should particularly avoid any representation to the contractor that he possesses authority which in fact he does not, thereby leading the contractor into acts outside the scope of the contract.

Duties to the Public

Anyone offering his services to the public as a professional engineer is under obligation to be qualified by learning, skill, and experience in the practice or business in which he professes to act. Moreover, he undertakes to exercise such care and skill as he claims to possess in the conduct of his work. It needs scarcely to be said that he impliedly assures the public that his work will be performed with scrupulous honesty and faithfulness.

Engineers employed by public bodies are bound to conserve the public interest in so far as lies within their power. They may not in any way be financially interested in the contract. If so, they may be indicted under the common law for misconduct in office. Thus, an engineer whose employment in the public services required him to make use of tug boats was held to be properly indicted when he employed a tug belonging to himself, but officially registered in the name of another, even though his supervising officers were aware of the transaction.

Duties to the Profession

Under the various Provincial Acts governing the practice of the engineering profession in Canada, members are bound to observe a high standard of conduct, and on violation are subject to reprimand, censure, suspension, or expulsion. It is the duty of every professional person to know of the powers possessed by the organization to which he belongs and the obligations laid upon him as a condition of membership.

Rights of the Engineer

Definiteness of Appointment

The rights of the engineer under employment may be adequately secured by oral agreement, but it is much better to ask for a written one. This, of course, need not be in formal legal phraseology, but may consist merely of an exchange of letters confirming the terms upon which the employment is based and establishing mutual understanding concerning those terms. There are two instances under which contracts for employment must be in writing: (a) contracts not to be performed within a year, and (b) contracts with municipal corporations.

Engineers are often concerned with the second of these two cases. It is most important that the engineer undertaking employment by a municipal corporation should see that his engagement is in the form of a by-law, with the seal of the corporation attached and with the signatures of the legal signing officers. If this formality is not observed, the engineer may find that he is unable to collect his fees if the municipal council for any reason wishes to dispute them.

A notable case in point is one that arose in Toronto about thirty-five years ago. An accountant, on behalf of his firm, undertook at the request of the mayor of the city to prepare a financial report in connection with the proposed purchase by the city of the properties and business of the Toronto Railway Company and the Toronto Electric Light Company. No appointment by city by-law was made under seal of the corporation, as required by the Municipal Act of Ontario. The accountant did a part of the work and presented an interim report, which was printed on the order of the city council. His account for services was, however, not approved and lengthy litigation ensued, resulting in a final decision of the Judicial Committee of the Privy Council. That court of last resort held that the appellant could not maintain his action for the recovery of his fees in the absence of a city by-law.(8)

Rights to Fees

The amount of compensation that may be appropriately asked by an engineer will, of course, depend upon the nature and difficulty of the work to be undertaken and the skill and experience of the engineer himself. It also depends upon the level of charges previously made in the community by other engineers for like services. Whatever the charge is to be, it should be clearly set out in whatever agreement is made between the engineer and employer. If no fee or compensation is specified before the engineer begins his work, and disputes occur, the court will allow what it considers to be reasonable remuneration. Negligence in the performance of his duties will not necessarily deprive an engineer of the right to his fees, or of such portion of them as he deserves.(25) (44) He may lose all of them if he has exceeded the limit of cost set by the owner.(46).

Should an arbitrary revocation of the appointment be made by the employer without notice, the engineer may legally claim compensation for the work done while he still believed he held the appointment.(9)

If, for any reason, the services of an engineer are terminated before the work is completed, he has a right to demand payment on the basis of the work already done.(10)

The courts will usually imply that the engagement of an engineer is not terminated by the death of his employer; otherwise, great difficulty and confusion would arise.(11) The view is that where the engineer is retained to design and supervise the construction of works, his services will be required for the whole job and not only for a part of it. Under certain circumstances the death of an employer will terminate the engagement of the engineer.

Use of Knowledge and Experience Gained in Employment

In the absence of an express contract with his employer to the contrary, the engineer will not be restrained from using his knowledge and experience in the practice of his profession for the benefit of other employers. Thus, a chemical engineer undertook to solve for an employer certain problems concerning the commercial development of clay deposits. During his employment he worked out some processes which he refused to disclose to the employer, claiming to be entitled to royalties on them. It was held that while the employer was entitled to damages and to the information that had been withheld, the engineer should not be restrained from imparting his knowledge to others in the absence of an express contract. A professional man will not be prevented from using his knowledge and experience in the practice of his profession.(12)

In another case an employer sought to restrain an employee from disclosing information obtained in his service. It was held that since the engineer was not warned as to secrecy when he entered the employment in which he learned the process without difficulty, an injunction could not be granted to prevent him using knowledge that had thus become his own. The dishonest or surreptitious obtaining of knowledge would have placed him upon a different footing, but no obligation could be implied not to use knowledge honestly acquired.(13)

Custody of Plans and Drawings

In the absence of a special agreement, plans and drawings are to be regarded as the property of the person who pays for them. In a typical case it was held that even if there were a custom that the engineer should retain plans and drawings, such custom would be unreasonable.(14)

It is therefore clear that if the engineer wishes to retain his plans as instruments of service he must have it so stipulated in the contract.

Powers of the Engineer

Powers Under a Contract

The powers possessed by an engineer in connection with a construction or equipment contract should be expressly indicated in the contract. Their extent will depend upon the will of the owner or employer, whose agent he is in administering the contract. It is most important to see that any conditions which define, limit, or extend the usual authority of the engineer are clearly and definitely expressed, so that the engineer may not be in a position of going beyond the limits of his authority. If in a particular engagement the usual powers of the engineer have been reduced, special mention of this circumstance should be made in the contract. Otherwise, the contractor has a right to assume that the prevailing practice will hold. The courts are most particular to examine the exact wording of the contract in disputes concerning the powers of the engineer and make sure that in his supervision of the work he has not gone beyond the powers expressly granted to him in writing.

The validity of the usual contract provisions conferring power or authority on the engineer, as in the issue of binding certificates(25), has often been tested in the courts. The owner and the contractor may agree to give the engineer as much or as little power as they wish, and if they bind themselves to such an arrangement, the courts will not interfere, unless some violation of the law is involved.

It will, therefore, be useful here to consider instances in which the engineer has sought to exercise powers beyond those given in the contract between the contractor and the owner.

An engineer does not warrant, nor has he any implied authority to warrant, the strict correctness of his plans or estimates, or that the work as planned can be carried out, or that the temporary constructional works are practicable.(15) (16)

The engineer has no authority as the agent of the owner, and without his knowledge or consent, to promise the contractor that the conditions of the contract will be varied or waived.(17)

The engineer has no implied authority to order as extras such things as are omitted from the plans and specifications, but which nevertheless are obviously needed for the full completion of the work in accordance with the intent of the contract.(17)

The engineer may not dismiss the contractor if in so doing he undertakes to decide whether or not any wrongful act of the owner or himself has been done. He cannot "take advantage of his own wrong".(18)

The engineer cannot vary the whole scheme or allow the substitution of entirely different materials than those specified in the contract.(19)

Powers as a Public Official

As an official of a public body, and its technical representative, the engineer must observe strictly the requirements of the statutes or regulations governing the work of the particular department or service in which he is employed. He is not authorized to order on his own authority things that are not mentioned in the contract, and particularly so if such action is prohibited by statute.(20)

Under the contract system the engineer acting for a public body enjoys powers that are very much the same as those exercised by an engineer serving a private corporation or an individual in contract work. It is, however, most essential that he inform himself of the relation of the statutes and regulations to the work that he has in hand.

In the May Issue, the second instalment of this paper will outline the engineer's liabilities under the law. The list of references for the complete paper will appear at that time.

ELECTRICAL INSTALLATIONS in the C.N.E. GRANDSTAND, TORONTO

by

Karel R. Rybka, M.E.I.C.

Electrical Consulting Engineer, Toronto, Ont.

The Grandstand of the Canadian National Exhibition was built by the City of Toronto in 1947-48, on the site of the earlier grandstand that was destroyed by fire in 1946. The engineer's task was made more difficult by the conversion of the 25 cycle area of Ontario to 60 cycle being under discussion. The equipment was therefore planned so that the major or more expensive portions of the work could be used without costly alterations, if and when 60 cycle power were ever provided. The laminated wood roof rests on the bottom cord of trusses, and the leading edge of roof carries a "lighting and control cabin" of about 8 ft. height and 15 ft. depth, which extends the full length of the roof. Figure 1 is a general view of the grandstand.

Electrical Service

The bulk of the electrical system is served from the 4150 volt, 25 cycle underground hydro service network in the exhibition grounds. A transformer sub-station is placed in the grandstand building. It serves the grandstand and adjacent areas. In order to ease the installation of cables within the sub-station as well as between the sub-station, the nearby switchboard, large reactor banks and other equipment, and to safeguard these important cables and render them readily accessible, the space below floor was not backfilled, so these voids could be used as cable tunnels.

This paper outlines the electrical system of the new C.N.E. grandstand, and the many and varied services it renders. General and emergency lighting, as well as the special lighting facilities for stage and sportsfield, are described in turn. Other features discussed include control of incandescent lights, supply of direct current for arc lights, wiring for exhibition areas, and communication services.

Preliminary studies of requirements anticipated a power demand of 1200 kva. at 550 volt tension in and around building. This assumed "step-down" transformers. About 500 kva. would be required for the incandescent lights for colour and intensity effects, which must be served and controlled from one central point. These lights required a supply of approx. 120 volt. On the other hand, large direct current loads for arc lights, which require about 200 kw., had to be placed up to 600 ft. away from the centrally located switchboard. Provisions for driving heavy machinery exhibits were also needed. For these loads it was found advisable to provide 575-volt, 3-phase current, in order to reduce copper size and transmission losses.

The sub-station was therefore equipped with one 600 kva. transformer to supply 208/120-volt, 3-phase 4-wire lighting current, and one 600 kva. unit supplying 575-volt 3-phase current for motors, direct current rectifiers, and the like. The switchboard was subdivided to suit (Fig. 2). This switchboard contains air circuit breakers of 50,000 to 100,000 amp. interrupting capacity in the supply mains, and for feeders supplying very large single loads and standard "Nofuz" type circuit breakers of 5,000 to 20,000 amp. interrupting capacity for smaller loads.

General Lighting

The lighting provisions of the grandstand comprise five main sub-divisions:

(a) The interior general lighting
(b) The exterior general lighting
(c) The effect (colour) lighting of stage
(d) Emergency lighting
(e) The general lighting of sports field or stage.

Of these sections the general lighting of sportsfield or stage and the effect lighting may be considered complementary. The other three sub-divisions are complementary to each other.

Public spaces, such as dining rooms, main corridors, etc., are provided with direct lighting fixtures, flush in the ceilings. Exhibition space, storage, dressing rooms, kitchens and similar spaces are equipped with suspended, direct lighting fixtures. The general indoors lighting is supplemented by a large number of cold cathode (Neon) tube directional lights, and section indications; they consist of 3-foot long green arrows enclosing 6-in. high red letters, and are placed near ceiling of main corridor, and point to the respective seats. Exit lights are prominent and of unmistakable design.

The external general lighting starts with the roadways around

Fig. 2. The main switchboard.

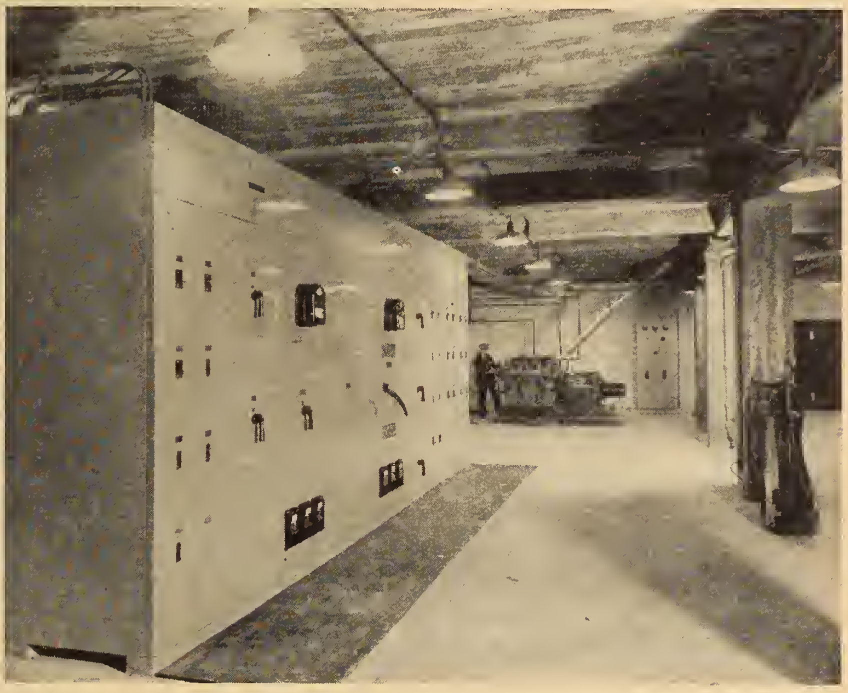
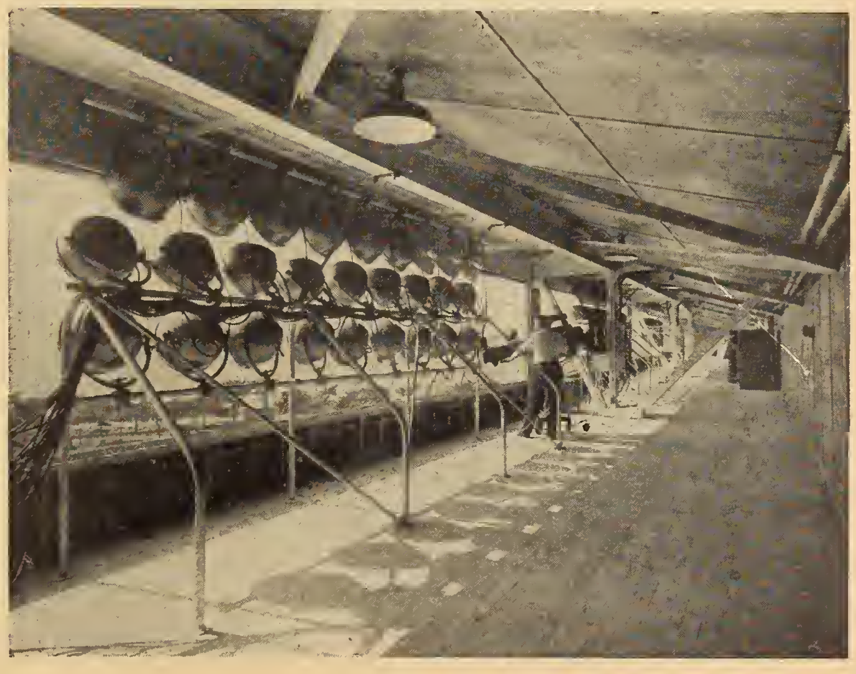


Fig. 3. Typical arrangement of 1500-watt lights. Note arc spotlight and rectifier in background.



the building. Octagonal cast iron standards were selected that harmonize with architectural treatment. These were placed about 90 feet apart and equipped with twin 500-watt luminaires, one of which is projected over the roadway, to approximate the new Toronto street lighting regulations. The immediate approaches to the building are accentuated by several concrete canopies, which are equipped with small flush mounted light panels on underside. Strips of coloured cold cathode (Neon) cove lights on canopies stress the architectural design of the building, while large "Neon" signs direct the traffic into and around the building. The general illumination of the seating space is supplied by 36 200-watt lighting units, flush mounted on underside of roof. They can be dimmed to an unobtrusive intensity during a spectacle.

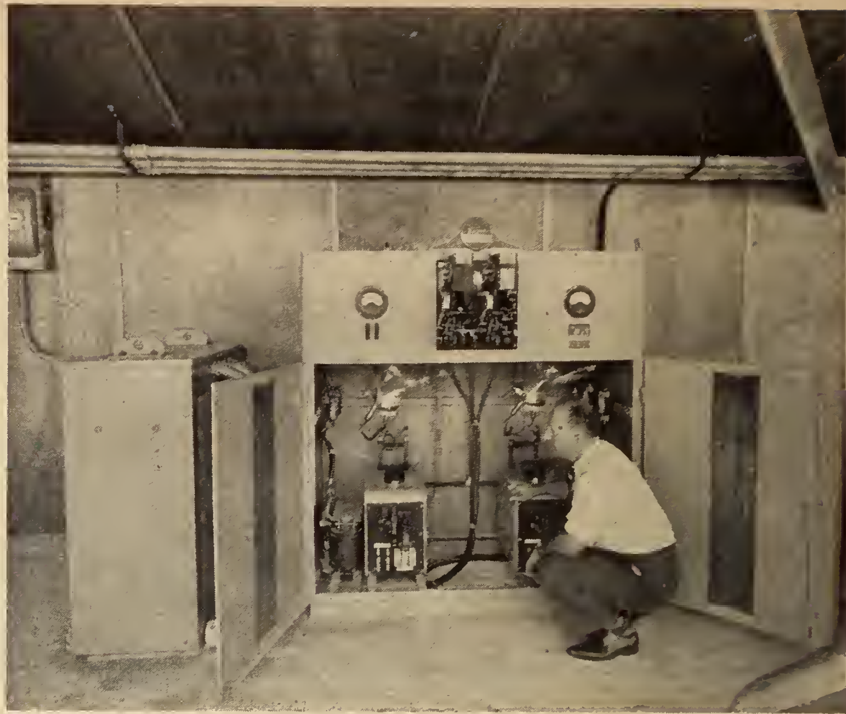
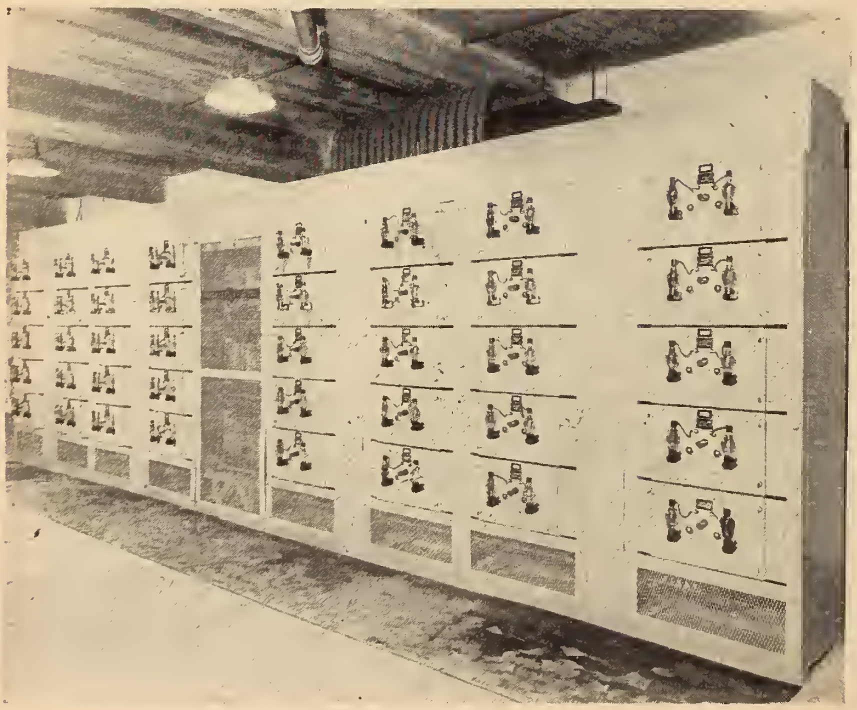


Fig. 4. D-c Rectifier assembly.

Emergency Lighting

A 50-kw. Diesel engine generator which delivers 60-cycle 208/120-volt current is provided (Fig. 2 background) and is operated at "no-load" during a performance. It is connected through a couple of transfer switches to feeders serving all lights over the seating area, exit lights and stairlights. In case of failure of regular power supply, these lights are automatically supplied from the generator at their full brightness, regardless of how much they were "dimmed" before. This arrangement was selected in preference to an engine generator that would start automatically in the event of a utilities power failure. There is, with automatic starting of an engine, always the inherent delay in power supply to lights, due to the required acceleration of the assembly to near full speed, which might cause unrest among the 25,000 spectators. There is also the chance of a delayed start of such equipment, that would accentuate the power interruption.

Fig. 5. Reactor frame — general view.



Lighting of Stage and Sportsfield

The bulk of the lighting equipment for stage and sportsfield is in the "lighting cabin" on the leading edge of the roof. This booth has a continuous shuttered "window" opening, behind which are several rows of lighting equipment and auxiliaries. It is divided by the trusses into 18 interconnected bays. Four bays in and near the centre contain a group of 48 3000-watt incandescent spotlights for highlights and special effects. One bay just west of the two centre bays is soundproofed, and sub-divided to house the broadcasting personnel. One bay to the other side is allotted to controls for lighting effects, and to the Press.

The outlying bays to either side house a total of 240 1500-watt spotlights for general stage lighting (Fig. 3). All spotlights are operated at 110 per cent of rated voltage as is customary in this type of service. This increases the light output of lamps by about 40 per cent and power demand by 16 per cent, but shortens lamp life to a third of normal expectancy, which, therefore for usual lamps would drop from 1000 to 300 hours. As the lighting equipment will be used on an average, less than a hundred hours each year, the lamps still will last several years. These groups of general lights are interspersed with 10 high capacity arc lights. All fixtures can be used clear or with colour screens for stage work, as well as for lighting of the sportsfield and track.

Preliminary computations indicated that, for a suggested desirable "vertical" light intensity of 200 foot candles on centre of stage and 100 foot candles on backgrounds and scenery, about 250 1500-watt lights would be required, even if only one colour were used. The plans called, however, for three "colours" and three pre-set groupings of lights usually called "scenes". Thus, on first study the above mentioned equipment seemed hopelessly inadequate, but it could not be exceeded unless an extremely heavy, expensive and uneconomical roof structure were provided to carry the increased weight. A careful analysis was therefore made of all the lighting equipment permissible to be set on the roof, and of inevitable additional lighting equipment at sides of the stage for crosslighting, as well as at rear for separate lighting of such features as cycloramas and special parts of scenery.

Control of Incandescent Floodlights

The incandescent floodlights are supplied from 13 three-phase 4-wire lighting distribution panels, each of which supplies on the average eight fuse protected, switched branches from each "phase". The panels are of special design, and one is placed in each bay of light control booth that contains floodlights. They contain "plug-in" connectors for the branches and flexible cords are taken from the connectors to the lighting units, which are mounted in two or three rows on heavy pipe framing.

A "phase" on a panel comprises one "circuit" whose brightness is controlled from the light console (Fig. 4) in lighting control booth. This is achieved by means of a saturable core reactor that, through change of direct current saturation of its iron core, alters the inductance in the alternating current supply to the panels which is coiled around the core. The small amount of direct current required for the different degrees of saturation is provided by electronic rectification, and this is remotely adjusted by a potentiometer coil on console through an electronic valve. The reactors and auxiliaries are very heavy, and are therefore located in switchboard room on ground floor (Fig. 5), thus, incidentally reducing the size and length of conductors to panels.

One such control unit is provided for each of the 39 lighting circuits, and one for control of the "house" lights over the seating area. Each control unit has, in addition two similar potentiometers that permit pre-setting the voltage in the circuit at desired values, and a black-out switch which shuts off supply to circuit. Transfer switches render one of the three potentiometers operative, leaving the others free to be manually re-adjusted. Each potentiometer of a unit control may be adjusted individually, thus proportioning the brightness of the lamps, in the diverse circuits for a desired effect.

This effect can then be retained but dimmed or brightened, by transfer of all the contributing unit controls onto a common potentiometer or master controller, which will increase or reduce all the preset degrees of reactor saturation in the desired ratio. In this installation three "colour-master" controls are provided, each controlling lamps on one of the three horizontal rows of lights that may have been transferred to them. Amber, red, green, blue or other colour filters are usually applied on rows of lights. Thus each colour is controllable as to intensity, either in small sections from the unit or in large groups from colour master. In addition four "group-masters" have been provided, which allow a similar over-riding control of groups of lights within given quarters of the length of the light booth. A "grand-master" controller permits simultaneous over-riding of the entire group of "colour masters" and "group-masters" by one controller. A "grand-finale" switch throws all lights that are not individually blacked-out, simultaneously to full brightness.

All or any of the first potentiometers of the units known as "first scene" can be collectively transferred or "faded" by means of another master controller to the corresponding second or third potentiometer settings or "scenes", or they can be simultaneously "blacked-out". This "fader" permits not only variation of a pre-set colour for lighting effect from its maximum intensity to "blackout" but also allows gradual merging of one effect or "scene" into another.

Direct Current Supply for Arc Lights

Apart from some low intensity arc lights in wings, which are separately supplied, the above mentioned 10 high capacity arc lights using 135 amp. at 60 volts, are used for special spot-lighting. They have been specially designed for the grandstand, and have an extremely wide range of operation, from remote points of sky and of ground to the stage apron and in size from an 18-in. diam. spot to 30-ft. diam. at 100-ft. range, when operated at 100 to 135 amperes. Superimposed, these 10 arcs would produce an intensity of over 2000 foot candles on the stage. It is this equipment that was particularly helpful in overcoming the computed deficiency of the general lighting.

Each pair of arc lights is fed from an adjacent glass-bulb mercury arc rectifier of 30 kw. direct current output. These rectifier assemblies contain a transformer designed to give the required 6-phase alternating current, and a rectifying mercury arc twin bulb assembly which contains also controls and starting equipment.

Although a small saving in first cost would have been possible through use of motor generator sets, the high efficiency and characteristics of the glass-bulb rectifiers, particularly the momentary overload capacity, and absence of moving parts, decided in their favour. Other types, such as selenium or copper oxide rectifiers, were dismissed as they change their operating characteristics with age.

Wiring for Exhibition Areas

In many of the ground floor areas concentrated light and power loads for illumination and operation of exhibits may be required. A twin grid of square, easily accessible metal duct was provided at ceiling of ground floor areas, in addition to the general lights. One duct contains wires of sufficient carrying capacity at lighting tension to supply an average additional lighting load of 20 watt per sq. ft. of floor, and the other sufficient to operate up to 250 hp. of motor at 550 volt in the exhibition area.

The kitchen equipment and catering provisions are supplied from this grid. Branches are brought down on columns and are terminated with copper bars enclosed in steel boxes for easy connecting of loads to equipment. Lighting wiring is extended to weatherproof boxes spaced at regular intervals, safely out of reach, on outside of building and along roof parapet, for lighting or driving of outdoor displays, signs, etc.

Communication System

Conduits and distributing centres for an extensive Bell Telephone service are provided from underground cable ducts into and throughout the building. Several groups of public telephone booths line the main corridor, and are also placed elsewhere in strategic locations. Telephones are also provided in ticket booths, kitchens, offices and other spaces. A dial type automatic private intercommunicating telephone system connects some of the service and operating spaces, such as ticket booths, management offices, kitchens, storage areas, switchboard and transformer room, light control booth and others.

An extensive network of conduits and outlets has been provided for public address systems. One of these services is for announcements, and has speakers on the outside of the building and over the seating area and inside. Part of this system is usually tied in with the stage microphones during pageants and spectacles. Another system connects the stage managers with lighting booth, switchboard, dressing rooms, lighting operators on roof, and in the wings and other points. Conduits have also been provided from the broadcasting booth to the Bell Telephone, and to the C.N. and C.P. telegraph ducts in grounds for broadcasting purposes. Broadcast features are then carried on the wires of one of these utilities systems to the stations.

The electrical department of the C.N.E. provides the miscellaneous broadcasting and public address systems and wiring as the occasion arises, and sufficient conduit and distribution points for easy installation of all required equipment for these occasional uses have been provided. The electric plant further includes a fire alarm system. Push button call stations are located throughout the building, which record the call on an annunciator panel at one of the main entrances, and simultaneously call the fire department. An automatic system of fire alarms is installed in the 700 ft. long by 90 ft. wide storage area, which is located over exhibition spaces. A connection to Dominion Electric Protection Company's watchman system has been included.

Acknowledgments

The grandstand was built by the City of Toronto for the Canadian National Exhibition. Marani & Morris were the architects; G. L. Wallace, M.E.I.C., and C. D. Carruthers, M.E.I.C., structural consulting engineers, and Karel R. Rybka, M.E.I.C., electrical consulting engineer. The Pigott Construction Company was general contractor, and the Canadian Comstock Company, electrical contractor. Special mention is deserved by the electrical department of the C.N.E., and specially its chief engineer, Fred Mayberry, M.E.I.C.

Planning and Luck

There are cyclic theories of sun spots and of business activity and of various other natural and artificial phenomena. Among the latter we may place the controversy over the merits and demerits of the metric system of measurements. Periodically, its proponents resurrect the campaign in its favour, and we are told how backward are those of us who persist in sticking to the illogical system of unrelated units which we have inherited from our ancestors.

One of the great advantages claimed for the metric system is the modulus of ten by which its various units are related. To many of us this seems about its only advantage. Another and much less apparent advantage often emphasized by metric "fans" is that the metre, from which all other units are derived, is a "natural" unit, being theoretically the ten-millionth part of the quadrant of the meridian which passes through Dunkirk and Formentera. The measurement of the length of this quadrant is now known to be about 4,000 feet too short, which means that the metre itself is about one part in nineteen hundred short and that there are too many metres in any given length. Really, then, the metre is no more a "scientific" standard than is our Imperial yard.

In fact, it can be shown that our yard is as truly such a standard as the metre. Estimates of the length of the earth's polar axis vary, but an acceptable value is 500,500,000 inches. If we wished to say that our inch should be 1/500,000,000 of the length of this polar axis, we should have to increase its length by one-tenth per cent, and the length of the yard would be about one-thirtieth inch greater than it is now. Similarly, the mile would have about five feet and three inches added to it, making it 5285.25 feet long.

Our new cubic foot would be 1.003 times the volume of our present one, and it would contain almost exactly 1000 ounces of water at standard temperature. The approximation is so close that the present ounce weight would have to be increased by only about 1/18 grain. The new cubic foot would contain exactly 100 half-pints.

It is merely accidental that the units derived from the length of three grains of barley placed end to end, turn out to be so closely related to a natural length. It may be argued that the length of the earth's polar axis will increase, as the rotation of the earth slows down, but that effect will not become noticeable for a few thousand years yet, by which time we shall probably have evolved other units anyway, as we become more or less civilized.

Arguments for the superiority of the metric system along these lines do not seem to stand the test of close examination very well. Traditional British muddling seems to have resulted in something quite as satisfactory on this score as was produced by equally traditional Gallic logic.

R. De L. F.

CANADA'S GREATEST PROBLEM

by

James S. Duncan, C.M.G.

President, Massey-Harris Co. Ltd., and Chairman of the Dollar-Sterling Trade Board.

An address presented before the annual meeting of the Canadian Construction Association at Montreal on January 18, 1950

Measuring the growth and importance of the construction industry, and outlining the dangers confronting not only that industry, but Canada's economy as a whole, the author traces the developments that brought about Britain's acute dollar shortage, and the steps taken to date in an attempt to overcome it.

Pointing out that the solution is a world problem and particularly a Canadian one, he discusses our nation's vulnerable trade position, and describes the functions of the Dollar Sterling Trade Board in strengthening Canada's export markets.

Enumerating some of the difficulties to be surmounted, he challenges the Construction Industry to display its customary leadership in reaching a solution through purchasing a greater proportion of equipment and material supplies from those who have always been the best customers for our Canadian products, that is, Britain and the Sterling Area.

Already an important factor in the economic life of Canada before the War, the construction industry has made great strides since the end of hostilities. The fact that the numbers presently employed on construction are about four times pre-war days is not only a fair measure of the progress which your industry has made, but of the dynamic upward march of our Canadian economy as a whole.

Your industry, including those who produce building materials, currently employs between 12 and 15 per cent of Canada's labour force, and during the postwar period, has been the greatest single field for the employment of new labour, both native-born Canadian and immigrant. The Canadian producers of builders' supplies have also set up records of achievement which should fill a Canadian heart with pride, with an increase from a gross value of material produced in Canada of $186 millions in 1938, to an estimated $1,000 millions in 1949. Your contribution to our export trade, upon which the prosperity of this Dominion depends, through the shipment abroad of building equipment and materials, places you high among the contributors to our national economy, and the backlog of urgently needed housing, of industrial, utility and engineering projects speaks well of the important role which you can be expected to play in the future.

It would be too much to expect, however, in this troubled postwar world, that all would be smooth sailing for the construction industry. Certain threatening clouds are gathering on the horizon, as you well know. I will mention but two of these, namely, the danger that costs will outrun the capacity to pay and, therefore, the effective demand of those who need your services, and the menace of a serious restriction in Canada's export trade as a whole, due principally to the lack of availability of dollars to purchase our goods — that export trade which still represents over 25 per cent of our national income, and upon which the prosperity of every Canadian, and thereby of the construction industry, so largely depends.

The problems facing your industry are the problems facing Canada as a whole. Much could be said about the danger of mounting costs to Canadian economy. A land which lives as largely as ours does by its exports is treading dangerous ground when its costs are getting out of line with those of other producers throughout the world. I cannot help viewing our position with serious concern in the face of the growing importance and increasing industrial recovery of low-cost producing countries such as Germany and Japan.

Britain's Shortage of Dollars

But I propose to deal today with the second of the two problems which I mentioned, one which has been lurking ominously in the background of our economic life ever since the end of the war. This is a problem which would have stood out in bold relief but for the fact that it has been obscured by temporary palliatives of loans, of gifts, of Marshall Aid, namely, the problem of our inability to continue to export to the Sterling area in our accustomed volume unless ways and means are worked out to enable these countries to earn the dollars with which to pay for them.

Let us consider what has brought

COAL IMPORTS

Fig. 1. Trimming coal in the hold of a vessel bound for Canada. British coal has fine qualities and is in demand all over the world.

about this state of affairs. There is nothing new in the fact that the United Kingdom is suffering from an adverse balance of trade. This has been the case ever since 1853. The important difference between then and now is that she financed the margin between what she sold and what she bought by her " invisible receipts ", namely, the income of the investment which the British in their wisdom, as the foremost creditor nation, had made throughout the world, plus the income from her shipping, insurance and other services. This invisible income, although slowly being built up again, has been greatly diminished as a result of the costs incurred and the losses entailed during two world wars. Broadly speaking, the United Kingdom will have to rely, in the future, upon the moneys which she earns from her exports to pay for her necessary imports.

It is well that we who have enjoyed the privilege of living in the comparative security of the North-American continent should recall some of the factors which have brought Britain to her present dilemma. Until 1914, she was not only the largest creditor nation, the centre of world finance, but her influence, backed up by the Royal Navy, made itself felt to the far corners of the earth.

Her understanding of the intricacies and the responsibility of her position as chief creditor nation of the world, her progressive and liberal policies, and her sense of justice and fair play vouchsafed for the world the longest era of peace, prosperity and progress ever known. But 1914 changed all of that. Britain emerged from that world conflict greatly weakened. During the uneasy years of peace which followed she was, however, able to maintain, if somewhat precariously, the equilibrium of her international trade.

Measure of Britain's Wartime Losses

It was in World War II that Britain assumed burdens beyond her strength to carry, but she did so with her eyes open and deliberately. She knew that to win, she had to throw everything she had into the balance, and she did so without hesitation. Her courage, industry, and initiative were not called into question then as they are by some today. We looked to her then to hold the fort for us all. Yet all this was but nine years ago. How short is the memory of man!

To finance this all-out effort, she spent of her substance and of her wealth which, she had accumulated abroad during the 19th Century, regardless of consequences. So long as the money held out, she bought her weapons of war on a cash-and-carry basis. Then she liquidated $1,712 million of her dollar investments to meet her ever-expanding requirements of food and ammunition from North America. But this was still not enough. During the tragic years that followed, she learned the true meaning of total war in a manner unknown to any other combatant, with the exception of Germany or perhaps Russia. Her industry was re-directed to war work to a point where her export trade was deliberately sacrificed. She emerged from the second world conflict victorious but sadly weakened. The re-orientation of her wartime industry to peacetime pursuits was laborious. Her export trade, which in prewar days represented approximately 16 per cent of her national income, had dwindled to less than 3 per cent, while Canada's export trade had risen from 26.5 per cent of national income to 36 per cent in 1944. The end of the war also found Britain owing $11 billions in the Sterling area alone, of which $6 billions had been spent in the defense of India and Egypt.

Measure of Britain's Post War Recovery

But let us see just what the United Kingdom has accomplished during recent years; her industrial production in volume is 30 per cent above prewar; her agricultural production in volume is 25 per cent above prewar; her exports in volume are 50 per cent above prewar; by carefully restraining imports, and by channeling production into export markets, she has nearly reached a general balance in her international trade expressed in sterling; she has gone far towards re-establishing prewar leadership of her Merchant Marine and shipbuilding industries; her invisible account. which as late as 1947 showed a deficit of £189 millions, showed a surplus of £103 millions in 1948; and her visible trade deficit in 1948 was £100 millions less than it was in 1938. If one appraises this performance against the backround of the difficulties which confronted Britain when, battered and weary, she emerged from the war, it will be seen that she has done well, indeed.

Where she failed, so far, is where other European countries have failed, namely, in her dollar transactions. Dependent as she is upon many dollar area commodities which are essential to her economic life, her inability to earn sufficient dollars to pay for them, even with Marshall Aid and Canadian assistance, is causing a strain upon her already seriously depleted gold and dollar reserves, which is alarming and constitutes a threat, not only to her dollar solvency but to her position as banker to the Sterling area.

Solution Particularly a Canadian Problem

These difficulties are common to the other Sterling area countries and to most of the countries of Continental Europe. This situation is not specifically a British problem; it is a United States problem, a world problem and particularly a Canadian problem. It can only be solved by the co-operative effort of the principal countries involved, in which the United Kingdom, the United States and Canada are among the most important.

One part of the solution rests with the highest levels of Government in this and other countries. It concerns such matters as the future disposal of the Sterling balances, the lowering of customs and other trade barriers on the North American continent, and the creation of incentives for Britain's export industry to sell in the dollar area. But the other part of the solution — and perhaps the more important of the two — rests with business leaders and citizens in the United Kingdom, in Canada and in the United States, and, therefore, with each one of us individually.

Let us look briefly at our own position. We are prosperous; 1949 has been a good year; employment has been the highest on record; our industries, our mining and our agriculture have all been actively engaged in their various tasks; new sources of wealth are being discovered — oil in Alberta, uranium in the Northwest, iron ore and titanium in Quebec and Labrador. There is much to be proud and optimistic about. Yet for those who probe below the surface of things, there is much also to be alarmed about. The weak link in our economy is our dependence upon external trade for close to one-third of our national income. There would be no danger in this if we were still living in a prosperous world, one of free convertibility and of multilateral trading — but we are not.

We are living in a world impoverished by war; in one where free convertibility of currencies no longer exists, one in which our historic customer, the United Kingdom, which in prewar days took approximately half of our exports, is threatened with dollar bankruptcy and has no alternative but to continue to restrict her purchases from us. In such a world our position of dependence on exports, not only for our prosperity, but for the very maintenance of our standard of living as we presently know it, is far from an enviable one.

Canada's Vulnerable Position

We have, so far, been spared the effects of these adverse factors for two main reasons; because our exports to the Sterling areas have been artificially maintained, by loans or by the operations of the Marshall Plan; and because our exports to the United States have been abnormally great. Now the continuance on their present scale of benefits arising from these two favourable factors is, to say the least, doubtful. Marshall Plan Aid comes to an end in 1952, and even before this happens, off-shore purchases in Canada by E.R.P. authorities may well be substantially curtailed.

On the other hand, it is surely unreasonable to expect, once production in the United States has caught up with consumption, that this country, whose economy parallels ours in so many respects, will continue to purchase from us in like quantities the exports of our western plains, our lumber, our metals, our canned fruits, or our manufactured products.

The vulnerability of our position comes from the fact that we might find ourselves faced simultaneously with a drastic reduction in our shipments to the Sterling area and a substantial shrinkage in our ship-

PAPER MACHINERY

Fig. 2. Canadian-made paper machinery awaiting shipment from Montreal to Tasmania.

ments to the United States. It is not a happy prospect, but it is one with which all thinking Canadians must reckon. It may be just around the corner, unless we do something about it quickly. That something, as I see it, is the good old-fashioned and homely remedy of buying from those who buy from us. In view of the Sterling area's present position, I can see no means of permanently bolstering up our export trade to them, our traditional customers, other than to help them earn the dollars necessary to purchase our goods by buying British goods from them.

In 1948, we purchased from the United States $1,800 millions worth of goods, but we only purchased $299 millions worth from the United Kingdom. On the other hand we shipped to the United States $1,500 millions worth of goods, and to the United Kingdom $720 millions. In other words, we have had to dip into our reserves of gold and United States dollars to the extent of over $600 millions to square our accounts with that country since V-J Day.

The Emergency Exchange Conservation Measures, which Canada took at the end of 1947, stopped and temporarily reversed this trend, but the potential threat still continues. On the other hand, our purchases from the United Kingdom were so small, proportionate to our sales, that Britain did not have dollars available to pay for the goods we shipped to her. She would have been obliged to reduce drastically her imports from us, had it not been for the Marshall Aid and the moneys which we loaned to her. Obviously ways and means must be found of bringing our commercial accounts into better balance, both with the United States and with the United Kingdom.

Dollar Sterling Trade Boards Function

It is to assist in this re-orientation of our imports, to avoid the drain on our own American dollar resources on the one hand, and to place in the hands of the Sterling area dollars with which they can purchase a larger proportion of our exportable surpluses, that the Dollar-Sterling Trade Board has come into existence. Its objectives are not sentimental ones. We have not come into being to hasten the recovery of the United Kingdom. We have been formed for the primary purpose of restoring and strengthening Canada's export markets, upon the maintenance of which not only our prosperity but our very way of life depends.

It is fairly obvious that one way of effecting some diversion of imports from the United States to the United Kingdom would be to recommend the broadening of the scope of the Exchange Conservation Act, but such measures of control are distasteful to the great majority of our people. They should only be resorted to when all other methods fail, and I believe strongly that when Canadians fully understand where their best interests lie, they can be counted upon to adopt the right course of action of their own volition, without coercion or regimentation. It is with this voluntary process that the Dollar-Sterling Trade Board is dealing. We are trying to do it in the Canadian way. If we are successful, no extension to the Emergency Exchange Conservation Act will be necessary. In due course, it is hoped this emergency measure will no longer be required.

How Construction Industry Can Help

Now, in this scheme of things the Canadian Construction Association has an important and vital role to play, and when I say to you that you are buying annually from the United States about eight times as much construction materials as you now buy from the United Kingdom, I believe you will agree that an improvement in this situation is not only overdue, but should be possible of attainment.

I will go further and say that if you succeeded in doing no more than restoring the ratio of your United Kingdom - United States purchases of building materials to what they were in 1938, you would be going a long way towards solving some of our difficulties. Today, your current construction goods imports from the United Kingdom in terms of volume are practically

CHINA FOR CANADA

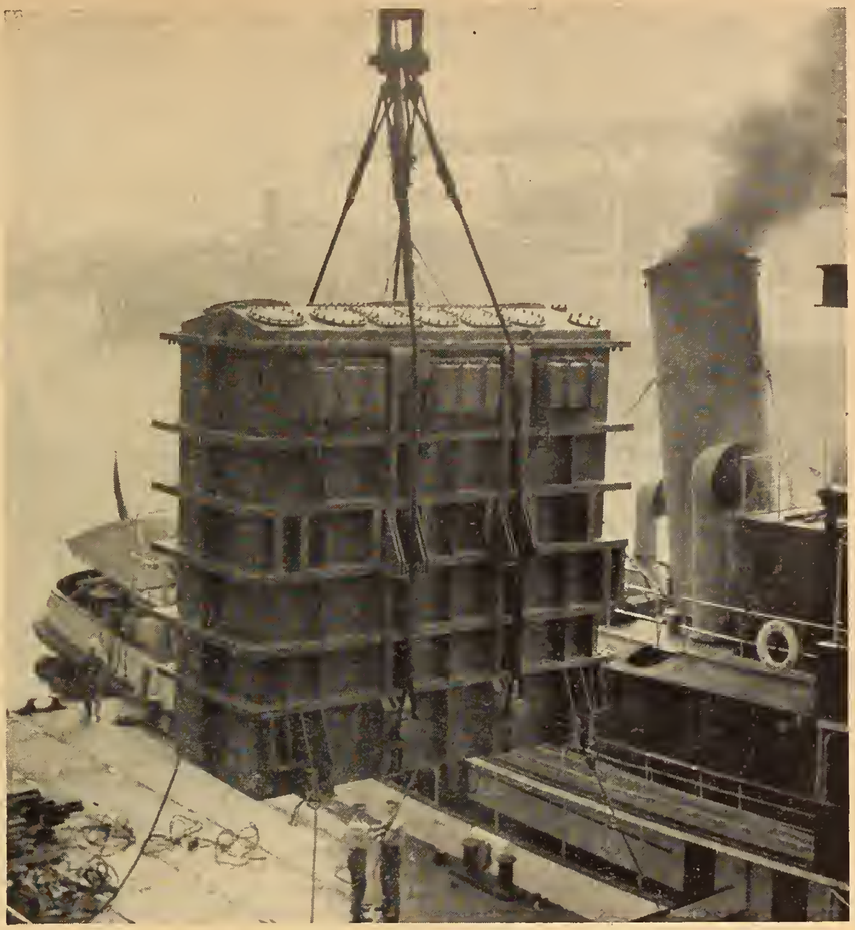
Fig. 3. The tradesman in this photograph is a "groundlayer". He coats the china with oil "size" and the color is dusted on to the oil. The ware is then fired.

unchanged from prewar times, but those imported from the United States have risen to 2½ times the prewar totals. If the Canadian Construction industry were to increase its imports from the United Kingdom by 2½ times prewar, this would be the equivalent of adding approximately $50 millions to our present imports, and this could be done by a decrease of only 1/6th of its present imports from the United States.

It does seem to me, therefore, that much could be done to increase your purchases of builders' materials from Britain. These only amount currently to $35 millions per annum, and I strongly believe that if the entire construction industry, contractors, supply houses, public utilities, institutions, architects, engineers and your Trade Union leaders made a concerted effort towards this end, you could expand your purchases from Britain to, at least, $85 millions annually. Moreover, I believe this could be accomplished, if well directed, without injury to Canadian producers.

From the great progress which your construction industry has made in Canada since the war, and because many of the products of the United Kingdom do not compete with the Canadian industry, I believe Canadian producers are strong enough to hold their own against all comers, and that any damage which may be done to them by imports from the United Kingdom will be more than compensated by the over-all advantages of improved exports to that country, with the resultant buoyancy of our economy. Moreover, the Canadian building material industry has a very large stake in our foreign trade, quite apart from its sensitive indirect reaction to Canada's exports of the products of its farms, its forests, its mines and its industry.

In order to assist you to orient your thinking along the lines of conversion from United States to United Kingdom imports, I am leaving with your President a Table of 19 items, which cover the bulk of Canada's imports of construction materials. The estimated diversions on this Table from present United States sources to United Kingdom total approximately $52 million. We do not suggest that this list is complete or necessarily accurate. It is submitted to you more as a basis of study, as something which may stimulate your thinking and in the hope that it may prove helpful.



BRITISH ELECTRICAL EQUIPMENT
Fig. 4. This huge British transformer, weighing over 77 tons, was unloaded in Montreal in September 1949.

Difficulties to be Surmounted

If all that was necessary to accomplish these import diversions was the willingness and co-operation of your own industry, I believe that I would be right in assuming that the battle was already won. But some of the difficulties which you will be up against are not only those surrounding Canada's willingness to buy supplies from Britain, but rather of our inability to obtain from that country many of the materials and commodities which we would welcome, and which so far have not been available to us because of the inflated and more profitable demand from the Sterling area countries and other valid reasons.

But let us not be discouraged; here also the situation in the United Kingdom is changing. Devaluation of the pound sterling has made the North American market more attractive, and with increasing encouragement from the Government, the Dollar Exports Board and other agencies, British industrialists have come to realize more fully that it is only by diverting a portion of their exports to the Dollar area countries, that effective progress towards the rehabilitation of the national economy can be made.

With that sense of public responsibility which is so characteristic of Britain, many are prepared to do so, even if it means, and it probably will, temporarily, at least, less profitable operations. You will, therefore, find the suppliers of materials more able and more willing to co-operate with Canadian demands than they were six months or a year ago, and more willing also to meet the peculiar requirements of our market in adapting their products to our Canadian tastes and specifications, and in ensuring that the essential replacement of parts and servicing will be readily available.

Changing your accustomed source of supply will be irksome. It will mean developing new con-

A BRITISH-BUILT SHIP FOR CANADA

Fig. 5. A fast cargo vessel photographed immediately after launching. It is an addition to the fleet of Canadian Pacific Steamships.

tacts, often maintaining higher inventories; it will be less convenient; sometimes, even, it may cost you money, but it will be worthwhile in the end. And let us not forget that in so doing, you will be working, not for Britain but for Canada and for yourselves. This country cannot prosper without its export markets, and your industry cannot prosper unless it operates within the framework of a prosperous Canada.

The problems affecting your industry are the problems of Canada as a whole. If this programme of partial diversion of imports from the United States to the United Kingdom meant discrimination against our great and generous neighbours to the South of us, I would be against it. But it means nothing of the sort. Canada's importations from the United States are so preponderant that a scaling-down of a mere 15 per cent of these, based on 1948 figures, would enable us to increase our imports from the United Kingdom by over 90 per cent, and would go a long way towards bringing both our trading accounts into a reasonable and desirable balance.

A Challenge to the Industry

So let us to the task with our accustomed energy and dedication, and may my last words be a challenge to the Canadian Construction Industry, which has done so much in the past to ensure the prosperity of this land, to show leadership once again in this problem of import diversion! Your example will be emulated by others.

This young and vigorous country of ours, so richly endowed by nature, can look forward to the future with an assurance perhaps unequalled by that of any other nation throughout the world today if she can but overcome the threat to her overseas exports and particularly to those in the Sterling area. I am confident, however, that with the energetic and intelligent co-operation of men and women of goodwill and understanding—and as I know my Canada, this will not be found wanting—this difficulty will also be overcome, and we shall move forward once again towards that great future which undoubtedly lies ahead of our nation. √

CANADIAN SHIP WITH CANADIAN GOODS

Fig. 6. The "S.S. Lake Nipigon", leaving Vancouver with 4,500 tons of fertilizer, 1,450 tons of sulphate, newsprint, and general cargo, and 2,000,000 f.b.m. of lumber, ties and piling.

PROPULSION & AUXILIARY MACHINERY in "WIND" CLASS ICE-BREAKERS

by

James A. Wasmund

Westinghouse Electric Corporation
East Pittsburgh, Pa.

A paper presented before a joint meeting of the American Institute of Electrical Engineers and The Engineering Institute of Canada, at Montreal, Que., on December 1, 1949.

Outlining some of the wartime exploits of this type of Ice Breaker, the author discusses the requirements to be met by design, and how the vessel operates.

Descriptions are given of the hull, power plant, power requirements, speed regulation, auxiliary power plant, "heeling" pumps and steering gear. In conclusion, statistics relating to production and disposal of "Wind" class vessels are given.

One of the many duties of the U.S. Coast Guard is to render assistance when necessary to all water-borne craft and to isolated communities in territorial waters. In order to fulfil these duties, ice-breaking ships with experienced crews are a necessary part of the coast guard fleet. These ships are urgently needed in time of war for protection of northern boundaries, and to assist Great Lakes vessels to deliver essential war materials, by extending the open season for shipping in fall and spring.

For example, a navy press release of December 14, 1944, reports, " Four coast guard cutters, operating in ice-packed Arctic waters, smashed a determined Nazi effort to establish fortified bases in Greenland. One German armed trawler was sunk another captured, a third found abandoned, 60 prisoners were taken, and a radio station was captured and destroyed ". The vessels " Eastwind " and " Southwind " were involved in this action.

The Chicago Tribune in January, 1945, reported that three Maritime Commission cargo ships had been brought to Chicago in a record breaking winter passage through the Soo Locks and Straits of Mackinac, for the final leg of their voyage down the Mississippi River to the Gulf of Mexico. The voyage was made possible by the new coast guard ice-breaker " Mackinaw ", which at times had to smash through more than a foot of solid ice and windrows of six or seven times that depth.

The original article stated that the Mackinaw was forced to make use of all its rated 10,000 shaft horsepower in making this trip. Probably the Mackinaw did use full power, but if she did, the convoy moved along at a speed of about 12-14 knots, because this is relatively puny ice for such a ship.

Design

Study and design for larger and more powerful ice-breakers had been under way in coast guard headquarters engineering long before, but the advent of World War II made their speedy procurement a matter of utmost importance. Studies of ice conditions convinced the designers that two types of vessel would provide most efficient operation.

Where the ice normally forms quite solid, but to a uniform thickness, a vessel having a forward screw is desirable; however, there are many operations where the ice forms in such thickness as to injure the bow propeller. The action of the bow propeller is that of a dredge in breaking up ice and moving it aft out of the way. It also creates a turbulence in the water, which assists the action of the bow. Stories have been told of pulling up to solid ice and chewing away, using the bow propeller as an ice shaver; however, this is certainly not recommended practice.

The "Wind" class vessels were designed with the bow propeller, but with provision for substituting a shaft tube cap for the propeller and shaft when necessary.

Since, it is impossible to break a passage through heavy polar ice floes, to negotiate such expanses a vessel must take advantage of open leads, or force floes apart by applying sufficient thrust to form a lead. Also, since these leads are winding in character, a vessel of short length and maximum manoeuvrability is required. The ship's hull must be extremely strong, and the installed power plant of sufficient power to force a lead.

Also, since the ship may be frozen in for long periods of time, and its voyages may be of such a nature that refueling is practically impossible, the power plant must be economical of fuel during long periods of full power operation, as well as during enforced idleness. The economy in space and fuel consumption offered by diesel-electric propelling machinery, together with its flexibility of operation, were deciding factors in its choice for this service.

The Hull

The "Wind" class ice-breaker has a length of 269 ft., beam of 63 ft. 6 in., draught of 25 ft. 9 in. at a displacement of 5,040 tons, and has 10,000 shaft horsepower available for distribution to three propellers, as will be explained later. The shell plating is of welded high tensile steel, which type of construction has performed exceedingly well in service. Little or no hull damage has been sustained from the rigorous service to which the vessels have been subjected, as compared to difficulties encountered with riveted hulls. The hull plating is 1⅝ in. thick at the waterline, and the welds required 22 passes.

The strength and shape of an ice-breaker hull are designed to obtain a balance between the weight of the ship and flare of all sections, so that the vessel will lift rather than be crushed. In addition, all ice-breakers are identified by their cut-away bows. The sloping forefoot serves as an inclined plane up which the bow slides when forced against an ice formation. The application of some of the vessel's weight by this method creates a bending moment on the ice formation, and some of the ice breaks from its inability to resist tension forces.

Power Plant

The propulsion power plant of the "Northwind" class ice-breakers consists of six 2,000 b.h.p. opposed-piston diesel engines, driving direct-current generators. When delivering full rated power the fuel consumption is less than 0.4 pounds per brake horsepower hour.

The engine generator sets are arranged in pairs in three engine rooms, separated by watertight bulkheads. Any combination of the three starboard generators can be connected to a starboard propulsion bus to supply power to the starboard stern motor, while any combination of the three port generators can be connected to the port stern motor. Either or both forward generators can be connected to supply power to the bow motor at the same time the remaining generators supply power to the stern motors. Thus the full 10,000 available shaft horsepower can be equally divided between the two stern propellers or equally between the three propellers.

Each of the six propulsion generators is designed for parallel operation and to produce 900 volts at its terminals at full speed. This is 50 per cent higher than the usual marine d.c. propulsion generator voltage, and 300 per cent higher than would be used in the more common series or loop circuit, where three generators apply power to one propulsion motor.

Parallel Operation Chosen

The decision to arrange the propulsion generators for parallel operation was arrived at only after careful study and consideration of the factors involved. The three engine rooms and three motor rooms are separated by watertight bulkheads, and the flooding of one of these compartments must result in loss of power of only that equipment contained in the damaged space. Since it is not desirable to bring cable runs through watertight compartments, the reduction in cable size, as well as the smaller generator commutators and brush rigging resulting from the use of higher voltage generators, were factors to be considered.

The power required to drive a propeller varies approximately with the third power of the propeller r.p.m. for a free-running vessel. Thus if the propeller speed is doubled, the propeller will require eight times as much power. Putting it another way, the vessel can be propelled at almost 80 per cent rated speed with only 50 per cent rated power.

Power Requirements

The power requirements will increase sharply if the speed of the vessel is retarded by ice-breaking or towing. If the propeller r.p.m. remains constant, the power requirements during ice-breaking will show an increase up to 100 per cent or more of the power required for free running.

The approximate power requirement of the stern motors as a function of motor r.p.m. is shown in Fig 1. The power required for a free-running vessel is represented by curve A, while the power required during maximum ice-breaking is represented by curve B. When running at 105 r.p.m., the motor output is 5,000 h.p. for maximum ice-breaking conditions, while the output is less than 2,000 h.p. for a free-running vessel. To utilize the available power from the engines, it is therefore necessary to speed up the motors by reducing the motor shunt field current. This current, as will be explained later, is placed under automatic regulation, so that the motors always absorb practically the full engine output.

When one or two generators only are used with each motor, the available power is reduced; but the generator voltage remains at 900 volts as long as the engines run at full speed. This is, of course, the only condition under which they can produce rated horsepower. With 900 volts impressed upon the motor armature, the minimum stern motor speed is 105 r.p.m.

At this speed, and maximum ice breaking conditions, the power requirement of each motor is 5,000 h.p., but only 3,300 h.p. with two engines, or 1,660 h.p. with one engine, is available. The engines are therefore overloaded, and a torque-limiting feature of the engine governor, which limits torque as a function of speed, reduces the engine speed. As a result, the generator voltage, and consequently the motor speed, are reduced and the motor load decreases. The speed will reduce to a point at which the propeller requirement equals the engine output.

This is indicated in Fig. 1 where lines for the available power at reduced speeds, for one or two generator operation, have been added. It will be noted that, under maximum ice-breaking conditions and with two engines in operation,

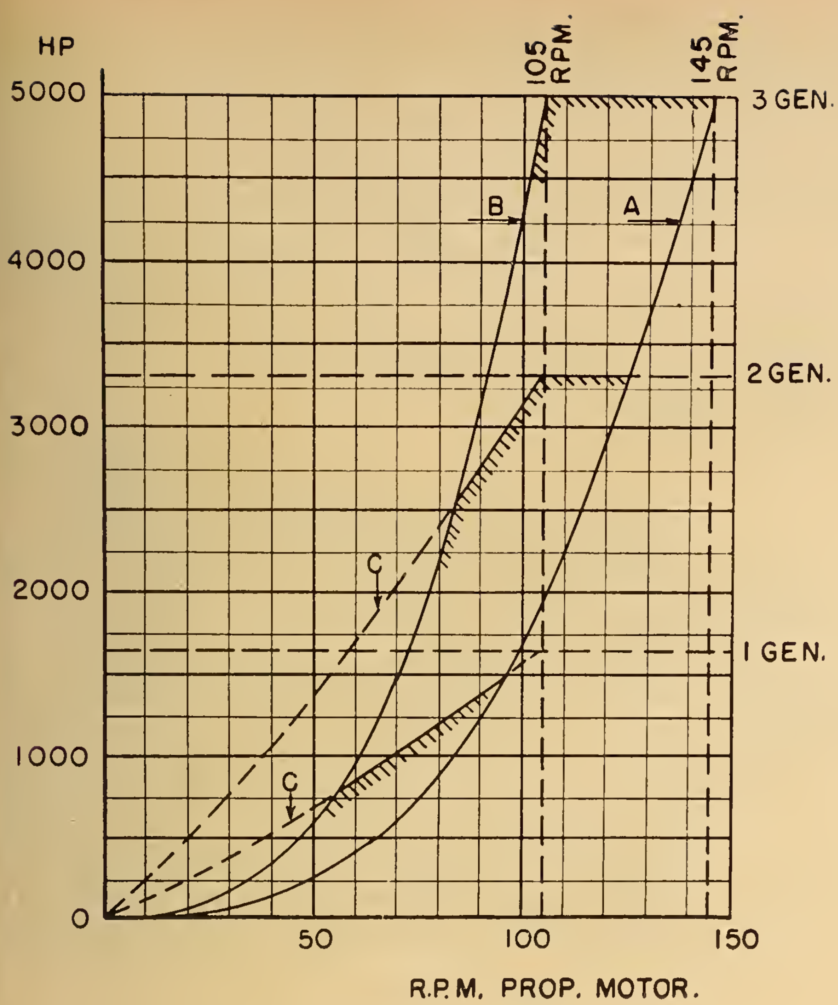


Fig. 1. Propeller power requirements.

A. Power required for a free running vessel.
B. Power required during maximum ice-breaking conditions.
C. Generator output at reduced engine speeds.

only 2,500 h.p. at 80 r.p.m. is available at the propeller, and with one engine, 800 h.p. at 55 r.p.m. It will also be noted that no engine speed reduction is required for two-engine operation, and very little reduction for one-engine operation when the vessel is running free.

The two 5,000 h.p. stern motors and the 3,300 h.p. bow motor are designed for 900 volts to match the generator bus voltage. They have a wide range of speed over which they are capable of supplying full rated horsepower, this range being 105/145 r.p.m. (38 per cent) for the stern motors, and 140/210 r.p.m. (50 per cent) for the bow motor. The constant horsepower rating is, of course, provided in order to utilize the maximum rating of the engines, whether operating free-running in open water or where the speed of the vessel is sharply retarded by operation in ice or by towing.

Speed Regulation

For normal operation the torque required for propulsion is controlled automatically by adjusting the speed of the propulsion motors, so that the torque-limiting feature of the engine governors will not ordinarily come into action. The electrically controlled torque follows a straight line, starting at 810 engine r.p.m. and ending with 60 per cent torque at 250 r.p.m. The torque regulator is of the "Silverstat type", provided with a current coil and a potential coil. The two coils are connected in such a manner that the ampere turns of the current coil, which is predominating, are opposed by the potential coil. The combined magnetic effect then acts on a spring-loaded contact arm, which causes resistance to be changed in the motor exciter shunt field circuit.

Thus an increase above rated value in motor armature current, or a decrease in applied voltage, will result in increased exciter field current and, consequently, in propulsion motor field current. The motor will therefore slow down and the load will decrease to normal. By proper control of the regulator contact arms, it is therefore possible to regulate the motor current to a desired value which depends on the number of generators in service and the momentary engine speed.

In general, speed of the propulsion motor is controlled by gradually raising the generator excitation to approximately 75 per cent of normal value, while the engines are running at idling speed and the motor is excited at minimum value. Higher speeds are obtained by raising the engine speed gradually from idling to normal r.p.m., while at the same time increasing the generator excitation from 75 per cent to normal value. During this period the motor responds to the current regulator, and automatically absorbs maximum available engine output at any speed and loading condition.

The governor setting and consequently the engine speed are controlled from the motor-room control boards, or from the operating stands on the bridge, by means of pneumatic devices. Low pressure air is supplied to master speed control transmitters on the speed controllers. The transmitters are actually pressure regulators which are connected to actuators mounted on the engines and connected to the governors. Several actuators can be controlled by one master transmitter, and the speed of the corresponding engines will be regulated simultaneously. Vernier transmitters on the motor control boards are used to balance minor differences in engine speed. The same speed controller which operates the master transmitter varies the generator exciter field current by means of a reversing rheostat.

Each motor is completely independent in its control. Each can be changed from full speed in one direction to full speed reverse in from 8 to 10 seconds. The controllers can be moved as rapidly as desired without injurious effects on the electrical machines.

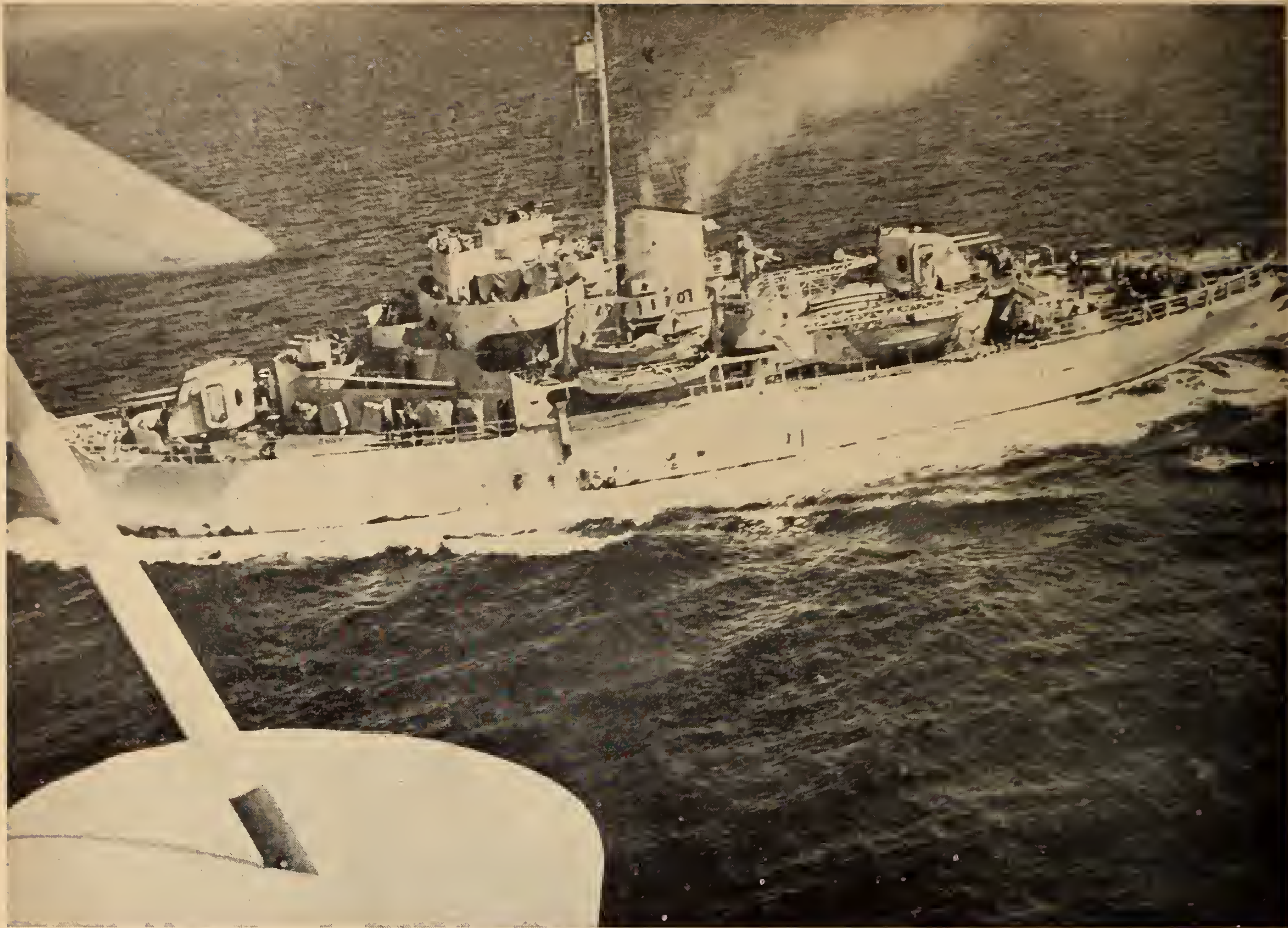


Fig. 2. U.S. Coast Guard Ice-breaker "Northwind".

Auxiliary Power

The auxiliary power plant on the ice-breakers is 60 cycle alternating current and is made up of four diesel-driven 250 k.v.a., 450 volt, 3 phase, 80 per cent power factor, 900 r.p.m. generators. Each generator is excited by a 4.2 k.w., 120 volt direct-connected exciter, except when supplying power to the heeling pump motors. Two auxiliary engine generator sets, together with a generator and distribution switchboard, are located in the forward engine room, with a duplicate plant in the after engine room. The sets are on the platform level, outboard of the propulsion engine-generator sets.

Excitation for the propulsion motors and generators, as well as for d-c control power, is obtained from three motor-generator sets; one such set is located in each motor room. When the bow motor is not in operation the bow exciter set serves as a standby unit, which can be selected for use with either the port or starboard machines. Each set consists of a 50 h.p., 440 volt, 1750 r.p.m., squirrel cage driving motor; a 15 k.w., 250 volt generator exciter; a 20.7 k.w., 300 volt motor exciter and a 2 k.w., 125 volt control power generator.

Manipulation of Water Ballast by Pumps

The transfer of 220 tons of sea water, between six wing ballast tanks through three 24-inch pipes, by reversible motor driven propeller-type pumps, was one of the interesting problems encountered in the design of the ice-breakers. The heeling motion, caused by the continual shift of ballast, is used to keep the hull plating continually moving, to prevent sticking by static friction while in contact with the ice.

Since the ship's service power is 3 phase alternating current, it was evident that it would be desirable to use squirrel-cage line-start induction motors for driving the pumps. However, the three 60 h.p. motors must be started simultaneously, and it was desired that this be done from one of the 250 k.v.a. auxiliary generators segregated to a special heeling pump bus.

It was quite evident from the start that the combined motor in-rush current would not permit "plugging" service during cycling operation. However, it was calculated that by "forcing" the generator field to approximately 2½ times normal during starting, and by introducing a time delay in re-energizing the motors in a reverse direction, operation with a single generator would be possible. The purpose of this was to permit water from a full tank to begin to flow in the direction of the empty tank and thus stop or reverse the action on the pump impeller. The normal exciter could not supply the over-excitation required; therefore, a special excitation motor-generator set was supplied with the heeling pump control equipment.

Operation of the heeling pumps can be by manual control, whereby the operator determines the time for reversal. Usually however, the control is set on "automatic" and the motors reverse at periodic intervals, the time being adjustable over considerable range. A total roll of about 10 deg. (5 deg. each side of vertical) can be obtained with the heeling equipment.

A similar system, involving the transfer of 110 tons of water from bow to stern tanks in approximately 3¼ minutes through a single 18-inch pipe, requiring the use of one 40 h.p. motor driven pump, is used for trimming the ship. The control system is somewhat more simple, however, because the motor can be line started directly from the auxiliary bus.

Steering Gear

The steering gear of the "wind" class vessels is of the electric-mechanical type. It was the first installation of direct drive with "Rototrol" variable-voltage control, and was designed specially for ice breaking purposes. Two separate systems of operation were provided; follow-up control for normal operation in open water, and non-follow-up when operating in ice. The latter system provides a locked rudder condition at any point without strain on the electrical equipment when power is not applied.

The steering gear quadrant is driven by either of two 50 h.p. motors, coupled to the same drive shaft, so that the motor which is not in use will run idle. Power for the motor which is in operation is supplied by one of two motor-generator sets as selected. Each motor-generator set is made up of four units: an alternating-current constant-speed driving motor; a three-field, variable-voltage main generator; a three-field, variable-voltage "Rototrol" generator for excitation of the main generator; and a small constant-voltage pilot generator for supplying energy to the control circuits.

The three fields of the main generator were designed to limit the maximum stalled motor current to 2½ times normal, in order to protect the motors and generators when operating in heavy ice, which may hinder or prevent movement of the rudder. The transmission from the quadrant to the tiller is by heavy springs, in order to absorb sudden shock instead of transmitting it to the steering gear.

Production and Disposal of "Wind" Class Ice Breakers

A total of seven of the "Wind" class vessels were built, plus one great lakes vessel which is powered with identical machinery, excepting that the propulsion motors are slightly higher in operating speed. The original "Northwind", the first vessel completed, was turned over to a Russian crew, under lend-lease, and renamed the "Severny Vetter", as soon as the builders trials were completed. Subsequently, two more of the original four vessels found their way to Russia.

We are now negotiating for their return; however, a few weeks ago, the Russians reported that they could not be returned because they were stuck in the ice. This may have some truth in it because, since the end of hostilities, we have consistently refused to supply spare parts for these ships. As soon as the first ship was assigned to Russia, an order was entered for a replacement. Later, the U.S. Navy ordered two ships, the "Edisto" and "Burton Island", these being the ships which accompanied Admiral Byrd on his recent Polar expedition.

The lake breaker, named the "Mackinaw", was built with a slightly greater beam and less draught than the ocean going ships. This was necessary because of the depth of the channels which the ship is required to negotiate. The propellers also had to be somewhat smaller, and therefore the motors were made higher in speed.

The home port of the "Mackinaw" is Cheboygan, Michigan. In order to reach the mooring dock it is necessary to negotiate a rather narrow passage several miles in length. A turning basin has been constructed at the end of the passage to enable the ship to turn around for the trip out. During the winter months, however, practically the entire population of Cheboygan build fishing huts on the turning basin; therefore, in order to maintain public relations, the "Mackinaw" is forced to break a passage to the dock, back out through the passage, turn around and back in again.

In addition, there are several islands in this neighborhood where a handful of people live the year around. In the winter these people use the ice as a highway to the mainland. Therefore, even on emergency calls, the Mackinaw is forced to detour considerable distances to avoid dropping some of the citizens into the lake—which all goes to prove that limitations imposed are not always of an engineering nature. √

THE ENCLOSURE AND RECLAMATION OF THE DUTCH ZUIDERZEE

by

Johannes Wartena

Civil Engineer, Westmount, Que.

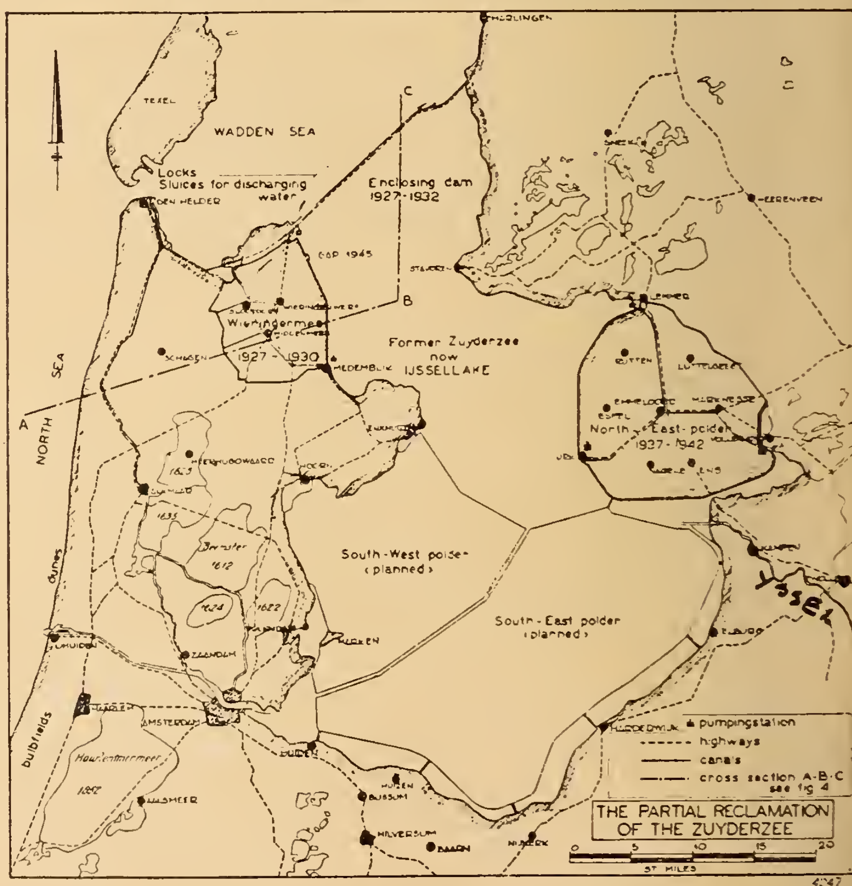
Reclamation of land is nothing new to the Netherlands. During the Middle Ages the land above low tide was drained by discharging the water during periods of low tide. And since the invention of a revolving cap for the windmill in the beginning of the 17th century, making it possible to use wind coming from any direction, whole lakes and parts of the sea could be changed to useful agricultural land. In those days the first plans for the draining of the Zuiderzee originated.

But first a technique had to be developed. The invention of the steam engine at the end of the 18th century made pumps more efficient and independent of wind. The large Haarlemmermeer was drained in 1852. Improvement of dredging machines and conveyor methods, new ways of using steel and concrete, and modern administration made it possible to attack the Zuiderzee. After a serious struggle in the economical and political fields, and a long and thorough study of the hydraulic and agricultural aspects, Parliament ratified the Bill authorizing the Zuiderzee works in 1918.

Building a polder (a piece of land protected by dikes against high water) is a long, tough job. It consists of building a dike through the shallow water of the sea, the construction of locks and pumping stations in these dikes, draining the polder by digging canals and ditches, and finally the construction of the bridges, roads, villages, farms, etc.

The bottom of the Zuiderzee is mostly clay, covered by water to a mean depth about 12-15 feet. Several plans had been made since the 17th century to reclaim it wholly or in part. The growing rural population of the Netherlands needed more land for cultivation, to avoid excessive subdivision of land already available, and to reduce Dutch imports of food. Disastrous inundations during a

Fig. 1. Large scale general view of reclamation work.



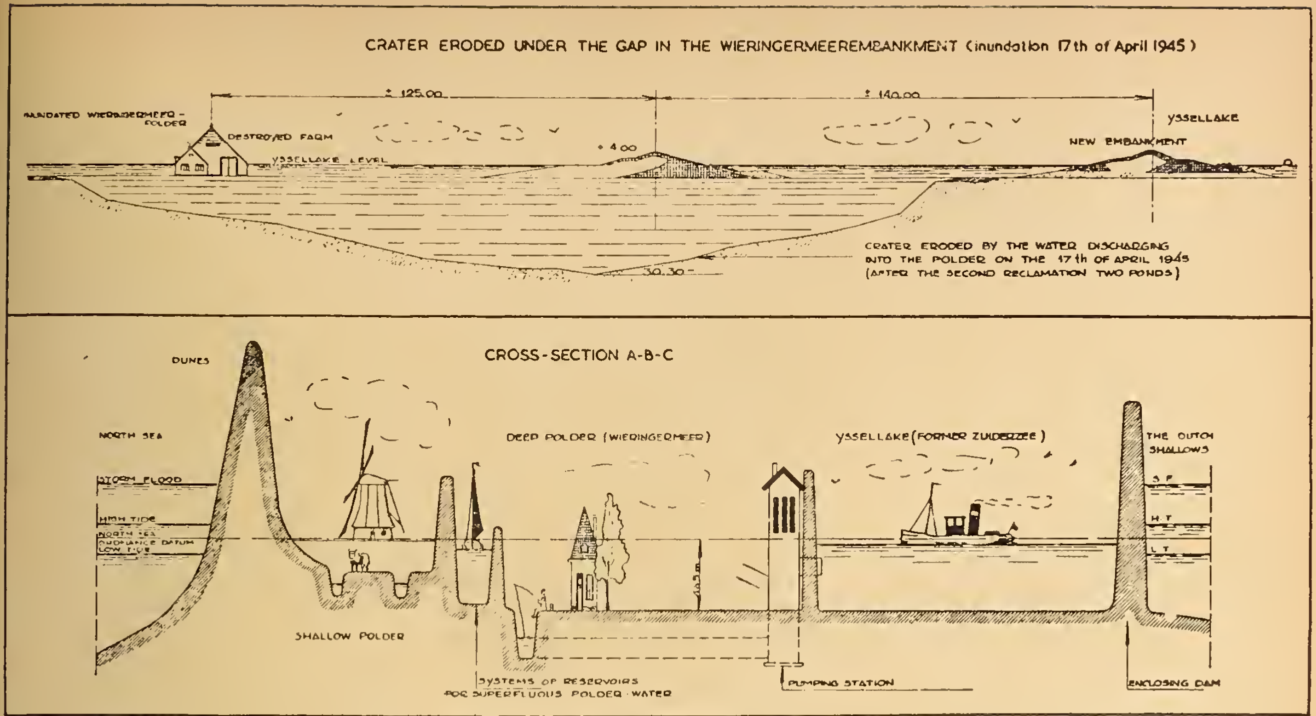


Fig. 2. Profile of the Polder.

storm tide in 1916, and the war-time shortage of food, were the main incentives for the adoption of the final project in 1918, making true once more the saying: "God created the world, except Holland, Holland was created by the Dutch themselves".

Scope of the Zuiderzee Project

The project included: (a) Enclosing the Zuiderzee by making a dam 25 miles long between the coasts of Friesland and Noord Holland, by which the Zuiderzee would become a large inland lake, called Ysselmeer (Yssel-lake), and (b) Draining 550,000 acres, which were to consist of four polders. First, the North West Polder (Wieringermeerpolder) of 50,000 acres, then the North East Polder of 120,000 acres (which in the meantime has also been drained), and lastly the South West and South East Polders, together containing 380,000 acres.

The enclosing dam was constructed for the following reasons:

1. Building a dike in the open sea with tidal action is more difficult and expensive than in still water, so that the dikes of the four polders could be built lower inside the dam than they could have been without the dam.

2. The river Yssel has its mouth in the Zuiderzee, and carries fresh water. In the enclosing dam are sluices which discharge water out of the Yssel-lake into the open sea. The result is that, after some years, the Yssel-lake contains only fresh water. This fresh water counteracts the influence of the salt in the future land at the bottom of the lake, so that agricultural production can start at once after drainage.

3. This fresh water lake in the heart of the Netherlands is most important for the irrigation of the surrounding country during dry summer.

4. The dam protects the old dikes, and reduces maintenance costs.

5. The dam provides a short route for the highway between Noord Holland and Friesland.

For these reasons the cost of the enclosing dam which stands at some 200,000,000 guilders including interest charges and maintenance, will not be charged to the account of the new polders.

An important material for the construction of this dam was boulderclay, a very tough, hard and unfertile glacial deposit. After dumping material for raising two small dams to above sea level, the space between these small dams was filled up with sand and covered with stones, clay and grass. This boulderclay was dredged from the sites of the future polders.

The construction of a dam in the open sea had never been attempted before, and was a difficult experiment. It took from 1927 until 1932 to construct the dam, the locks, the discharging sluices, the highway, and, of course, the bicycle-road.

The Wieringermeerpolder (N-W-Polder)

In 1930, two years before the enclosing dam was finished, the 50,000 acre North West Polder was freed of salt water. Two pumping stations pumped the 45 billion gallons out of the polder within 6½ months. The problems to be solved next were then desalting of the soil, laying out of canals and ditches for drainage and navigation, projecting the roads, and planning the villages, farmhouses and barns. Standardization of the buildings made it possible to complete the three villages in 1931, 1932 and 1935 and the 512 farmhouses in 1942. On agricultural, engineering, architectural and administrative matters many problems had to be solved. The North West Polder was, we might say, an experimental laboratory for all the succeeding work.

War Damage and Restoration

On April 17, 1945, the Germans allowed the inhabitants of this North West polder only eight hours to leave their homes before they blew up the dike. Then the water, which stood 11 feet deep outside the dike, rushed through the gaps, destroying everything that had been built up so carefully over the past 15 years. In May, 1945, the Germans capitulated, and early in August of that year the dike around the gap was closed, and the pumps started again.

By December, 1945, when the area was pumped down to the original low water level, it was found that the three villages were completely wiped out and 40 per cent of the farms had been destroyed. Agriculture was dead and the ditches were silted up. Fortunately the Yssel-lake was fresh, so that drained soil could be put into cultivation at once after repairing the drainage system. 1946 gave a nearly normal harvest. Reconstruction of buildings was retarded by the serious shortage of materials, but by January 1st, 1949, a quarter of the farms and nearly half of the buildings were reconstructed, while about 85 per cent of the population had returned.

The Noord-Oost-Polder

This area, surrounded by a dike 43 miles long, contains 36 million cubic yards of material, compared with the 10 million cubic yard concrete and the 20 million cubic yard excavation of the Grand-Coulee dam in the United States. The construction of the dike took nearly 5 years (1936-1940). In April, 1942, 175 billion gallons of water were pumped out. Navigation canals, dredged under water before the draining of the polder are 60 miles in length. Primary ditches for irrigation have a total length of some 200 miles. They are 60 feet wide at the waterline. There are 1,000 miles of secondary ditches (width 13 ft. depth 5 ft.) as well as 10,000 miles of drainage ditches. This is 2½ times the length of the U.S.A.-Canadian border.

Sixty bridges were constructed, as well as 4 locks and 3 pumping stations to keep the water on two different levels. 300 miles of road were laid out. The future population of the area inside this polder is expected to reach thirty to forty thousand people. War, coupled with the lack of skilled labour, as well as the shortage of food and materials, slowed down the progress of the works. Books could be written about the 5,000 men including lawyers, doctors, students, and soldiers, many of whom were wanted by the Germans, all working with hand tools, and about the crews of allied planes coming down in the N. E. polder, after being hit during their raids on Germany and how they mysteriously disappeared on their long and dangerous journey to England.

Land is Precious in the Netherlands

The Dutch nation has been very busy recovering from the wounds of the war, but soon there will be a start on the two remaining polders. When completed there will be an increase of 10 per cent in farm land, the conditions of the surrounding land will be improved and the reclaimed land will provide employment for 300,000 people.

It must seem strange, especially to Canadians, that Holland takes so much trouble in reclaiming these 550,000 acres, but the tremendous differences between the Canadian and Netherland countries must not be overlooked. Canada is 300 times the area of the Netherlands, while density of the Netherlands population is almost 250 times what it is in Canada. The lack of natural resources forces the Netherlands to import all the raw materials for its industries and consequently agriculture is a stabilizing factor for its economy.

On the spot where the last gap in the dam was closed in 1932, a monument has been erected. On it is written the following inscription:

"A living nation builds for its future". √

Technical Writing

*An Easily Acquired Skill**

by

John A. Miller

General Engineering and Consulting Laboratory,
General Electric Co., Schenectady, N.Y.

Many engineers, discouraged by a feeling that learning to do good technical writing is a herculean task, permit themselves to be satisfied with writing of admittedly inferior quality or, worse yet, do not write at all. To dispel some common misconceptions regarding the difficulties of learning good writing the author reviews certain fundamentals which, if properly applied, should promote better writing.

Criticism of the writing ability of the average engineer is heard nearly as often as criticism of the weather. But in neither instance is anybody doing much about it. Some people say that nothing can be done about engineers' writing, that skill at writing is a gift from heaven, and you are either born with it, or born without it. Others say that skill at writing is not particularly desirable, or at least not very important, and there is no need to do anything about it. Before accepting either of these views, let us examine the evidence. Maybe technical writing ability is of real value, and maybe something can be done about developing it.

Those who say that the average engineer can get along well enough without writing ability often contradict their own theory when they undertake to explain what they mean. What they consider unimportant is found to be *fancy* writing rather than *good* writing. Though these critics place a low valuation on writing ability, they still want what is written to be clear, concise and easy to read. And that certainly requires a certain amount of skill at writing.

Does Good Writing Require Training?

Remarks recently made by a nationally prominent business executive illustrate this clearly. Deploring the idea of including more English composition in college engineering courses, he contended that " Literary composition is a pretty unimportant matter in good technical reports." All that is needed, he claims, is that the reports should say what they really have to say in the clearest and briefest possible manner. For that he believes no particular training is needed.

Ideas presented here by the author are based on considerable writing experience. He has written a substantial number of technical papers and articles, one of which received an award from A.S.C.E. and another an award from the Society of Americal Military Engineers. Many of his papers have been accepted and published by various engineering and industrial publications. His books are "Men and Volts at War—The Story of General Electric in World War II" (1947), "Fares Please!—From Horse Cars to Streamliners" (1941), and "Master Builders of Sixty Centuries" (1938). Experience as an editor of the McGraw-Hill Co. for some years, and more recently in handling publicity for the General Engineering and Consulting Laboratory of the General Electric Co., has prompted him to outline a procedure by which the average engineer can improve his writing.

" Young college graduates," he continues, " can express themselves well enough to conduct their personal affairs in a rather complicated world, or they never would have emerged from college." Because many a young graduate understands football and can describe a football game orally " with enthusiastic clarity and fluency," this executive reasons that anyone who understands his subject should be able to do good technical writing.

It would be interesting to record on a dictaphone the average young college graduate's description of the football game, and then have it put on paper for someone who had not been present at the oral presentation. That the written version would demonstrate the talker's enthusiasm seems very likely. That it would describe the game clearly and fluently is, to say the least, questionable. Actually the conditions surrounding an oral presentation are such that we overlook defects that would be glaringly apparent in a written presentation.

Knowledge of Subject Is Not Enongh

Many years of experience in reviewing technical papers and articles have convinced the present writer that knowledge of the subject is by no means all that is essential for good technical writing. Knowledge of the subject is the beginning. Without it the writer is defeated before he starts to write. But that alone is not enough. The technical writer must know also how to put his knowledge into words — in the simplest and clearest possible words, and in the smallest possible number of them.

Perhaps an analogy can be drawn from the problem of painting a barn. Everyone knows that barns must be painted from time to time. That is a purely practical matter. Since the building to be painted is a barn we can dispense with the services of an artist to select a colour scheme, but we still need someone who knows something about painting. He need not be a professional painter but he must know what kind of paint to

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use under the existing conditions and how to apply it so that it will not blister or peel in a short time. Everyone will agree that technical reports, papers and articles must be written from time to time. For that kind of writing there is no need for a literary artist, but there is need for someone who knows what words to use and how to put them together.

Anyone Can Learn Technical Writing

Granting, then, that some knowledge of how to write is of real value to the engineer, the question is what can be done to develop it. The people who say that writing ability is a special gift from heaven take a too gloomy view of the situation. Some special gift may be needed to become a Shakespeare or a Mark Twain, but none is required for engineers' reports, papers for engineering societies and articles for technical magazines. Any informed and intelligent person can write them acceptably if he learns the proper procedure and follows it.

Whether or not our engineering schools should devote more time to instruction in technical writing is a subject too complex for discussion here. Much could be said in favour of it. At the same time there are some very real difficulties in the way. In any event there are thousands of young engineers already graduated who could benefit by a serious attempt to develop their writing ability. So let us consider what can be done independently of the college curriculum.

Contrary to a prevalent idea, the development of technical writing ability is not a difficult matter. Experienced editors and publishers can cite instances by the hundreds where young men without any unusual gifts have become good technical writers by applying themselves conscientiously to the job. If they have done this, others can do it.

Learning the proper procedure and acquiring facility at it are a good deal like learning to play golf. You can buy a book or take a correspondence course on the subject. We have all seen advertisements of these kinds of instruction. No doubt you can learn something that way, but it's hard to work up much enthusiasm through such impersonal exercise. You can take personal lessons from a professional. That is more fun, but involves following a rather rigid schedule which is not always convenient. Or you can learn casually by getting a little advice here or there, and practising by yourself. That easy procedure for acquiring writing ability will serve very satisfactorily to meet the needs of the average engineer. It doesn't take much effort — but it does take some. Doing what comes naturally is not quite enough to accomplish the purpose.

Probably the most important step in the development of technical writing ability is to cultivate the habit of putting yourself in the position of the reader of what you write. Try to build up a picture of that reader — who he is, what his interests are, what he already knows about the subject you intend to discuss, and what more he wants to know. Then, as you write, ask yourself what questions will arise in the mind of the reader and whether you are answering them. When you can honestly say that you have visualized the reader, have put yourself in his place, and replied to all the reasonable questions you think he will want answered, you will have assembled the basic material for a good paper or technical article.

Two Ways of Organizing Material

The next step is to organize the material. Some authors like to prepare a comprehensive organization plan before starting to write. Others find it easier to put down on paper all that they have to say and then shuffle the elements around into the most logical order. For most purposes the latter method is somewhat easier. The biggest hurdle in writing a technical article is getting something down on paper, and it's not a bad idea to get over the biggest hurdle right at the start.

Writing without a detailed plan leads to a job of rearrangement after the writer has made up his mind what his plan ought to be. But you can hardly avoid rearrangement no matter how you tackle the problem, unless you have had a great deal of experience. Any comprehensive plan drawn up in advance of writing is likely to prove unsatisfactory as the job progresses and to require modification later. So rearrangement is inevitable at some point in the proceedings, and there are many advantages in direct action — getting essentials down on paper first.

From then on the job is one of polishing. That sounds easier than it really is. Polishing is just as important in writing a technical article as it is in making a roller bearing. A smooth finish is essential for the frictionless functioning of the machinery. You don't want creaking of the machinery in a manufacturing process or in a technical discussion.

On the other hand you don't need to carry the polishing process to a silly extreme. A split infinitive, or a preposition at the end of a sentence, is not necessarily the awful sin the purists would have us believe. When a critic of this kind attempted to correct Winston Churchill for using a preposition at the end of a sentence, the latter scribbled boldly over the suggested change, "This is nonsense up with which I will not put!"

Extensive Vocabulary Not Required

In a written paper the first thing to be polished is the wording. An extremely extensive vocabulary is not needed, but the author must be sure he knows the exact meaning of all the words he uses. The need for that might be thought to be so obvious as to deserve no mention. Actually a good many authors use words that do not mean quite what they intend to say. Take, for example, the word "unique." This has the very simple meaning of having no counterpart, yet many writers use it as though it had no more significance than "unusual." Misuse of a single word may not confuse the reader seriously, but the greater the number of words that are carelessly used, the more hazy is the general impression created in the mind of the reader.

Of importance equal to that of the author's understanding of the meaning of his words is the readers' understanding. This is something that engineers are prone to neglect. The trouble is not so much their use of obscure words, though there is some tendency in that direction, but in the use of an ordinary word in some specialized sense. Thus an automotive engineer, when he speaks of a "job," means a vehicle, while the electrical engineer takes the word to mean the performance of a certain amount of work. On the other hand, the electrical engineer says "jack" when he means a receptacle with connection to electric circuits, while the automotive engineer thinks of it as a device for lifting a heavy weight.

This kind of confusion is avoided if the author keeps always in mind the character of the reader.

(Continued on page 282)

Notes on the Design of Drops for Erodible Channels

by

T. Blench, M.E.I.C.

Associate Professor of Civil Engineering, University of Alberta

A " spreading floor " would seem to be a logical application of the principles of non-scouring drop design. Its object is to induce spreading in the hypercritical (or shooting) stage of flow which is associated with acceleration and therefore stability. Conventional design aims at spreading in the subcritical (or tranquil) stage which is associated with deceleration and therefore instability.

When a drop is flumed, this latter design is notorious for downstream jetting and deep scour. Subcritical divergence usually fails to occur in spite of the diverging walls provided by the designer.

The origin of the spreading floor appears to have been in India in 1934. A discussion of its principles under the title " Design of Canal Falls (Preliminary) " appeared in a publication of the West Punjab Irrigation Research Institute (Vol. II, No. 26, 1948.), and has been summarized in Appendix 20 of the report of the International Association for Hydraulic Structures Research, 1948.

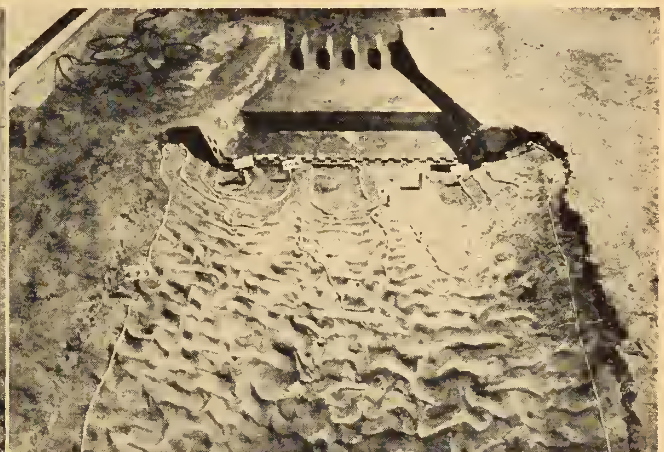
Figure 1, shows a model of an old-fashioned 900 cusec canal drop in an erodible channel of regime depth about 5 feet. The indicated scour below channel bed is 17 feet, agreeing with the prototype. In this drop, the flow would emerge parallel-sided from the throat and, because the fall is slight, would continue approximately parallel-sided along one or other wall of the divergence until the hydraulic jump formed. After the jump, it would not spread to fit the 1:5 divergence of the walls because the deceleration implied by such a spread is inconsistent with stability. It would continue as a jet along one wall and cause the scour observed.

In Figure 2, a spreading floor has been introduced at the throat elevation. The flow emerging from the throat would collapse on this floor and spread readily because, in so doing it would be accelerating. This flow would be hypercritical and, at the end of the spreading floor, would be at almost uniform depth and at nearly undisturbed channel width. The hydraulic jump would then require a minimum of downstream depth for its formation, with consequent inexpensive cistern design. The scour indicated by the model (Figure 2) is 6 feet against the previous 17 feet.

The spreading floor length of

Fig. 1. (upper left). Model of old-fashioned 900-cusec drop.
Fig. 2. (upper right). Drop of Fig. 1., improved by standard spreading floor; downstream floor inadequate.

Fig. 3. (lower left). Drop of Fig. 1., with spreading floor shorter than standard but downstream floor adequate.
Fig. 4. 20-cusec model of spreading floor design.



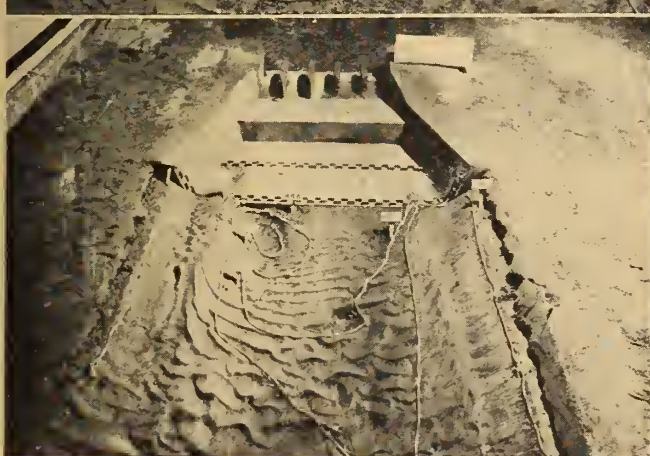


Figure 2 was made to suit rather conservative design rules for new works but it was introduced into an existing drop not long enough for it. The downstream floor length was therefore inadequate. Figure 3, shows a compromise, with the spreading floor length reduced to allow for a downstream floor length more consistent with good design principles. Friction blocks were added to eliminate side scour. These modifications reduced indicated bed scour to 4 feet and eliminated side scour (in the non-cohesive sand of the model).

Figure 4 illustrates the flow through a 20 cusec model of a spreading floor design. The regime width of the channel is indicated by the downstream walls. Side divergence is 1:2. With the earlier design, where the spread of flow is expected in the subcritical stage, divergence as slight as 1:5 would produce serious scour. In the model, downstream flow conditions are excellent and scour is negligible.

The basic principles for design of these channel drops (which result in several design rules to ensure their attainment) are given in the West Punjab Institute paper as:-

(i) destroy the energy of the fall (by hydraulic jump),

(ii) adjust the emergent velocity distribution to be comparable with the undisturbed distribution of the stable erodible channel,

— and the spreading floor design is considered to be the most effective way to ensure compliance with principle (ii).

The paper gives rules for length of spreading floor, upward slope of the floor when fall is small; cistern depth and length, downstream floor length, etc. The principle of submerged hydraulic jump is discussed and illustrated from fluid polariscope photos. A very simple design formula for cistern depth in terms of loss of head and discharge intensity at jump section is given.

Although the paper deals specifically with drops for canal systems of up to 20,000 cusecs capacity, certain applications of the principles appear pertinent to high dam spillways. High and moderately high dams have afforded examples of unforeseen retrogression of boulder beds, collapse of poor rock sides, intense concentration of spill water, and unfortunate location of the hydraulic jump under special conditions. √

TECHNICAL WRITING — An Easily Acquired Skill

(*Continued from page 280*)

Then he can determine in advance whether or not the reader will correctly grasp the specialized meaning of the word he intends to use. If there is any doubt about it, the author had better substitute another word. It is a good plan to be on the safe side and to avoid specialized meanings wherever possible. There is almost always a way to say what you want in perfectly plain words whose meaning no one can misunderstand.

Short Words and Short Sentences Are Best

Plain words — and short words — make the best reading anyway. It has been pointed out, in a recent government pamphlet based on studies by Dr. Rudolph Flesch at the Readability Laboratory of Columbia University, that a simple rule-of-thumb way to measure the simplicity of any piece of writing is to count the total number of syllables per 100 words. If the number of syllables runs much over 150 per 100 words, there is opportunity to improve the writing by using shorter words.

Perhaps you think that rule may be all right, when you are writing for children, but that it won't work for grown-ups. Try it and see. For example, count the number of syllables in the first 100 words of this article, which was written without any conscious effort to economize syllables, and you will find the total is 159. Or, count the syllables in one of your own business letters. You will find, unless you are particularly prone to use long words, that your natural style averages only about three syllables to two words. The trouble is that natural style is too often thrown overboard in technical writing, and in its place miraculously appears an unnatural, ponderous style that discourages the reader.

Another handy rule-of-thumb proposed by Dr. Flesch is to limit the average number of words per sentence to about seventeen. There is no magic in that particular number. It just happens to be a good average for easy reading. Sixteen or eighteen would be perfectly acceptable. But if the average should drop to ten, the writing would seem choppy, and if it should rise to twenty-five, the reader would have to work appreciably harder to get the meaning. Short sentences also make the author's job easier by simplifying the punctuation problem. You aren't likely to get into any serious punctuation difficulties when you have only seventeen words to handle.

Revise and Re-revise

Most important of all the things to be done in the polishing process is to revise, and revise, and re-revise. Sometimes an engineer feels that it is a confession of inexperience to revise a piece of technical writing. That is a mistaken idea. Actually, the reverse is true. Scarcely anyone can write a thing the best way at the first attempt. A second attempt is almost sure to produce a better piece of writing, and a third attempt, a still better piece. Willingness to revise, far from indicating a lack of experience, shows that the writer is approaching his task in a spirit of draughtsmanship, and that he realizes that a first-class result comes only from persistent effort.

Along with willingness to revise should go a willingness to take suggestions from others. Here a middle-of-the-road policy is best. The author who seeks advice from a multitude of counsellors is likely to end in a maze of conflicting opinions. On the other hand, the most experienced authors often find suggestions extremely useful. Certainly, therefore, an author of limited experience should not feel himself above taking suggestions.

Simple Rules for Technical Writing

In brief, therefore, the secret of success in technical writing is short words and short sentences presenting the author's thoughts in clear, logical order — plus painstaking revision. Much more might be added about introduction, conclusions, illustrations and other details, but those are matters that can be considered after the fundamentals have been acquired.

Writing for general magazines and newspapers, because of the different type of readers to whom it is addressed, requires techniques different from those needed for engineering papers and articles. Consideration of ways to acquire these techniques is beyond the scope of the present discussion. They are not likely to be of primary concern to the average engineer, anyway. But the technique of good technical writing should be of concern to him and, fortunately, it is one that can be easily acquired. √

ECONOMIC CONSIDERATIONS in the CONSTRUCTION OF RAILWAYS in REMOTE AREAS

An address delivered before a joint meeting of the Winnipeg Branch of the Engineering Institute of Canada, and the Association of Professional Engineers of Manitoba, on January 12, 1950, at Winnipeg.

by

S. W. Fairweather,

Vice-President, Research and Development,
Canadian National Railways, Montreal.

The subject which I intend to discuss is of particular interest to those who are developing what may be termed the "frontier fringe of Canada." The frontier of which I speak is not a dividing line between nations; it is a dividing line between the developed and the undeveloped. Beyond it lies opportunity, a challenge to the venturesome and a sure hope of reward to industry, intelligence and perseverance. This frontier is not static; it is being pushed back year by year. It has receded far beyond the position it occupied along the Atlantic coast and the St. Lawrence River 200 years ago. Through development westward from the east and eastward from the west the natural resources of Canada are available in a belt of varying width from ocean to ocean. Now development lies northward and much of this once hostile, barren waste is proving to be a storehouse of wealth. Whether the development is of forest, fisheries, agriculture or mining, the objective is profit to the individual and an increase in national wealth.

Most of our natural resources still awaiting development are in the middle of the continent, far from markets. Land transportation is therefore necessary to bridge the gap. It is obvious that the cheaper transportation is, the more profit remains to the entrepreneur, and the greater is the possible development before reaching the point of no profit. Low transportation cost for mass movement by land is the peculiar advantage of the railway; no other land transportation system is in its class Without the railway the development of Canada could not have taken place, and without the railway additional development cannot take place in future.

The railhead is an important consideration in new development, because it represents the last point at which low cost transportation is available. With a commodity of high value, the margin between production cost and market value at railhead may be considerable; a gold mine may operate a long distance from railhead. On the other hand, if the commodity is of relatively low value, development is possible only a few miles from railhead; farming, forestry operations, and base metal mining fall into this classification. In this type of enterprise, railway extension is a necessary step prior to development. The branch lines to Noranda, to Flin Flon and to Sherrit Gordon are cases in point.

After considering the general economics of new branch lines, the author points out the necessity of co-operative planning by the railways and the proprietors of the projected industries which the proposed lines will serve.

Traffic estimates and cost analyses on the part of the railway are outlined and it is pointed out that branch lines can sometimes be shown to be very desirable in the national interest although they may not present a very promising economic prospect to the railway itself.

The author emphasizes throughout the paper that there is much more to be considered than the simple evaluation of capital outlay and operating expense, when a railway studies proposals for new branch lines.

General Economics of Branches

What are the considerations, justifying the construction of a branch line? Sound development must yield a profit to the entrepreneur and must add to the national wealth. The amount the entrepreneur pays for transportation must still leave him a profit after paying his other operating expenses. New or more remunerative employment must be afforded, adding to the national wealth and finding expression either in an increase in the standard of living or in an increase in population. One might expect that profit to the railway should also be an essential criterion, but this is not necessarily so. It is a frequent experience for railways to bring opportunity to entrepreneurs and to increase the national wealth by branch line extensions which are unprofitable when viewed from the standpoint of the railway alone. The reason for this odd state of affairs lies in the unique nature of the railway industry. It is not free to set a price upon its services based on specific costs; it obtains its revenue by means of a complicated rate structure which it is hoped, on the average and applied to all traffic, will yield sufficient revenue, but which may depart far from costs in specific cases. Under such conditions, the cost of constructing and operating a railway extension may exceed railway revenue from traffic created thereby, but the entrepreneur may be making a profit and national wealth may be increased. There is nothing unfair in such an arrangement, provided that the railway is afforded an opportunity to earn, on the whole of its system, enough to meet expenses and to yield a reasonable return on its invested capital. Should conditions arise, however, where the railway's overall revenues become deficient, the ability to make branch line extensions needed for development purposes is severely hampered. When a railway decides to construct a branch line, it usually happens that the capital so invested exceeds the initial expenditure by the entrepreneur in the area served. If the branch line is well located and taps enough natural resources with enough marginal utility, this condition will be reversed in time. The railway will have a lean time during the development period, because fixed charges on capital and certain maintenance and operating costs will have to be met, regardless of traffic. Rarely will traffic offer initially in the amount required to meet these costs; indeed, the railway is fortunate if the break-even point is reached in five or even ten years.

Obviously, a railway must use good judgment in investing capital in a branch line extension. Its own costs are closely ascertainable, but it also needs to know a great deal about the country through which the proposed branch line will run. It must interest itself as intimately in the prospective profitable operations of the entrepreneur as the entrepreneur himself. There is a partnership, though on an unequal basis, between the entrepreneur and the railway. Each ventures capital, but in the initial stages the railway puts up more than the entrepreneur. If the development is successful, the entrepreneur realizes a profit sooner than the railway. He can also determine quickly whether his operations will be successful, and can therefore limit his venture capital. The railway, on the other hand, puts the entire amount of its venture capital in at the start and can salvage little or none of it in the event of failure.

Co-operative Planning Essential

It is plain that the best chance of success for the entrepreneur and the railway as economic partners lies in keeping each other fully informed. The railway must know what the plans of the entrepreneur are and how they are made before it can advise him whether or not it can provide railway service economically, and he must know whether or not a railway branch will be built before he invests his capital. These plans and the information which led to them, with all other information obtainable from sources ranging from Government reports to direct observation, are the basis upon which the decision to build a branch line must rest. Analysis will reveal the nature and scope of anticipated development, the amount and nature of employment which may be afforded, the wealth which may be created, and the demand for rail transportation and its cost.

In studying a branch line project, analysis will first be directed to testing whether or not the entrepreneur can operate at a profit. Unless the answer is "yes," there is obviously no point in considering the matter further. This phase of the investigation is one familiar to the entrepreneur. He bases his decision upon anticipated profits; he knows the market value of his commodity and can estimate closely his costs of production and transportation. These factors and the extent and availability of his natural resources, enable him to determine the scope of his activities. His transportation charges are those determined by the railway rate structure. Generally they are available to him at a fixed unit price, regardless of the size of his operations, but the cost of transportation actually incurred by the railway does not follow this law, and this fact leads to the second phase of the analysis.

It is generally true that any operation which is profitable to the entrepreneur is beneficial to the nation, since the element of profit adds to the national wealth. However, if the entrepreneur's costs are not the real costs, this may not be the case. The possibility of this condition has been mentioned as regards transportation. It requires only casual consideration to realize that an entrepreneur, conducting an operation profitable to himself, may be in receipt of a subsidy from cheap transportation to such an extent that the subsidy is greater than his profits. It is necessary to apply some test beyond that of profit to the entrepreneur. Any deficiency is most likely to be found in the transportation costs, so the situation must be analyzed from the standpoint of the railway. If this analysis shows a profit both to the entrepreneur and to the railway, then there can be no doubt as to the desirability of the project, but if profit to the entrepreneur is probable and loss to the railway is certain, a decision based on broad national considerations must be reached, sometimes the railway is placed in the plight of creating a profitable opportunity for an entrepreneur and aiding in the national development without improving its own position.

Railways Influence Development

The developmental influence of a railway will be felt over a varied area, depending on the means of secondary transportation, e.g., waterways, roads or bush trails, also on the nature of the terrain and on the natural resources available. In agricultural areas the economic zone of development is a strip of country about 30 miles wide on each side of the railway, so that each mile of railway brings development to 60 square miles of land. In wooded country, the zone of development is wider, perhaps 40 miles on each side, added to which there is the possibility of further development by transportation in streams and lakes suitable for floating pulpwood and timber. Fisheries follow somewhat the same pattern. Mining may be divided broadly into two classifications, base metal and precious metal mining. In the former, the zone of development is narrow; a base metal mine of any size needs to have railway service at its shaft head if it is to operate economically. Precious metal mining is in another category and can operate at greater distances from railhead.

In sizing up the economic possibilities of a line extension the first things to do are to determine the general nature of the country, the availability of secondary means of transportation and the nature and extent of the known natural resources. Agricultural possibilities and forest and fisheries wealth are dealt with in provincial and federal records, supplemented by other information, including actual field observation. For mining possibilities, resort is had to the geological and mining reports of the provinces and of the Federal Government, and, where available, to records of development work by mining companies engaged in prospecting.

Traffic Possibilities

The next consideration is to determine where markets for the produce of the new territory exist and, by analysis of market prices, to estimate the costs of transportation and of production, to see if there is a sufficient margin of profit to justify development. Each type of natural resource must be treated in this manner and a rate of its development established. This rate of development will be related to the entrepreneur's margin of profit; if it is large, the development may be expected to be rapid and extensive; if it is small, development will be slower and not so extensive. As a guide, it is prudent to take an area of similar character, which is served by the railway and study its past rate of development. In this manner, useful figures can be deduced, not only as to the rate at which development may take place, but as to how much railway traffic may be engendered at various stages of the development. From these bits of information, an estimate of expected inbound and outbound traffic can be made, the outbound traffic consisting of raw or semi-finished products, and the inbound traffic consisting of finished goods, such as settlers' effects, machinery and miscellaneous merchandise.

Also to be taken into account are passenger, mail and express traffic, and telegraphic communications. Thus the prospective traffic for each year from the opening of the line to the date of optimum development can be estimated, furnishing the measure of revenue which the railway may expect to obtain directly from the line. The railway will also obtain other traffic which does not move over the line at all. This traffic arises out of the secondary effects of the distribution of the national wealth created. It is impossible to determine what form this traffic will take or where it will occur, but, it is a matter of some importance.

Branches Influence Entire System

Having now secured some sort of idea of the traffic pattern to be expected, the next step is to consider the expenses to be incurred. These are interest and depreciation on the cost of building and equipping the line, the cost of maintaining the line, the cost of operating train service on it, and of furnishing station service, and, finally, the cost of moving traffic engendered by the development over the rest of the railway system. This form of cost analysis makes it possible to determine whether or not the proposed extension will add to or subtract from the system's net income. It is necessary to consider at this stage whether the development activities engendered by the line are entirely new, adding to the total activity in the country, or whether the development is competitive, and takes place at the expense of diminished production in some other location served by the railway system. Development in Canada has added decidedly to national activity and national wealth. This development could not have taken place without the construction of railways; analysis shows that for each dollar of capital invested in railways, the increase in national wealth has amounted to about $15. As development proceeds it is reasonable to expect that the law of diminishing returns will operate, and that it will become more difficult to maintain this ratio.

Effects on National Economy

What will be the effect upon the national economy and upon the railway of constructing a branch line? One should take into account the effect of the distribution of profits from the primary enterprise. If a mine produces minerals having a market value of $X at an expense of $Y, that the profit, X-Y, is distributable and gives rise to further employment. Moreover, each employee has a similar distributable portion of his wages, which he expends on living amenities or invests as savings. Those who supply materials to the mine and community also receive a profit, which in turn is distributable. This effect can best be allowed for by multiplying the total production by a factor which, for a profitable operation will lie between 1.5 and 2.5. For an average development, it would be safe to use a factor of 2.0. If, twice the gross production as determined by market value is greater than the entrepreneur's costs and transportation costs not included in his freight rates, the extension is probably justifiable in the national interest. Each case requires special investigation from which it is possible to estimate the levels of development which are necessary to justify a railway extension from the standpoint of the industry, the railway and the nation.

Suppose that an opportunity exists involving 100 miles of construction from the existing railhead, and that development would appear reasonably profitable. From the standpoint of the industry, transportation charges will be a relatively minor part of costs, and from the industry's point of view, justification for building the extension is almost independent of the size of operation. This means that once a railway is provided, both large and small industries can develop. From the railway standpoint, and assuming that the new industry is not merely a displacement of industry elsewhere, the railway may expect to add to its gross revenue, directly and indirectly, about 7% of twice the value of production of the industry. This is the revenue it will have available to pay interest and depreciation on capital expended on the extension, to pay the operating cost of the extension and the cost of handling traffic engendered as a result of the branch line, but moving over other parts of the system. The cost of the extension may perhaps be $85,000 per mile, or $8,500,000 altogether, interest and depreciation on which, assuming a 50-year life for a mining area, for example, would be $425,000 per year. Maintenance and operation of the branch would cost a minimum of $500,000 per year and cost of operation on the balance of the railway system would be about 6% of the total production. From this is seems that the average value of production would have to be of the order of $12,000,000 per year before the branch would be a profitable venture in itself. This example shows how careful the railway must be in making line extensions if it is to safeguard its own income position.

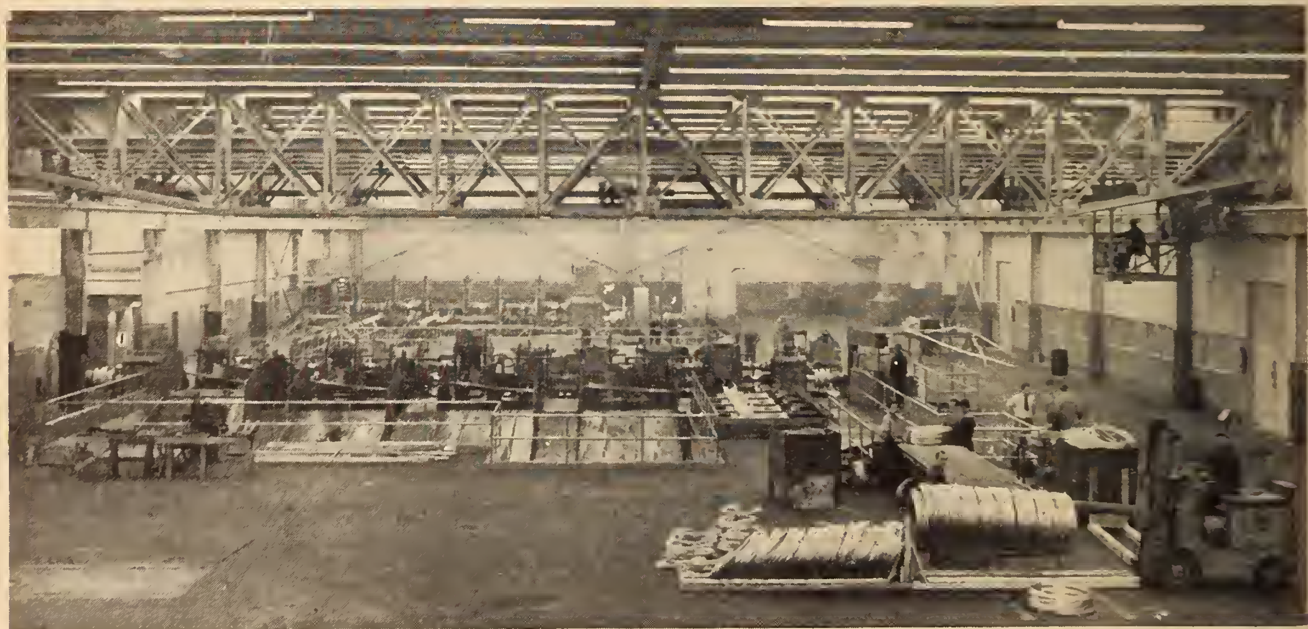
Now consider the effect on the national income. Here there is a completely different situation; granting once again that the development is not merely a transfer of activity from some other point, the direct and indirect effects of the production such that an average output of $750,000 per year would justify the extension. This is only one-sixteenth of the amount needed when tested by railway income requirements. Obviously it is not in the national interest that railway extensions await a sure return for the railway. This accords with the history of railway construction, which has always been extended far beyond the limits of direct returns.

How can Rates be Determined?

How is the situation to be met? Formerly, it was not uncommon to subsidize the construction of a railway, but that method of financing is now out of fashion. It would be adequate if rates and tolls under regulation were maintained at a level high enough to pay a fair return on prudently invested capital, because then the cost of the general benefits from the new development would be spread over the whole community. There is a theory of railway rate regulation known as the "Agency Theory" which is based on this premise. It has never been fully applied, although it was approached at a time when the railways had a monopoly on land transport. Under such conditions it was possible for a railway to extend its services and offer low rates to induce development of low-valued commodities, levying the rest of the costs upon the community as a whole by means of higher rates on more valuable commodities. Individual rates bore no necessary relation to costs, but as applied to the total economy yielded sufficient revenue to give a fair return on railway capital. Highway competition has to a considerable extent destroyed the railway's monopoly and has therefore greatly hampered the freedom of the railways in aiding in development. Relatively low rates, well below the railway's average costs, must be extended to entrepreneurs engaged in developing natural resources on the frontier fringe, for to burden them with the total cost of transportation would be to hamper development. However, if the railway extends low rates, and is unable to secure elsewhere the revenues needed to balance its costs, a sick railway industry will be the result, and a sick railway industry cannot be expected to do its part adequately in aiding development.

ALL-ALUMINUM CRANE

The photo below shows the interior of the new aluminum rod mill at Arvida, Que. It also illustrates an aluminum crane which has been in continuous service for over a year. By employing aluminum instead of steel, the total weight of the crane was reduced by approximately one-half and a reduction in weight of the supporting steelwork was also found possible.



Notes on Management

Why Aren't More Industrial Engineers in Top Management?

Mr. Bruce Wallace, vice-president and treasurer of the Otis Elevator Company, had the following to say on this interesting question in an address before the Society for the Advancement of Management.

"Industrial engineering is one of the finest training grounds there is for top management. Surely no class of employees is better prepared to solve the complex problems that require careful analysis, complete understanding, unbiased reasoning, and the ability to write straightforward factual reports on their findings.

"Why is it, then, that there are not more industrial engineers in top management? Probably the most important factor has been that engineers have traditionally been specialists. Industrial engineers, in general, have concentrated their efforts on a small segment of the cost of the product. They have done a fine job in reducing the productive labour content of manufacturing cost.

"Their effort has contributed greatly to the tremendous productivity that we enjoy in this country. That productivity makes this nation the best-fed, the best-clothed, and the best-housed nation in the world, and permits the average working man to enjoy comforts that only the rich in other lands can have.

"But the industrial engineer has been concentrating his efforts on between 10 and 15 per cent of the sales dollar; it is evident that he must broaden this scope and realize that great opportunities exist for him in the control of that other 85 to 90 per cent of the sales dollar.

"I recommend to industrial engineers, as a group: determine to expand your usefulness; learn something of general business problems; study the principles and practice of sound costing; study budgeting and the control of expense; make yourself an authority on all phases of your business, which stem from your original wage-incentive standards. You will find your usefulness to your company expanded and that suitable recognition will follow."

Warehousing Operations

One of the main reasons for this column is to discuss some aspect of management that might be of general interest without developing the subject into anything like a definitive treatise. The field of management is so broad that it allows much latitude in the selection of subject matter. Consequently, we can justify a few words on a subject that has often been considered a necessary evil but which, in actual fact, should be of prime concern to management—warehousing. It is certainly true that warehousing and handling methods, in almost every case, have a pronounced effect on break-even points. This can be easily recognized when we consider that between the purchase of raw materials and the delivery of finished products it is the most often repeated phase of industrial operations.

Increasing costs of labour and construction are forcing management to regard their warehousing problems with more concern. From the manufacturing point of view they must store the multiplicity of parts, assemblies and materials in adequate quantities and at the right locations. From the sales point of view they must maintain a balanced line of finished goods, with due regard to any seasonal sales fluctuations that might exist. The space used is valuable and handling costs are generally high —hence this is a problem that should be attacked with the same calibre of talent as is used in the development of the actual production techniques. Indeed, one might say that under modern conditions warehousing has become a part of production technique, for manufacturing is so interlaced with warehousing problems that factory efficiency depends in large part on warehouse planning.

Warehouse planning, like production planning, logically starts with a consideration of sales volume and requirements. If the sales forecast is sufficiently detailed it is not too difficult a matter to compute the required physical size of the stock of each item, whether it be a raw material, a component or finished product. Thus, depending upon the ready availability of the various items, the stock levels that are to be maintained at the various locations can be set.

These stock levels are readily convertible to the ideal cubic and square footage requirements. Before determining the actual space necessary, it is necessary to consider such building characteristics as floor loads and ceiling heights. Since stock is rarely kept at an ideal level, allowance has to be made for the maximum stock that might reasonably be on hand at any time in view of seasonal sales fluctuations and any other influencing reasons.

It is obvious that the location of the various items in a warehouse is extremely important from the standpoint of handling costs. This means reducing the travel time of the goods in greatest demand. Consequently, the common error of arranging stock in some arbitrary alphabetical or numerical sequence to simplify location should be avoided.

No warehousing system is perfect. This is especially so in those instances where the warehousing operation has been a case of fitting and piecing into limited available space. The goal is to get the maximum net accessible warehousing area from a given gross area that can be operated at minimum cost. But no system, no matter how well planned, can of itself produce efficiency. Good management is required. This consideration has led some companies to concentrate all responsibility for their physical distribution operations—warehousing, materials handling, traffic management, packing and packaging, stock records and control of stock — in the hands of one top-level executive. This is a feature which might well be considered by many companies since it brings to bear a unified approach to an important specific phase of operations which have often been handled in part by several departments.

The Queen's University Synchrotron

A new and important tool was added to Canada's nuclear physics facilities in January of this year, when the synchrotron laboratories at Queen's University were officially opened.

Built by General Electric at Schenectady, New York, the synchrotron electron accelerator is the first of its kind to be used in nuclear research in Canada. It is capable of producing X-rays with a maximum energy of seventy million volts—about two thousand times the energy of those first produced by Roentgen and about thirty-five times the energy of the gamma rays from radium.

Basically the synchrotron is a machine for accelerating electrons to high speed and firing them at a target to produce X-rays. A doughnut shaped vacuum tube is fitted between the poles of a magnet excited by alternating currents. Electrons are injected into the doughnut tube and the magnetic field together with a small voltage of ultra-high radio frequency causes them to circle in a constant orbit inside the tube until they have acquired the desired energy. The electrons are then diverted from the orbit to strike a target where they produce an X-ray beam.

Seventy million volt X-rays are very penetrating and it is necessary to protect the operating personnel from their effects. The magnet assembly and power supply equipment at Queen's have therefore been placed in an underground room, fifteen feet below ground.

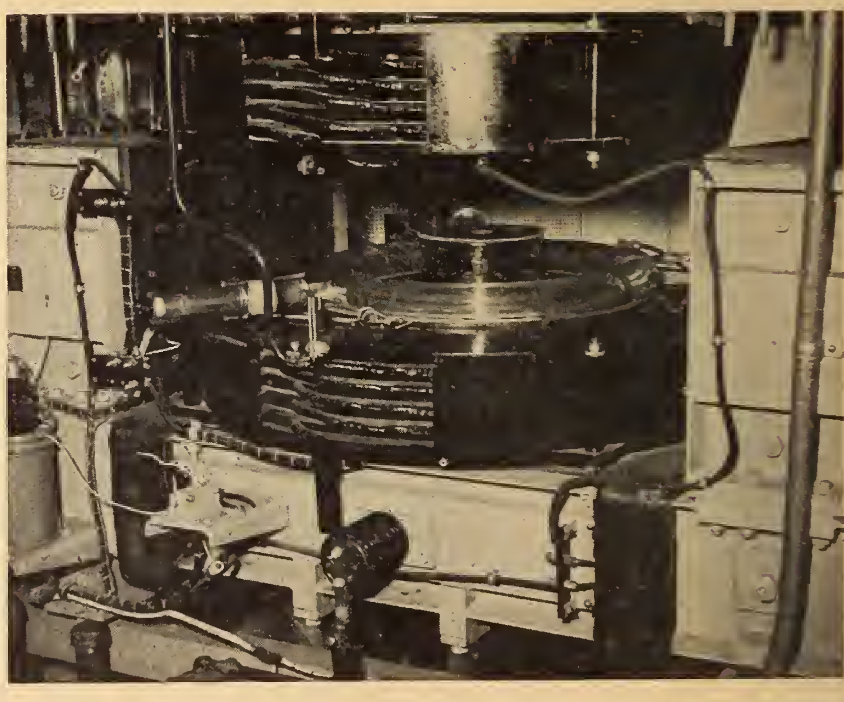
The synchrotron has a number of features which make it convenient for routine operation without corresponding sacrifice of flexibility. All of its components are designed for continuous service at their normal ratings, and yet moderate overloads may be safely tolerated for a limited time. Automatic protective devices free the operator from the drudgery of continuous monitoring of the instruments.

The magnet has water cooled laminated structures and forced air cooled coils of advanced design. Flow switches prevent operation of the machine without adequate cooling. For access to the doughnut the upper part of the magnet may be raised by a motor-operated mechanism. Insulated covers on the coils allow experiments to be carried out near the doughnut.

The starting unit contains an integral source of direct current for tuning the magnet during the initial minute of operation. It also contains instrument transformers for indication of magnet power supply. The voltage regulator is automatically controlled to maintain tuning and is so arranged that it resets itself automatically for further operation, after the equipment has been shut down. The capacitor bank, housed in a ventilating duct, has a fuse for each capacitor. A thermostat is provided to prevent operation of the machine if the cooling of the capacitors is inadequate.

The control equipment is so designed that the synchrotron may be put into full operation by using two switches only. The first of them turns on the starting equipment, starts the flow of cooling water and air and runs the magnet up to its operating excitation. The second turns on the timing circuits and the injection and radio-frequency voltages, putting the machine into full operation. A timer is provided which cuts off the X-rays after a predetermined period. There are manual switches for the individual control of the major components. An unusual feature is a bank of lights which indicate whether the preliminary conditions necessary to operation are satisfied. These lights are extremely useful in avoiding wasted time in servicing and operation.

The illustration is a close up of the magnets and the doughnut —the heart of the new machine.



From Month To Month

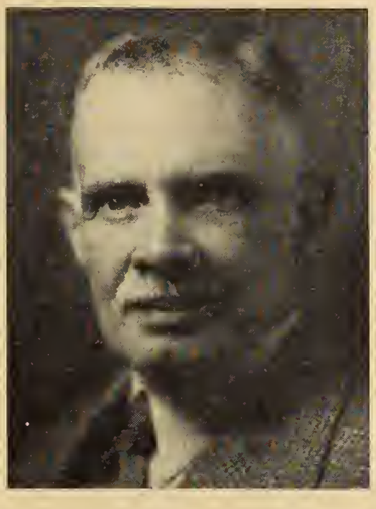
News of the Institute and Other Societies, Comments and Correspondence, Elections and Transfers

A New Field Secretary

At the March meeting of Council Vice-President R. E. Heartz announced that Lieut.-Colonel L. F. Grant of Kingston had accepted the position of Field Secretary which became vacant after the tragically sudden death last November of Mr. C. E. Sisson. Colonel Grant has agreed to take up temporary residence in Toronto and has assumed direction of the Institute's office at 350 Bay Street.

Every aspect of Colonel Grant's career emphasizes his remarkable fitness for the work of the field secretary. He has had wide experience as a practising engineer, a distinguished soldier, a respected educator, and an enthusiastic worker in the interests of the Engineering Institute and the profession of engineering in Canada. He has travelled to every part of the Dominion and has held almost every office in the Institute and its branches up to and including the presidency in 1947-48.

His full career has been outlined on many occasions in the Journal (and particularly in the issue of May, 1947 (p. 230) when he assumed the presidency) and it would be superfluous to repeat details here. It is more pertinent to stress the further valuable services which he will be able to render to the profession through this new appointment. He will visit Institute branches throughout Canada and meet with the executives and the membership under less restricted conditions than those attending the annual visits of the president.



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

He will be available particularly to the Toronto Branch and the branches throughout the important industrial centers of Ontario and will be able to do much to bring the activities and importance of their national professional organization to engineers throughout Canada.

Colonel Grant is in the category of those generally referred to as " the senior engineers " and he is known to, and respected by, a host of his contemporaries throughout Canada and the United States. To a marked degree, however, his interests have been with the young men of the profession to whom he has always been delightfully easy to approach and to know, and it is perhaps in this regard that he is pre-eminently qualified for his new job. The younger members will do well to take advantage of his experience and counsel on the occasions of his visits to the branches or at the office in Toronto.

A Look Backward

(Cover Picture)

To afford a fleeting picture of Canadian engineering in earlier days we have pictured on this month's cover the one remaining wooden covered bridge in Ontario.

It is 180 feet long and spans the Grand River at West Montrose. It has been in continuous service since 1881.

As this issue goes to press, we learn that the Ontario Department of Highways is planning a new bridge to carry the main highway but the covered bridge will be maintained as an historic site.

Photo courtesy Hamilton Bridge Company

Inaugural at Sudbury

A group photographed during dinner. Left front to rear: Mrs. J. Quance, John Quance, Mrs. Mel. Whittles, Mr. Whittles, Mrs. F. Totino, Mr. Totino. Right front to rear: W. F. Miller, Mrs. Miller, E. R. Graydon, E. A. Cross, D. G. Geiger and I. R. Tait.

Guests at the head table included: Mrs. W. R. Dalton, C. Stenbol, Mrs. E. R. Eaton, E. V. Buchanan and Miss M. McLaren of Headquarters.

Officers and guests at the council meeting were (left of table, front to rear), R. E. Heartz, R. H. Moore, F. H. Midgley, D. G. Geiger. (Right of table, front to rear), W. J. W. Reid, P. E. Buss, E. R. Graydon, E. A. Cross. (Background, left to right), I. R. Tait, G. R. Turner, I. P. Macnab, D. W. McKinty, A. M. Lount, E. P. Muntz, T. M. Medland, E. V. Buchanan, J. B. Stirling.

The 32nd branch of the Institute was inaugurated with appropriate ceremonies on April 1st at Sudbury. The 94 officers and guests at the inaugural dinner were in evident agreement that the branch was off to a good start.

M. D. Stewart, chairman of the new branch and city engineer of Sudbury presided at the dinner. In most appropriate terms he welcomed the visitors and told of the preliminary work leading up to the opening ceremonies. In particular he stressed the contribution of Vice-President Vance who had visited the branch on two previous occasions to complete preliminary negotiations.

The Mayor of Sudbury, Mr. W. S. Beaton, welcomed the visiting engineers, congratulated the new officers, and expressed his confidence in the future usefulness of the branch to the City of Sudbury and to the engineers in the area.

President Armstrong touched briefly on the sixty-three-year history of the Institute and pointed out that his was the privilege of being the first president to inaugurate three branches during one term of office—Newfoundland, Kitchener and Sudbury. The freshman councillor from Sudbury, E. R. Eaton, added a delightful touch to the programme with a versatile exhibition of whistling and bird-calls. The general-secretary referred to the services which the new branch would be able to render and the meeting adjourned with brief, pertinent remarks from the four vice-presidents in attendance—Ira P. Macnab, Halifax, (Zone D); R. E. Heartz, Montreal, (Zone C); W. J. W. Reid Hamilton, (Zone B); and J. A. Vance, Woodstock, (Zone B).

A regional meeting of Council was held during the day. In addition to the president, members of the headquarters staff, and the vice-presidents noted above, some seventeen councillors and visiting members attended from Montreal, Toronto, London, Sault Ste. Marie, Ottawa, and Niagara Peninsula Branches. Some of the visitors had arrived on the preceding day to take advantage of arrangements made by the branch for visits to mining industries in the area.

The executive of the new branch received commendation from all sides on their warm hospitality and the excellent arrangements made for the day's ceremonies.

The Engineering Foundation

Sponsorship and grants of $42,500 by Engineering Foundation to twelve projects in fundamental research in the engineering sciences and to two projects in advancing the engineering profession stimulated contributions by industry and universities of $642,800 to these projects for the fiscal year ending September 30, 1949, according to the annual report of the Foundation issued recently. Also included in the report is a summary of the Foundation's activities since it was established 35 years ago as the joint research activity of the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, and American Institute of Electrical Engineers.

Current Foundation Activities

Notable among the current Foundation projects are the three councils (on riveted and bolted structural joints, on the properties of columns, and on the characteristics of reinforced concrete) sponsored by American Society of Civil Engineers. These councils were established because of a lack of precise data for design formulas and specifications and all three are showing exceptional progress.

The oldest of the three, on riveted and bolted joints, has six research projects under way and the results should soon be of value in the design of new railway and highway bridges, and in strengthening older bridges now subject to steadily increasing traffic loads and speeds. One important conclusion already available, is that a bolted joint has considerably higher resistance to failure by fatigue than a similar joint fabricated with either hot- or cold-driven rivets.

Prominent among the projects sponsored by the other Societies are studies on the properties of metals at high and low temperatures, on the plastic flow of metals, and on the properties of petroleum-base and synthetic lubricants and the correlation of these properties with the behaviour of the lubricant in various types of machines.

Of the Foundation projects for the advancement of the engineering profession, the Engineers' Council for Professional Development has recently had an enviable record of achievement. It has studied and approved 314 engineering curricula in 74 colleges and universities and has started to survey South American universities with the object of recommending standards for the curricula of these institutions. It has also developed a test for determining the aptitudes that are essential or at least desirable if a high-school graduate is to be successful in a college engineering course and career.

Royal Canadian Engineers Memorial Scholarships

When Brigadier G. Walsh, C.B.E., D.S.O., M.E.I.C., was chief engineer of the First Canadian Army in North West Europe he initiated the collection of voluntary contributions from all ranks of the Royal Canadian Engineers for a memorial to sappers who lost their lives in the Second World War.

Opinions from sappers were overwhelmingly in favour of using the fund for some form of educational grant rather than any physical memorial. A plan was therefore instituted last year to award annual scholarships to the value of about $125.00 to a deserving engineering student in the graduating year at each of the degree-granting engineering schools in Canada. Details of the plan appeared in the September 1949 issue of the *Journal* (p. 572).

Colonel H. W. Love, O.B.E., M.E.I.C., chief engineer of the Canadian Army, recently released a list of the first recipients of the scholarships as follows:—

J. P. Preston and Oscar Friesen, S.E.I.C., University of British Columbia.

J. E. Feir, S.E.I.C., University of Alberta.

J. A. Cook, University of Saskatchewan.

W. D. Alexander, S.E.I.C., University of Manitoba.

W. C. Diakow, S.E.I.C., University of Toronto.

C. E. Alkerton, Queen's University.

A. J. F. Gauthier, McGill University.

M. Paquet, S.E.I.C., Laval University.

W. R. Shaw, University of New Brunswick.

The Engineering Institute of Canada extends its congratulations to these student engineers who have earned their awards not only for academic ability but for the qualities of leadership they have exhibited by activities in the Canadian Officers' Training Corps. The sappers are to be congratulated also for their decision to put the memorial fund to such effective use.

The Inheritance

We rightly praise the Engineer
Who stamps to dust the rocky hill,
Who fashions many a cunning gear
To turn the river to his will.
But seldom do we praise enough
The man of stern austerity,
In sable gown of common stuff,
Who taught him trigonometry.

The Engineer's high virtues wake
Our admiration and acclaim —
The love of truth, the urge to make
Exactitude his only aim.
But some one else deserves a bow:
The girl, commanding in Grade Eight,
Happed in a distant graveyard now,
Who taught him to be accurate.

J.E.M., in *Saturday Night*, Toronto

THE PRESIDENT

Photos arranged counterclockwise on this page show:

Students at Mount Allison University, Sackville, N.B.

The student body at St. Francis Xavier University at Antigonish.

Part of the head table at the Ottawa Branch luncheon. Left to right, Mrs. H. E. Treble, the president, Alan Ross, Mrs. Armstrong, Dr. C. J. Mackenzie, Mrs. Ross, Dr. G. C. Monture, Mrs. K. M. Cameron, Major-General G. R. Turner, H. P. Stockwell.

A part of the group of nearly 300 students who heard the president at McGill.

Some of the head table guests at the meeting in Cornwall. Left to right: J. L. Shearer, D. Ross-Ross, H. W. Nickerson, L. Austin Wright, Mrs. Armstrong, Chairman G. G. M. Eastwood, Mr. John Armstrong, Mrs. Eastwood and Major-General G. R. Turner.

At Antigonish the president attended the charter presentation ceremonies of the student branch of the Mining Society of Nova Scotia.

A part of the large group of members and their wives who turned out to welcome the president at Peterborough.

ON TOUR

A very large proportion of the engineering students at the University of New Brunswick heard the president's address at Memorial Hall.

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Clockwise on this page:

At Carlton College, Ottawa, the engineering students were pictured, with Institute officers in the background.

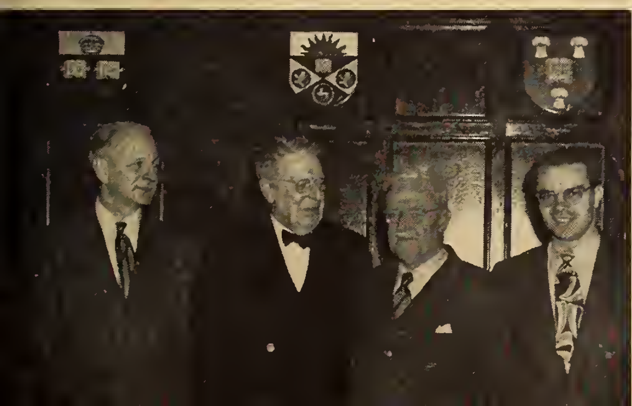
At Nova Scotia Technical College, the president addressed junior and senior classes separately. This picture shows the third year group.

The main lecture theatre at Ecole Polytechnique, Montreal, was filled to capacity for the president's visit.

The next two pictures are typical of the large gatherings of students. These photos are of Queen's and the fourth year group at Nova Scotia Tech., respectively.

At University of Ottawa, the president was photographed with Father René Lavigne. Also in the photo are H. E. Treble, J. L. Shearer, Alan Ross, General G. R. Turner and John Watt.

The photograph below was taken at Queen's. It includes J. W. Brooks, branch chairman, the general secretary, the president, Dean D. S. Ellis and George Devlin, student president.



Correspondence

To The Editor:

It has been stated that "the Engineering Institute membership and activities embrace with equal emphasis all branches of engineering: civil, electrical, mechanical, and so on . . ." It is the purpose of this letter to bring to other members' attention a newer small group of Agricultural Engineers.

In Canada, Agricultural Engineering courses are offered at the University of Saskatchewan, University of British Columbia, and Ontario Agricultural College. Information regarding curriculum, etc. is freely available from any of these institutions. Such literature indicates that the courses have all the basic subjects of Mechanical Engineering with specialization in Agricultural Engineering during one university year.

The Agricultural Engineer has his place in the selection and use of engineering materials and methods from all sources, correlating them with the basic agricultural sciences, for these broad objectives:

1. Economic improvement of the farmers' position by increasing farm output at lower production costs.
2. Raising the standards of living in rural areas by making the means thereof more freely available, both technically and economically.
3. Conservation and improved management of agricultural resources for the betterment of individuals and of the country as a whole.
4. Increased mutuality of agriculture and industry; i.e.—making the farm a greater market for industrial products and a greater source of industrial materials.

Agricultural Engineers are generally divided between public service and private industry. Included in the former group are those engaged in research, resident teaching and extension work in colleges, universities, experimental stations, federal and provincial agencies. Among those in the latter group (private industry) are engineers and executives in companies making farm machinery, mechanical and structural equipment, building materials, etc. As a rule, they are concerned with development and design of product, and engineering of application, rather than production engineering.

Thus, Agricultural Engineers engage in a wide range of work for various employers scattered over the world. Unity of the group is developed and maintained by professional organization in the American Society of Agricultural Engineers (A.S.A.E.). It is fairly well agreed that this type of organization specializing in a single type of engineering has a definite place while best overall results can be obtained by supplemental co-operation with other branches of engineering e.g. through The Engineering Institute of Canada.

Within the A.S.A.E. are organized technical divisions covering the four main phases of Agricultural Engineering, namely:

1. Power and machinery — involves all power (except electricity), implements, and machinery related to farm or agricultural equipment production.
2. Rural Electrification — activities primarily associated with application of electricity to the farm, especially development of economic agricultural uses of electricity.
3. Farm Structures—work given to farm and community buildings with attendant equipment serving rural areas.
4. Soil and Water—all measures of an engineering nature for the conservation, utilization, and management of soil and water resources.

Some confusion has arisen in various quarters about identity of Agricultural Engineers and Agricultural Mechanics to the disadvantage of both groups. As may be seen by referring to university calendars, the Ag. Mechanics are agriculturalists while Ag. Engineers are *engineers*. It is desirable that Agricultural Engineering be considered complementary in its work to that of associated professional groups such as Civil, Mechanical, Chemical, etc., Engineers, as well as Agriculturalists in their respective divisions of Ag. Mechanics, Field Husbandry, Agricultural Chemistry, and so on. With proper recognition given to qualifications associated with different branches of such professions, Ag. Engineers and Ag. Mechanics may be assigned to jobs to which they are best suited for maximum efficiency and harmony with their fellow workers.

Yours very truly,

NORMAN FLATEN, *Scribe*
Saskatchewan Student Branch of the American Society of Agricultural Engineers.

Meetings of Council

Secretary's Notes

The February meeting of Council was held on the 18th instant at the Headquarters of the Institute in Montreal with President J. E. Armstrong in the chair.

Conference of Commonwealth Engineering Institutions

The general secretary reported that through conversations and correspondence with Mr. James Vance, Vice-President and President-elect, he had obtained from Mr. Vance an expression of his willingness to represent the Institute along with the general secretary at the forthcoming conference to be held in Johannesburg in April. Council unanimously and enthusiastically appointed Mr. Vance as an official delegate and expressed its appreciation of his willingness to attend.

Military Engineers Association

It was agreed unanimously to prepare a resolution to the Minister of National Defence along the lines proposed by the Association. This relates to the Association's effort to have the regulations so modified that the engineers in the services may get a practical training in industry.

Employment of Foreign Consulting Engineers for Canadian Work

The president reported that this subject had been discussed before all the branches of the Institute which he had visited so far and that in every instance wide support was given to the action and the policy of the Institute. It was agreed that each councillor would send to Headquarters information obtained by him relative to additional cases of the employment of American consulting engineers for work to be done in Canada.

International Joint Commission

A letter was presented from the Prime Minister Mr. St. Laurent acknowledging receipt of the letter of appreciation from the Council of the Institute relative to the appointment of General The Hon. A. G. L. McNaughton to the International Joint Commission. The Prime Minister thanked Council for the resolution of approval which had been submitted.

President's Report on Visits to Branches

The president gave a brief summary of his tour of the branches in the west and in the east. To date the schedule had required visits at the branches or with the universities to a total of thirty-six, in addition to which he had officiated at the inauguration of two new branches. He reported that he found the affairs of the Institute in good condition. The meetings were well-attended and the hospitality had been excellent.

At the president's request the general secretary reported on the results of the discussions which had taken place with the executive of each branch. Mr. Wright stated that all the subjects discussed had received unanimous support right across the country and it was expected that shortly several of these items would be presented to the Council and to the membership in the form of proposals to amend the by-laws. Before proceeding this far however it was expected that the subjects would be on the agenda for the forthcoming conference of branch officers.

Julian C. Smith Medal Fund

A letter was presented from the member who had collected the funds for the establishment of this prize. He reported that there was a surplus in the fund which he proposed should be taken over by the Council and used "in the best interests of the Institute". Council accepted this offer and expressed its appreciation of the donors generosity.

American Academy of Political and Social Science

Two members of the Institute resident in Philadelphia, S. Logan Kerr and Professor W. S. Pardoe, were appointed official delegates of the Institute for this conference. Both gentlemen had acted as delegates at the conference in 1949.

Inauguration of Branch at Sudbury

It was agreed that a regional meeting of Council would be held at Sudbury on April 1st to coincide with the inauguration of the branch. At the same time it was announced that visits would be arranged to the industries for those who were able to arrive a day early to attend them.

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In view of the fact that a regional meeting of Council has been arranged for April 1st to be held at Sudbury, Ont., it had been agreed at the February meeting of Council that the March meeting would be a pro forma type for the transaction only of routine business and to meet the requirements of the by-laws.

The March meeting of Council was held on the 17th at the Headquarters of the Institute in Montreal with Vice-President R. E. Heartz in the chair.

Approval was given to the appointment of E. R. Eaton as Councillor to represent the new branch at Sudbury.

Kitchener Branch By-laws

The by-laws as submitted by the committee were approved.

Students' and Juniors' Prizes

The H. N. Ruttar prize for students and juniors in the Province of Ontario was awarded to J. W. McPhail, S.E.I.C. of Vancouver, B.C., for his paper "The Design and Control of Asphalt Paving Mixtures".

Student memberships for one year were awarded to the following gentlemen who were successful in the recent Students Night competition at the Montreal Branch: R. E. Dyson, Dawson College; G. Lefebvre, Ecole Polytechnique; A. R. Edis, McGill; D. Portaria, Ecole Polytechnique.

It was reported to Council that Dr. L. F. Grant of Kingston, Ont., had accepted the post of field secretary of the Institute, to operate out of the Toronto office.

News of Other Societies

Announcing the **Chemical Institute of Canada's** 33rd annual conference and exhibition in Toronto, June 19 to 22, at the Royal York Hotel, Ryerson's Institute's FM station, C.J.R.T., has been broadcasting weekly a series "Headlines in Chemistry", describing achievements in the chemical field in Canada.

The **American Waterworks Association** (500 Fifth Avenue, New York 18, N.Y.) has available preliminary programmes for the 70th annual conference, May 21 to 26, 1950, at Philadelphia, Pa.

The **Society of Naval Architects and Marine Engineers** (29 West 39th Street, New York 18, N.Y.) announces that headquarters of the spring meeting, May 25 and 26, will be the Hotel Cleveland, Cleveland, Ohio.

The **Institute of Aeronautical Sciences** (2 East 64th Street, New York 21, N.Y.) announces July 12, 13 and 14 as the time of the annual summer meeting, at I.A.S. Western Headquarters Building, Los Angeles, Calif.

Columbia University Conference

The Department of Industrial Engineering of Columbia University, New York City, announces that it will conduct a five-day conference on the Costs, Budgeting, and Economics of Industrial Research from June 12 through June 16 of this year. Experts from industry and the university will participate in lectures, discussions, and clinic sessions designed for the practical research and development administrator.

The conference is in addition to the regular evening course given in the administration of research and development, and is intended to supplement the work of the various groups and conferences already in the field and to provide practical material for the research executive and his assistants.

Additional information may be obtained by writing Professor David Bendel Hertz, Department of Industrial Engineering, 409 Engineering, Columbia University, New York 27, New York.

Personals

Notes of the Personal Activities of Members of the Institute

John E. Armstrong, M.E.I.C., president of the Institute, and chief engineer of Canadian Pacific Railway, Montreal, has had conferred upon him honorary membership in the American Railway Engineering Association. The Association's requirements are that "Honorary Members shall be persons of acknowledged eminence in railway engineering and management". Such members are only ten in number, out of a total membership of 2300.

Maj.-Gen. Howard Kennedy, M.E.I.C., of Toronto, Ont., has been appointed by United Nations to the post of director of the Near East. The agency was created by the General Assembly to carry out a $54,000,000 interim programme of aid through work relief projects in the Near East for more than 650,000 Arab refugees. The director, as chief executive officer of the agency, will be responsible to the Assembly for the programme's operation.

Gen. Kennedy, is a graduate in civil engineering from McGill University. He has had extensive experience in industrial construction and operations and has served as manager of the Quebec Forest Industries Association. He served overseas during World War I, and in 1939 went overseas again with the first Canadian division engineers.

Later he became Quartermaster-General, at N.D.H.Q., Ottawa, in charge of engineering, services and development, supplies and accommodation, transport and communications.

Maj.-Gen. Howard Kennedy, M.E.I.C.

Dr. F. W. Gray, M.E.I.C., has been granted honorary life membership in the Association of Professional Engineers of Nova Scotia.

Dr. Gray is a resident of Victoria, B.C. He retired from Dominion Steel and Coal Corporation of Sydney, N.S., in 1945, after having served that organization for many years. He was active in the work of the Association and of the E.I.C.

A. G. Tapley, M.E.I.C., of Halifax, N.S. was granted honorary life membership in the Association of Professional Engineers of Nova Scotia at the annual meeting of the Association in January.

Mr. Tapley, who has been active in the affairs of the Association and in those of Institute, is in the Department of Public Works at Halifax, N.S.

Sidney Hogg, M.E.I.C., has been appointed managing director of Western Bridge and Steel Fabricators Ltd., Vancouver, B.C.

Mr. Hogg, the chairman of the Vancouver Branch of the Institute, previously held the position of chief engineer, sales manager and general manager of the firm.

F. G. Rutley, M.E.I.C., vice-president of the Foundation Company of Canada Limited, Montreal, has been appointed general manager of the company. He has, until his recent appointment, been vice-president and assistant general manager.

Mr. Rutley graduated from the University of Toronto in 1912 with the degree of B.A.Sc., and worked for a time in Calgary, Alta. He joined the staff of The Foundation Company in 1914 as resident engineer, which position he held for some years, acting for the company on the construction of many important works. Mr. Rutley next became secretary of the company and assistant to the general manager, and in 1931 vice-president of the Company

Department of Resources and Development

The new Department of Resources and Development at Ottawa is divided into five branches: Administration, Development Services, Public Projects, Forestry, and the Canadian Government Travel Bureau. Members of the Institute affected by the reorganization are:

In the Administrative Branch, **R. K. Odel,** M.E.I.C., becomes chief administrative officer.

In the Development Services Branch, **Norman Marr,** M.E.I.C., is chief of the Division of the Water Resources, and **G. E. B. Sinclair,** M.E.I.C., is chief of the Division of Lands. **C. K. LeCapelain,** M.E.I.C., is with the Yukon Mackenzie River Administration, and **C. V. F. Weir,** M.E.I.C., is chief of the Engineering and Construction Service. **R. A. Campbell,** M.E.I.C., is principal officer of General Engineering in this latter service.

J. M. Wardle, M.E.I.C., is director of the Public Projects Branch. **H. G. Cochrane,** M.E.I.C., is acting chief of the Trans-Canada Highway Division and **J. A. Pounder,** M.E.I.C., heads the Administrative Division of this branch.

Capt. Hubert J. A. Bird, M.E.I.C., of Winnipeg, was appointed in February honorary lieutenant-colonel of the 6th Field Engineer regiment.

Enlisting as a private, Captain Bird served in World War I with the Fifth Infantry Battalion, later transferring to the 8th field company, Canadian Engineers. He was commissioned in 1916, and afterwards proceeded to the Eighth Field Company, C.E. in France. He retired, with the rank of captain in 1939.

In civilian life, Captain Bird is president and general manager of Bird Construction Company of Winnipeg, Man.

Air Vice Marshal C. R. Dunlap, M.E.I.C., who was posted in October, 1949 to North West Air Command as air officer commanding, joined the R.C.A.F. 21 years ago. Among the more interesting of his appointments was that of official observer at the Bikini atomic bomb tests in 1946.

Prior to joining the force he attended Acadia University and the Nova Scotia Technical College, graduating as a bachelor of science in electrical engineering.

Before the Second World War, he worked for some time on aerial photography before specializing in air armament. When war was declared, he was appointed director of armament for the R.C.A.F.

In 1942 he was posted overseas as commanding officer of the R.C.A.F. station at Leeming, Yorkshire, and the following year went to North Africa as commanding officer of 331 bomber wing. Later, he returned to the United Kingdom to command 139 bomber wing engaged in daylight bombing operations. He completed 35 operational missions with this wing.

In 1945 he was awarded the American Silver Star for work with U.S. ground forces and the same year was promoted to air commodore and appointed deputy air member for air staff at A.F.H.Q., Ottawa. For the past two years, he has been in charge of the air planning division, R.C.A.F. headquarters in Ottawa.

J. L. Balleny, M.E.I.C.

G. W. Parkinson, M.E.I.C

W. A. Smith, M.E.I.C., recently elected chairman of the Calgary Branch of the Institute, is general mechanical superintendent of Burns and Company Ltd.

Mr. Smith was born at Belfast, Ireland. He was educated in Calgary schools, and received the degree of B.Sc. in civil engineering in 1933 from the University of Alberta. After graduation he joined the staff of Dominion Bridge Co. Ltd., Calgary, working on structural steel detail. In 1935 he went to International Nickel Co. of Canada at Sudbury, Ont. From 1937 to 1939 he travelled to the mining districts of Northern Ontario as sales engineer for Canadian Johns Manville Co. Ltd., Toronto, Ont. He then joined the staff of John W. Fogg, Ltd., Timmins, Ont., to work on sales, design and supervision of mine construction. He returned to Calgary in 1940, to be superintendent of utilities for Burns & Co. Limited.

G. W. Parkinson, M.E.I.C., has been elected chairman of the Saskatchewan Branch of the Institute. He is designing engineer with the P.F.R.A., Department of Agriculture, in Regina.

He is a graduate of the University of Saskatchewan, having received a B.Sc. degree in civil engineering in 1929. Then for two years he followed graduate studies at Lehigh University, Bethlehem, Pa., and was awarded an M.Sc. degree in civil engineering.

Returning to Saskatoon, Mr. Parkinson was with the city engineer's department in 1931, and worked at designing and estimating on various projects until 1936. Then he joined the staff of the Saskatoon Technical Collegiate as an instructor in mechanical drawing. He returned to the University of Saskatchewan in 1938 as an instructor and lecturer, and remained until 1946, when he joined the P.F.R.A.

W. R. Dalton, M.E.I.C., who was recently elected chairman of the Sault Ste. Marie Branch of the Institute, is associated with the Board of Education of that city.

Mr. Dalton, who was born at Nelson, Ont., studied at Queen's University, receiving the degree of B.Sc. in 1929. He worked after graduating for Canadian Westinghouse Company, Hamilton. With the International Harvester Company in 1936 he was in charge of inspection. In 1938 and 39 he taught for the Dominion Provincial Youth Training group of the Ontario Department of Labour at Sault Ste. Marie. In 1939 and 1940 he was at Danforth Technical School in Toronto, after which he went to the Sault Ste. Marie Technical School, as head of the draughting department.

J. L. Balleny, M.E.I.C., manager of the Canadian General Electric Company, Trail, B.C., has been elected chairman of the Kootenay Branch of the Institute.

Mr. Balleny was born in Scotland, and was educated in Newfoundland, and at Montreal, where he graduated from McGill University in electrical engineering in 1925. He followed C.G.E.'s test course, and worked for a time on design in industrial control engineering. He was then for two years an industrial electric heating engineer at the Davenport Works of C.G.E. From 1929 to 1932 he worked in the mechanical engineering department of Dominion Bridge Company Limited, Montreal. Then for three years he was with the Beauharnois Light, Heat and Power Company, Beauharnois, Que. Returning in 1935 to Canadian General Electric at the Toronto head office he was manager of the Industrial Heating Section until 1947, when he was appointed manager of the Company's office at Trail.

E. R. Graydon, M.E.I.C., who is chairman of the Toronto Branch of the Institute is chief engineer of the Ontario Division of the Dominion Bridge Company Limited.

Mr. Graydon was born in Toronto, and was educated there, graduating from University of Toronto in 1935. He worked for Toronto Iron Works Ltd., in that city for two years, before joining the Dominion Bridge Ontario Division. In 1938 he was field engineer on the Keewatin Channel Trans-Canada Highway Bridge, and in 1939 he worked in a similar capacity on the Port Stanley Bascule Bridge. From 1942 he worked on the design of structural steel, with the Dominion Bridge Co. Ltd., at Toronto, Ont.

R. C. Flitton, M.E.I.C., general sales manager of Canadian Vickers Limited, Montreal, is chairman of the Building Committee of the Montreal Protestant Central School Board, overseeing the current large programme of expansion. The programme which will involve the spending of some $9,000,000, includes the construction of three large high schools and two major elementary schools, as well as a number of smaller schools and additions and improvements to existing schools.

Mr. Flitton is a member of the Town of Mount Royal Board, having been chairman of that board for a number of years. He represents on the Central Board, protestant school boards of Mount Royal, Montreal East, Montreal North and the Town of St. Laurent.

The Montreal Protestant Central School Board operates nine boards on the Island of Montreal and administers the finances of eleven Boards.

W. A. Smith, M.E.I.C.

W. R. Dalton, M.E.I.C.

Lyle D. Hopkins, M.E.I.C., of Acadia Construction Co. Ltd., Bridgewater, N.S., was elected president of the Association of Professional Engineers of Nova Scotia at the annual meeting in January.

J. Douglas Fraser, M.E.I.C., chief engineer of Moirs' Limited, Halifax, N.S., is vice-president of the Association. Councillors of the Association are **C. D. Martin,** M.E.I.C., manager of wire cable sales, Northern Electric Co. Ltd.; and **Allan D. Foulis,** M.E.I.C., president of Foulis Engineering Sales Ltd., Halifax; **Clifford N. Murray,** M.E.I.C., of Dominion Steel & Coal Corporation, Sydney; and **A. T. MacDonald,** M.E.I.C., the town engineer at Kentville.

I. G. Wheaton, M.E.I.C., who was with the Imperial Oil Limited, Toronto, is now associated with Viking Pump Co. of Canada Ltd., of Windsor, Ont. He is district manager for the Company at Toronto, Ont.

Walter Murray, M.E.I.C., is on the staff of Foundation Company of Canada Limited, Montreal.

Mr. Murray was previously chief engineer of the sewers and waterworks department, of H. J. McFarland Construction Co. Ltd., Picton, Ont.

W. O. Maclaren, M.E.I.C., of Johannesburg, S.A. and **Brian Colquhoun,** London, England, have been awarded concurrently, the Prix E. Columbet, by the Société des Ingenieurs Civils de France. Their paper judged worthy of the award was published in *The Engineering Journal* in October, 1946, and was delivered before the French society. It dealt with the Repair of War Damaged Dwellings in the London Area.

The authors worked together for many years, in the firm Brian Colquhoun and Partners, consulting engineers. Mr. Maclaren withdrew from the firm in 1949, to establish the industrial engineering organization, Maclaren Vickery and Partners, at Johannesburg.

Frederick John Bateman, M.E.I.C., of Fair Vale, N.B., has been appointed town engineer for Edmundston, N.B.

He served overseas for five years in the First World War after which he was with the Riordan Company on town site work at Temiskaming, Quebec. He was employed for five years as town engineer at Bathurst, N.B., later serving as construction superintendent for J. E. and D. P. Connolly, Bathurst. From 1930 to 1940, he was town engineer at Dalhousie, N.B. During the recent war he was with the Civil Service Commission, located at Moncton, N.B. He spent two years as engineer in charge of construction for the Navy and two years in the same capacity with the Air Force.

He was employed for two years as construction supervisor for the Veterans Land Act, with head office at Saint John, N.B., serving the Maritime Provinces. For the past two years, Mr. Bateman has been in private practice as consulting engineer, with offices at Grand Falls, N.B., and Fair Vale.

Donald Ross, M.E.I.C., has joined the Pentagon Construction Company, and will work at the Chenaux Development, Portage du Fort, Que. He was formerly chief engineer and manager at P. Harrison & Co. Ltd., Montreal.

He graduated from the University of New Brunswick in civil engineering in 1946 with the degree of M.Sc.

J. P. Mooney, M.E.I.C., of Saint John, N.B., has been elected president of the Association of Professional Engineers of the Province of New Brunswick. He is manager of Mooney Construction Co., Saint John, and is a past councillor of the Engineering Institute.

Prof. J. H. Moore, M.E.I.C., who is associate professor of civil engineering, University of New Brunswick, Fredericton, is vice-president of the Association. Councillors are: **D. O. Turnbull,** M.E.I.C., consulting engineer of Saint John, who is chairman of the Saint John Branch of the Engineering Institute; **V. S. Chesnut,** M.E.I.C., port engineer, National Harbours Board, Saint John; **C. D. MacDonald,** M.E.I.C., consulting engineer, Weightman, Carey & MacDonald, Amherst; **B. E. Bayne,** M.E.I.C., of the C.N.R., Moncton; **D. J. Brewer,** M.E.I.C., president and manager, The Planet Construction Co. Ltd., Fredericton, and **R. C. Eddy,** M.E.I.C., retail manager with George Eddy Co. Ltd., Bathurst.

T. W. Toovey, M.E.I.C., has been appointed development engineer of The Sherbrooke Machineries Limited, Sherbrooke, Que. Until his recent appointment, Mr. Toovey was associated with the Whitemarsh Research Laboratories of Pennsylvania Salt Manufacturing Company where he was pulp and paper technologist, investigating bleaching processes, and applications of new chemicals in the pulp and paper field.

Before his affiliation with the Whitemarsh Laboratories, Mr. Toovey served as research chemist and technical consultant for Harmanetzer Papierfabrik, Harmanec, Czechoslovakia. Previous work also included association with Dr. E. Heuser at Canadian International Paper Company.

E. S. Braddell, M.E.I.C., is electrical and mechanical engineer with the chief architect of Trans-Canada Air Lines at Montreal. He was at Winnipeg, Man. prior to the transfer of T.C.A. executive headquarters to the International Aviation Building at Montreal.

Previously, he had been associated for a number of years with the engineering department of the Winnipeg Electric Co. and with the Power Apparatus Department of the Northern Electric Co. Ltd. While with the R.C.A.F. aero-engineering Branch during 1942-1945, he served in No. 6 (R.C.A.F.) Group of Bomber Command and was subsequently mentioned in despatches.

Mr. Braddell holds the degrees of B.Sc. (E.E.) and B.A. from the University of Manitoba and he is a member of the Association of Professional Engineers of Manitoba.

E. C. Hay, M.E.I.C., of Canadian Westinghouse Company, has been transferred to the Vancouver office of the Company to assume responsibility for the application and design of Nofuz products and associated equipment, and for co-ordination in manufacture and sales of the same products.

He was previously in the Toronto office of Canadian Westinghouse. He has been with the Company since his graduation from University of British Columbia in 1930, with the exception of two years during the recent war, when he served in the Directorate of Electrical and Communication Design, of the Department of National Defence at Ottawa.

Arthur Laplante, M.E.I.C., a resident of Quebec City, and president of Quemont Construction Inc. of Montreal, was elected a director of the Quebec Road Builders Association at the annual meeting held at Montreal recently.

G. A. McCubbin, M.E.I.C., of Chatham, Ont., at the age of 81 is still carrying on as a civil engineer. In February this year he was guest of honour at the 68th annual meeting of the Macaulay Club of which he is honorary president.

In his long career, Mr. McCubbin has been associated with a number of the largest drainage and land reclamation schemes in the province of Ontario. He has also handled numerous lesser projects.

Mr. McCubbin took up the study of engineering after teaching for six years and entered into practice at St. Thomas, Ont., where he was for some years a member of the well known drainage partnership of Bell & McCubbin.

Mr. McCubbin's work, as well as testimony in drainage litigation, and work as a consultant, have taken him to all parts of the Province. He served, also, as drainage consultant for the province of Alberta.

Mr. McCubbin surveyed several townships in Northern Ontario, for the Provincial government, in 1897, 1901 and 1903.

Of his drainage enterprises, the more important ones were improvement of the "Canada Company cut" at Lambton County about 1922, work on the Raleigh Plains in 1912, and the proposed improvement to the Nottawasaga River.

H. T. Miard, M.E.I.C., of the British Columbia Department of Public Works was appointed divisional engineer at Nelson, B.C., in January, 1950.

He joined the Department at Nelson in 1947 coming from Lethbridge, Alta., where he had been assistant district airway engineer for the Department of Transport.

Mr. Miard graduated in civil engineering from the University of British Columbia in 1933. He worked for the Department of Mines and Resources until 1940, when he joined the Department of Transport. It was in 1944, that he received the appointment as district airway engineer.

Mr. Miard was secretary-treasurer of the Lethbridge Branch of the Institute in 1946.

Helen Jean Baxter, M.E.I.C., on receiving recently a certificate of membership in the Association of Professional Engineers of New Brunswick, became the first woman entitled to practice professional engineering in New Brunswick, and one of the first in Canada.

Miss Baxter graduated from the University of New Brunswick in 1947. She is the first woman to have merited the degree of bachelor of science in civil engineering, at U.N.B.

Her first employment was as a general draughtsman at the Highway Division of New Brunswick Department of Public Works. After six months she was transferred to her present position as draughtsman in the office of the Provincial Architect in the same department.

The presentation of her certificate by Dr. A. F. Baird, Fredericton, was the highlight of a joint dinner of the Association and the Saint John Branch of the Institute in January.

C. R. Matthews, M.E.I.C., who was formerly on the staff of Dr. P. L. Pratley, Montreal accepted an appointment in the plant engineering services division of the National Research Council, Ottawa, in January, 1950.
Mr. Matthews graduated in mechanical engineering from McGill University in 1943.

J. S. Hubley, Jr.E.I.C., is in Houston, Texas, employed as senior engineer in the Gulf Coast District of The Railroad Commission of Texas, Oil and Gas Division.
Mr. Hubley graduated from Mount Allison University, in 1939, and after some time in the oil industry in Canada and Trinidad, B.W.I., and after four years service in the R.C.A.F. he attended University of Texas, where he received the degree of B.Sc. in petroleum engineering in 1946. He then worked with the Shallow Water Refining Co., Garden City, Kansas; and in 1947 joined the Texas Railroad Commission as a petroleum engineer.

R. R. Schieck, Jr.E.I.C., is employed with H. G. Acres and Company, Niagara Falls, Ont. He graduated from the University of Toronto in 1947 with the degree of B.A.Sc., in mechanical engineering.

D. C. MacVicar, Jr.E.I.C., has been appointed district engineer for the Provincial Department of Public Works at Merrit, B.C.
Mr. MacVicar graduated in 1947 from Queen's University with the degree of B.Sc. in civil engineering. Recently he was resident engineer on construction of the Sicamous Narrows Bridge, and resident and locating engineer on the Trans-Canada Highway revisions in the Fraser Canyon.

A. L. Sharpe, Jr.E.I.C., is now working with Canada Creosoting Co. Ltd., in Montreal. He was at Toronto previously with the Ontario Hydro Electric Power Commission.
He graduated from Queen's University in 1944 with the degree of B.Sc. in mechanical engineering.

R. J. Scarabelli, Jr.E.I.C., is employed by the Department of Public Works of Canada in Ottawa, Ont. He was formerly with Grant Mills Ltd., Montreal, general contractors. He graduated in 1947 from McGill University, Montreal, with the degree of B.Eng. (civil).

Ritchie MacPherson, Jr.E.I.C., was recently appointed pulp superintendent of the Laurentide division, Consolidated Paper Corporation at Grand'Mère, Que. He joined the Company immediately after he received his engineering degree from the University of Saskatchewan in 1944.

David Feldman, Jr.E.I.C., has joined Matthew Moody & Sons at Terrebonne, Que. He worked previously with Stadler, Hurter & Co., Montreal. He graduated from the University of Saskatchewan in 1945 with the degree of B.Sc., in mechanical engineering.

Lieut. B. Yarymovich, S.E.I.C., is in the Royal Canadian Electrical & Mechanical Engineers, stationed at No. 202 Base Workshop, Montreal.
Lieut. Yarymowich graduated from the University of Toronto in 1949 with the degree of B.A.Sc. in chemical engineering.

Bernard Geller, S.E.I.C., is with the Abitibi Power and Paper Company in Toronto. He was previously structural designer with Truscon Steel Co., Montreal. He graduated from McGill University in 1948 with the degree of B.Eng. in civil engineering.

M. A. Gagnon, S.E.I.C., a graduate in civil engineering from Ecole Polytechnique, Montreal, recently joined the staff of the Austin Company, consulting engineers, in Montreal.

Howard Cant, S.E.I.C., has been employed since November 1949 as a trainee in the engineering and maintenance department of the Canadian Kodak Co. Ltd., Toronto.
Mr. Cant graduated from the University of Toronto in 1949 with the degree of B.A.Sc. Up to November, he was with a Department of Mines and Resources location survey party working on the Whitehorse-Dawson City-Mayo Landing highway in the Yukon.

R. R. Cheyne, S.E.I.C., is working for General Steel Wares Limited in London, Ont. He graduated from the University of Saskatchewan in 1949, with the degree of B.Sc. in mechanical engineering.

Visitors to Headquarters

R. Pollard, M.E.I.C., Nelson, B.C., March 27.

John Oliver, M.E.I.C., Vancouver, B.C., March 27.

G. B. Shannon, U.K. High Commissioner, Ottawa, Ont., March 21.

W. A. Abbott, Ministry of Education, England, March 21.

A. P. M. Fleming, England, March 21.

E. L. Ball, M.E.I.C., Newfoundland, March 20.

Sir Hugh Beaver, M.E.I.C., England, March 16.

H. R. M. Acheson, Fort William, Ont., March 13.

D. O. Turnbull, M.E.I.C., Saint John, N.B., March 16.

Headquarters Records

Each time the *Journal* or other Institute mail is dispatched we are advised of undeliverable items due to incorrect addresses. Our records staff must follow up these changes and the regular service to members suffers thereby. *Please* advise headquarters when your address or occupation changes. The form below can be completed, clipped, and mailed to headquarters in a few moments.

Please Print

Name ....
Surname Given names

Home Address .... ☐

Employer ....

Employer's Address .... ☐

(Check address to be used for Institute mail.)

Product or Service ....

Position or Title ....

Degree, Year & College ....

Advise Headquarters Promptly of Changes

Obituaries

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

Arthur Amos, M.E.I.C., Montreal civil engineer, who was formerly associated with the Quebec Streams Commission, died on March 23, 1950.

Mr. Amos was born in Montreal in 1875. He studied at Ecole Polytechnique, graduating with honours in 1895, being awarded several medals upon graduation. Following a tour of Europe he returned to Montreal and entered the Federal Government service when the Laurier administration was equipping Montreal Harbour and dredging a channel from Quebec City to Montreal to enable ocean-going ships to moor here.

Serving with the federal hydro-electric engineers until 1919, he also surveyed the St. Lawrence River from Lake Superior down to Cap Chat.

Later he was given by the provincial ministry the task of forming a Streams Commission, under the chairmanship of Hon. S. M. Parent. Mr. Amos then served as liaison officer between the Commission and the Provincial Government.

Following this, and after he had travelled by canoe over the major streams in Quebec, he undertook the task of classifying lakes and rivers in Quebec as well as of renaming several of them. He was, for a long time, an active member of the Quebec Geography Commission.

Retiring in 1937, he devoted his time from then on to music and astronomy, life-long interests.

He joined the Engineering Institute in 1899 as an Associate Member, transferring to Member in 1940.

Homer P. Keith, M.E.I.C., of Edmonton, Alta., passed away in hospital on February 14, 1950.

Mr. Keith had served with the Alberta government in various capacities for 20 years, and for several years during the Second Great War directed airport construction for the Federal Government along the Alaska highway.

Born at Comber, Ont., in 1883, he received his early education there. He graduated in 1907 from the University of Toronto with the degree of B.Sc. in civil engineering.

That year he went to Edmonton and for a time was in private practice there. He joined the Public Works Department of Alberta in 1917 as district engineer, was appointed resident highway engineer in 1920 and chief construction engineer for the Province in 1924. He was appointed deputy minister of public works in 1924.

Mr. Keith was regarded by provincial public works officials as an outstanding technician. In recognition of his work on highway construction and traffic problems he was appointed chairman of the Highway Traffic Board, serving as chief until his retirement in 1937.

He later became associated with the Dominion Department of Transport. Appointed in 1944 to the post of district airway engineer to direct airport projects in the north, he was responsible for construction of some $5,000,000 in wartime airport work.

On leaving the government service, he joined Arctic Coals Ltd., Edmonton, as general manager.

Mr. Keith joined the Institute in 1922, as an Associate Member, transferring to Member in 1940.

Allan Hugh Russell, M.E.I.C., of the Algoma Steel Corporation Ltd. of Sault Ste. Marie, Ont., died on February 14, 1950.

Mr. Russel, born at Renfrew, Ont., in 1888, studied at Renfrew Collegiate Institute and McGill University, Montreal. He worked at the hydro electric power plants of the Renfrew Power Company and the Lake Superior Power Co., Sault Ste. Marie, Ont., until 1912. The next year he was made assistant to the field engineer in the water power department, of Algoma Steel Corporation Limited, and in 1915 he was senior operator of the Corporation's hydro plant. After this he was with the Spanish River Pulp and Paper Co. at Sault Ste. Marie for four years before entering the civic service in 1921 as assistant city engineer. In 1925 was appointed city engineer of Sault Ste. Marie, and he remained twelve years in that position. He then spent two years as a sales engineer with Lyons Fuel Hardware & Supplies Ltd., after which he joined the Algoma Steel Corp. Ltd., as a civil engineer.

He joined the Institute in 1922 as a Junior, transferring to Associate Member in 1925, and to Member in 1940. He was active in the Sault Ste. Marie Branch, serving as its secretary-treasurer in 1927.

E. M. Woollcombe, M.E.I.C., M.B.E., of Halifax, N.S., vice-president and general manager of Foundation Maritime Ltd., died on March 5, 1950. He was well-known in Canadian and American shipping circles and the Canadian construction field.

In addition to being vice-president of the parent firm, Mr. Woollcombe was also vice-president and general manager of Maritime Towing and Salvage Limited and vice-president and director of Quebec Salvage and Wrecking Co. Ltd. He was president of Foundation Maritime (Atlantic) Ltd., and a director of Construction Equipment Company Ltd., Gunite and Waterproofing Ltd., and Atlantic Tug and Equipment Company Ltd.

Mr. Woollcombe was born at Ottawa, Ont., in 1901. He studied at Ashbury College, Ottawa, and from 1917 to 1920 attended Royal Naval College of Canada. After graduating from naval college in 1920 he attended McGill University in Montreal and upon graduating was gold medalist in mechanical engineering.

When the R.C.N.V.R. was being organized in 1924, Mr. Woollcombe devoted a lot of his time to this organization and served at Ottawa and Montreal and upon his retirement held the rank of Lieut. Commander. He offered his services during the Second World War but was requested to remain in his civilian occupation where he did valuable work in Atlantic Coast Salvage operations. As a result of this outstanding service, Mr. Woollcombe was awarded the M.B.E.

He worked for Montreal Engineering Company in design of water power, for a time before joining Foundation Company of Canada in 1924, for whom he worked on the Lachine Canal at Montreal. He left to go to International Paper Company and Gatineau Power Company from 1925 to 1933, to work on hydro electric power developments. For the last five years of that period he was assistant manager of their Development Department. He returned to Foundation Company of Canada, in Montreal, in 1933, as special assistant to the president.

In 1937 he went to Halifax as General Manager and Secretary of Foundation Maritime Limited. A few months later he was made General Manager and Secretary of Maritime Towing & Salvage Limited. In 1942 he became General Manager of both Companies and in 1947, Vice-President.

Mr. Woollcombe was instrumental in the organizing of the Eastern Canadian Tug-Boat Owners Association and was President at the time of his death. This organization is the recognized association of tug-boat owners operating in Montreal, Sorel, Quebec, Halifax and Saint John.

A member of the Nova Scotia Construction Association, Mr. Woollcombe was a past-president of the Halifax

Charles A. Fowler, M.E.I.C.

Edward M. Woollcombe, M.E.I.C.

Construction Association, an affiliate of the Halifax Board of Trade.

He joined the Institute as a Junior in 1925, transferring to Member in 1945.

C. A. Fowler, M.E.I.C., of Halifax, N.S., construction engineer and architect, died suddenly on March 4, 1950.

Mr. Fowler was born at Amherst, N.S., in 1891. He received a bachelor of science degree from the Nova Scotia Technical College, in 1914. He was county engineer in 1914 for the Department of Roads and Bridges of Nova Scotia, and in 1915 he was instrumentman for the Halifax Ocean Terminals. He was field engineer, for the Nova Scotia Tramways and Power Co., at Halifax in 1916. In 1917 he became construction superintendant for the Company. He joined Halifax Shipyards Ltd., in 1918, and was assistant chief engineer for three years. It was in 1921 that he founded the firm C. A. Fowler & Co., engineers and architects, which he headed up to the time of his death

His work in construction and architecture brought him prominence throughout the Dominion and particularly in the Maritimes. There he designed numerous schools, churches, garages and public buildings. Among them are the huge Halifax Shipyards, Ltd., main office and store, plate shop, machine shop, general shop, shipways and rebuilding of a 600-foot drydock and two marine railways. Among his outstanding recent works are the Halifax County Vocational High School, now under construction; the Queen Elizabeth High School and Auditorium; the new men's residence at Mount Allison University; and the new addition to Mount St. Vincent College.

For many years he was associated with Dr. P. L. Pratley, M.E.I.C., of Montreal, as provincial consultant, and he was instrumental in design of the Canso Bridge, to connect Cape Breton Island and Mainland Nova Scotia. Work on the $13,000,000 project is expected to begin shortly.

Dr. Pratley and Mr. Fowler also drew up plans for a Halifax Dartmouth bridge in 1931, which is under consideration now.

During the recent war, he served with the active forces as an artillery major from 1939 to 1941 commanding the 10th Searchlight Battery. Later he was on special duty with the Department of National Defence.

At the time of his death, Mr. Fowler was president of the Nova Scotia Association of Architects. He was a member of the National Research Council. A past president of the Alumni Association of Mount Allison University, he was also a member of the board of regents of Mount Allison, and served on the board of governors of Nova Scotia Technical College. He held membership in the Association of Professional Engineers of Nova Scotia and New Brunswick, and was a member and past-councillor of the Royal Architectural Institute of Canada.

Joining the Institute as an Associate Member in 1919, he transferred to Member in 1923. He was active in the work of the Halifax Branch, serving at one time as chairman of the Branch.

Michael M. Elwood, M.E.I.C., who had joined the sales personnel of Laurentide Equipment Company Limited, Montreal, in January this year, died in a motor accident on March 3, 1950.

Mr. Elwood was born at Petrokov, Russia, in 1904. He graduated in mechanical engineering from the German University of Brunn, in 1931, after which he worked on aero-engines and aircraft controls and later in special and heavy vehicles for the Cirrus-Hermes Engine Company Limited in London, England. Among other positions he held in Europe before and during the recent war was that of assistant to the general manager and chief of department of the Special Vehicle Division of the Skoda Works Ltd., in Pilsen, Czechoslovakia.

After the war, he was a technical adviser to the U.S. Military Government in Bavaria, Germany. In Montreal in 1949, he was appointed test and research engineer in the engineering department of Sicard Inc.

He joined The Engineering Institute of Canada in November, 1949.

News of the Branches

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

Border Cities

J. K. Ronson, M.E.I.C.
Secretary-Treasurer

J. A. MacGibbon, M.E.I.C.
Branch News Editor

The regular monthly meeting of the Border Cities Branch was held in the Prince Edward Hotel on February 17, 1950. A supper preceding the business meeting, was addressed by Vice-President J. A. Vance, and Chairman J. G. Hoba presided.

The speaker emphasized that the great need for close contact between branches and headquarters has long been recognized. The president is chiefly concerned with questions of policy and the general secretary is kept busy on matters of general administration. However, it was thought that the vice-presidents, who were senior members who had usually served as councillors, could provide valuable assistance in matters of policy. The president had, therefore, requested the vice-president to visit the various branches regularly.

He stated that, despite a comparatively large number of branches, many more could be added in view of the large territories involved. There are many engineers located in the North who are not given service or much consideration. As new branches are formed, it is necessary that consideration be given to the re-allocation of territories assigned to existing branches and that changes are dictated on the basis of the best service that can be rendered.

He reviewed the need for work among engineering students to help them and to induce them to join the Institute. The good work done by H. Bennett in this respect was outlined and the establishment of the Bennett Educational Fund was explained. It was also pointed out that a committee had been set up to study the methods and latitude of financing the fund.

In the course of his many trips around the country, the vice-president said, he has come, more and more, to realize the great part engineers have played and are still playing in the development of Canada. He does not share the widespread feeling that too many engineers are being graduated. He feels that there need not be any surplus of engineers. On the contrary, a large number of engineers should tend to extend and broaden the fields of engineering and thus help to develop the country further. He advises the young engineer to think of pioneer development and to get into those industries where there are now no engineers and where jobs are being done by practical men.

The commendable work done in Canada in recent years by Canadian scientists was reviewed briefly. The admission to the Institute of scientists employed in engineering capacities is due for detailed study in the near future.

The respective services and functions of the Institute and the Provincial Associations were reviewed briefly.

Pleasure was expressed about the official visit of the vice-president to the branch. There seems no doubt that such visits will achieve their desired results and it is certain that members will look forward to future visits with pleasant anticipation.

Cornwall

L. H. Snelgrove, jr.e.i.c.
Secretary-Treasurer

A. A. B. McMath, m.e.i.c.
Branch News Editor

On March 14, the Cornwall Branch heard an address on Canada's oil resources. The guest speaker was Mr. Vernon Taylor, operations supervisor in the Producing Department of Imperial Oil Limited, Toronto. In the Conference Room of Howard Smith Paper Mills, he spoke to a group of 34, which included guests from the Chemical Institute.

Mr. Taylor, a Westerner, has had many years experience in the industry. With the help of lantern slides, he described Alberta's large producing fields — Turner Valley, Leduc, Redwater and Golden Spike. He also outlined methods of exploration and drilling. after a brief review of Canada's oil history since 1861. The physical nature of an oil field was described and a piece of the porous rock in which oil is contained was exhibited. An explanation of the Alberta Government's methods of leasing oil fields then followed.

In oil production, Canada now ranks next to Texas, which produces one third of U.S. oil. This spring a 1150-mile pipe line to the head of the Great Lakes will be started. This will open up Eastern Canada markets. Already Canada has saved, since Leduc started in 1947, $90,000,000 in U.S. funds. The pipe line is expected to increase this saving by an additional $50,000,0000 by 1951.

A colour film entitled "A Mile Below the Wheat" showed how Canada is harvesting her oil crop from sources far beneath her wheat crop. A lengthy and varied question period was well handled by Mr. Taylor and indicated still further how well informed he is on the industry.

Branch chairman G. G. M. Eastwood was in charge of the meeting. P. A. Nasmyth made the arrangements for the guest speaker. H. W. Nickerson opened the lecture period by introducing Mr. Taylor. An expression of appreciation and thanks by A. A. B. McMath closed the meeting.

Hamilton

I. M. MacDonald, jr.e.i.c.
Secretary-Treasurer

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

On Thursday, January 12, 1950, the Hamilton Branch held its annual meeting at the Scottish Rite Round Room. Members assembled for supper at 6.45 p.m. and after supper re-assembled to enjoy an illustrated lecture on **Design Features of the Des Joachims Development** presented by Mr. A. L. Malcolm, assistant engineer, H.E.P.C.

Mr. Malcolm explained various stages of the vast project on the Ottawa River at the site of the little French village of Des Joachims, and he illustrated his remarks by means of lantern slides.

Equipment and supplies were brought in from railroad on huge floats which were pulled along a 42-foot super highway.

Pit run gravel was located within three miles of the dam site, crushed and transported to the storage area and from there to mixers by conveyor belts. Fifteen miles of roads were built around the dam site and linking it with the control dam.

Sluice kates are already closed so that spring run-off can be trapped to ensure partial operation this summer, as normal flow is required to operate other projects further downstream.

Mr. Malcolm stated that there was enough concrete poured to build a standard width sidewalk from Toronto to Winnipeg. When completed the project will develop 480,000 hp.

Mr. H. A. Cooch introduced the speaker and Mr. J. B. Carruthers moved a vote of thanks.

Guests at the head table included: E. A. Cross, past chairman, Toronto Branch; W. A. T. Gilmour, councillor; Chancellor Gilmour, McMaster University; L. C. Sentance, chairman designate; A. L. Malcolm; H. A. Cooch, president, Canadian Westinghouse Co. Limited; R. O. Morse, chairman, Chemical Institute, Hamilton Branch; W. J. W. Reid, vice-president, E.I.C.; E. J. Lillicrap, Hamilton Construction Association; I. MacDonald, secretary-treasurer; Neil Metcalf, chairman.

The chairman opened the business meeting. Minutes of the previous annual meeting and the financial statement were adopted. The report of the Nominating Committee about the 1951 executive was accepted. The chairman thanked Chancellor Gilmour for the facilities extended to the Branch during the past year.

The slate of officers for 1950, as presented by the nominating committee, was as follows: chairman, L. C. Sentance; E. T. W. Bailey, vice-chairman; George Schneider, secretary-treasurer. Members of the executive were W. L. Hutchison, W. R. McColl, J. B. Carruthers, W. A. Dawson. Ex-officio members of the executive are: W. J. W. Reid, vice-president; Councillor W. A. T. Gilmour; Neil Metcalf, the past-chairman; and I. MacDonald, the past-secretary.

Kingston

D. L. Rigsby, m.e.i.c.
Secretary-Treasurer

James T. Provan, jr.e.i.c.
Branch News Editor

On Tuesday, February 28, 1950, a joint meeting of the Kingston Branch of the Institute and the Engineering Society of Queen's University was held at the Queen's Memorial Union, Queen's University. The evening consisted of the reading of students' papers, films, discussion period and refreshments.

Several papers were presented, with Mr. James H. Bleaney winning the General Contratcors' Association prize for his paper entitled **Roadbuilding in the Arctic in Permafrost Areas.** Winners of the Engineering Institute prizes were, first, Mr. C. G. Saunders speaking on **Length Stress Relationship of 65ST Strip Specimens When Bowed in Fixed Length Holders for Stress Corrosion** and, second, Mr. R. H. Rehder speaking on **The Shaded Pole Induction Motor.** Honorable mention went to Mr. W. G. Cook for his paper on **Resistance Welding.** All students participating were given a subscription to *The Engineering Journal* and membership fees for a period of one year.

Students were introduced by Mr. R. Wheelan, president of the Engineering Society of Queen's and the prizes were presented by Mr. C. Smith representing the General Contractors' Association. and by Major A. L. MacLean representing the Engineering Institute of Canada.

Judges for the evening were Messrs. B. R. Currie, commissioner of works of the City of Kingston, Major G. W. Thompson, r.c.e.m.e. and F. M. Wood, mathematics professor of Queen's.

The meeting was drawn to a close after a short talk by the chairman of the Kingston Branch, Professor J. W. Brooks, which was followed by an informal discussion period during which refreshments were served.

Saguenay

F. E. Hogg, m.e.i.c.
Secretary-Treasurer

At the Arvida High School Assembly Hall on the evening of March 7th, 55 members of the Saguenay Branch and their friends heard Mr. D. Weston discuss **Two Recent Developments in Grinding, The Aerofall Mill and Tungsten Carbide as a Grinding Medium.** The speaker, originally from British Columbia, was introduced by chairman Mr. W. F. Campbell.

The mill is a dry combined crushing-grinding unit, capable of taking run-of-mine or quarry minus 18 in. sized material and reducing it in a single operation to as fine as 99 per cent minus 325 mesh. Air classification is employed and the product may be collected in either a wet or dry type cyclone. Depending upon the nature of the material to be treated and the capacity required, the unit may be operated using the material itself as the total charge, or with an additional charge of steel or tungsten carbide balls.

Tungsten carbide balls were developed because of their greater specific gravity and greater wear resistance. It is expected that a widened market will result in a lower price of tungsten carbide balls (now $5.00 a pound).

Great interest was shown and numerous questions were asked. The speaker was thanked by Mr. B. L. Davis.

Junior Section

K. Cram, jr.e.i.c.
Secretary-Treasurer

G. K. Clement, m.e.i.c.
Acting Secretary

At a meeting of the Saguenay Branch Junior Section, in the Arvida High School, the evening of February 7, Chairman F. H. Duffy presided.

Mr. M. Fredericks presented a paper on the manufacture of **Penicillin.** Mr. Fredericks, now with the Aluminum Company of Canada, Limited, formerly worked on the manufacture of penicillin with Ayerst, McKenna and Harrison. He described the history and various methods of penicillin production; and told of the high degree of purity required, and the exact control needed. The flowsheet and the coloured movies provided by Mr. Fredericks helped to make his paper highly informative and extremely interesting. He received a hearty vote of thanks from the rather small but enthusiastic group of listeners.

The remaining item of business was a preliminary announcement of the dinner meeting to be held in March.

NIAGARA PENINSULA GREETS THE PRESIDENT

In the photo at left are some of the officers at the head table. Left to right, W. J. W. Reid, President Armstrong, A. G. Asplin, J. A. Vance and P. E. Buss.

The photo at right shows some of the engineers who attended and met the president.

Saint John

W. M. Brenan, M.E.I.C.
Secretary-Treasurer

J. A. Flood, JR.E.I.C.
Branch News Editor

The Saint John Branch of the Institute and the Association of Professional Engineers of N.B. attended a joint dinner meeting in the Georgian Ballroom of the Admiral Beatty Hotel on Thursday evening, January 26, subsequent to the all day sessions of the annual meeting of the Association. The chairman of the Institute, D. O. Turnbull presided. Members of the Architects' Association of N.B., prominent local contractors, and a body of engineering students from U.N.B. were present as guests.

The highlight of the dinner meeting was the presentation by Dr. A. F. Baird of an Association membership certificate to Miss Helen Baxter of Fredericton, licensing her as the first woman to practise professional engineering in New Brunswick. Congratulations were extended to Miss Baxter by the chairman and by Dr. E. O. Turner, Fredericton, regional vice-president of the Engineering Institute on behalf of its officers and members.

Councillor M. L. McPhail on behalf of Mayor Patterson and the city council, extended a welcome to out of town guests and his best wishes to members of both organizations.

The toast to the Association of Professional Engineers was proposed by Dr. Baird, who touched briefly on the growth of the organization and its work in promoting the welfare of the engineers in the province; replying to this toast Mr. John Mooney, newly appointed president of the Association spoke of the contributions made by engineers in the growth of this city and province.

The toast to the E.I.C. was proposed by Andrew G. Watt, executive member, who also voiced his congratulations to Miss Baxter. In his toast to the Engineering Profession, Mr. Watt stressed the need for a much more active public

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MONTREAL BRANCH DANCE

On February 17 the Montreal Branch held its third annual dance. It was a particularly successful event this year. The obviously enthusiastic group in the left hand picture are (clockwise from the left) Earle Brown and Mrs. Brown, Ken Roast, Miss Elinor Tait, John Dickinson and Mrs. Dickinson, Leslie Tait, Miss Anne Martin, Lindsay Morris and Mrs. Morris, Gordon Shetler and Mrs. Shetler.

In the right hand picture are Mrs. Eadie, Mr. R. S. Eadie, Mrs. Flitton, Mr. R. C. Flitton, Mr. and Mrs. J. B. Stirling, and Mrs. W. D. Laird.

relations effort by both the Association and Institute with a view to greater professional recognition among the engineers of the province.

Robert B. Gander, president of the U.N.B. Engineering Society spoke briefly, thanking both organizations present for their interest in the welfare of the engineering students.

Following the dinner meeting a film on "The Drama of Portland Cement" was shown through the courtesy of Portland Cement Association by Mr. George Chittick of this city.

Vancouver

Alan Fletcher, jr.E.I.C.
Secretary-Treasurer

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

Vancouver Branch members made a field trip to the University of British Columbia Physics Department on Wednesday, March 15. Dr. Gordon Shrum, head of the department, had extended the invitation to members and friends to acquaint them with the new permanent quarters and with work being done by the enlarged Physics Department at the University.

Dr. Shrum gave a short address to describe the research work in progress departmental equipment, and enrolment. There are fifty graduate students, sixteen of whom are working on doctorates and thirty-four on master's degrees. The reputation of the University's Physics Department has travelled through the British Empire and graduate students from Tasmania, New Zealand, England and Eastern Canada are enrolled. The new Physics Building has been open two years and has acquired an amazing amount of research and teaching apparatus to assist the expanded enrolment.

Approximately one hundred-fifty members, students and friends were conducted, in groups, through the building by members of the Physics Department staff. Outstanding work is being done at present on nucleur physics in co-operation with the National Research Council. The Van de Graaff generator is almost ready for testing at the University and when this is completed the facilities of the department for nuclear research will be much increased. Research of a highly technical nature is being done by the graduate students; the majority of projects being centred on nucleur physics, spectrometry, optics and bio-physics. Most of the engineers present were somewhat confused by the highly intricate technical apparatus and projects underway.

Many thanks are due to Dr. Shrum and his staff and to the graduate students who devoted an evening to making the visit an outstanding success for the Branch.

Victoria

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

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

Topographical Mapping by Helicopter was the subject of an interesting paper given before the Victoria Branch, on March 17, by Mr. G. C. Emerson, B.C.L.S. and D.L.S.

To speed up the field work of the photo-topographical mapping the Provincial Topographical Division has been using the Helicopter for rapid transportation between triangulation stations.

The short field season is from June to October, and weather causes delay at times. In an effort to decrease time lost in travelling between locations, the topographical division carried out some Bell helicopter tests in the summer of 1948 near Chilliwack, B.C., in which they used the machine for the transportation of survey crews. As a result of these tests it was decided to make a full season's helicopter operation at Hazelton in Northern B.C. in 1949.

The work at Hazelton consisted of moving two-man crews to mountain areas where two or more photographic stations could be occupied. In planning these trips from the surveyors' point of view, it was necessary to consider occupation of stations, emergency routes out, food and equipment, weight, supplementary supplies and communications.

In all helicopter operations the weight of the food, equipment and men had to be known within 15 pounds. With camps well above the timber line, Coleman stoves and gas were carried as well as the usual surveyor's equipment including instruments, tents, sleeping bags and radio. The total weight of equipment for a two-man crew ran to 275 pounds, with food contributing 81 pounds of this.

Communication by two-way forestry radio sets were used, with one operating from the main camp to the three mountain camps. The mountain sets were stripped of all non-essentials and a short aerial was used, making a total weight of 30 pounds.

Of equal importance to the problems of the surveyor are those of the pilot. An increase of either altitude or temperature, resulting in a decrease in the density of the air, has a limiting effect on the range of the helicopter. No landing or take off must be considered routine, and as a guide the machine is equipped with a good thermometer which is consulted before a flight is started or a landing made. Wind speeds of 20 miles per hour are beneficial for both landings and take-offs but above this velocity the wind is too turbulent. For trial landings use is made of the No. 77 smoke bomb to determine the wind velocity and direction.

Hovering distances for the Bell helicopter are only two or three feet at an altitude of 5000 feet above sea level and it is important at such altitude to know exactly where you will come down. With this in mind, landing areas once tested are marked with yellow cloth for future use.

The problem of take-off is often the most difficult, and at the higher altitudes it is often necessary to side-slip into the valley from the mountain side after gaining the initial altitude of a few feet.

In order to make full use of the daylight hours and to travel during the cool of the morning and evening, flying time started at 7.25 a.m. and finished at 6.10 p.m. Actual flying time is equal to less than half of this with the rest of the day taken up with loading and unloading, refueling, etc. With such a concentrated effort of pilot and crew fatigue becomes an important item.

With the elimination of much of the climbing, survey crews are spending more time on the job and doing more points in a day. Mr. Emerson believes that with this accelerated programme, a 3-man survey party would give better distribution of the work and reduce the fatigue.

He paid high compliments to the pilot of their operations, Carl Agar, stating that the success to date has been mainly due to his steady nerve and the slow and easy progress from the known to the unknown.

A lively question period followed and then slides of the summer activities were shown. The speaker was thanked by J. A. Merchant, on behalf of the Institute for his interesting and well Illustrated talk.

Winnipeg

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

R. T. Harland, M.E.I.C.
Branch News Editor

A joint meeting of the Winnipeg Branch E.I.C. and the Association of Professional Engineers of the Province of Manitoba, was held on March 16, 1950. The guest speaker, Mr. J. M. Fairbairn, president of Chas. Warnock and Co., Montreal, chose as his subject **Inspecting and Testing Procedures.** Mr. Fairbairn pointed out the importance of adequate inspection and test of materials, parts, and sub-assemblies going into the construction of engineering structures and apparatus. Several interesting slides were shown, illustrating defects which had developed in structures, and which could have been prevented by adequate test of components.

This meeting also witnessed the presentation of the three prizes awarded annually by the Branch for the best theses written by students at Manitoba University in the departments of civil, electrical and mechanical engineering. The three successful students this year were D. A. Young, S. S. Archer, and R. A. Ducker, all members of the Student section of the Branch. Each was introduced to the meeting by the head of his department at the University.

Electrical Section

J. C. Pratt, M.E.I.C.
Secretary-Treasurer

R. A. Williams, M.E.I.C., presented a paper entitled **Diesel-Electrics for Railway Service** before the Electrical Section of the Engineering Institute in Winnipeg.

The address touched upon pioneer development of Diesel-Electric Road Locomotives carried out in Canada around 1925. It was pointed out that in 1949 out of 1,800 new locomotives built for use on this continent, all but 23 were Diesels. Construction of steam locomotives has virtually ceased. Due to simplicity of operation, thanks to automatic load limiting, electrical drive thus far proved to be the most practical method of transmitting power from diesel to locomotive drive wheels.

Mr. Williams is now with the Johns-Manville Co. and was formerly associated with the C.N.R. as Diesel Supervisor i/c of maintenance and personnel from the Lakehead to Vancouver.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

April 20th, 1950

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

ALSTON—WALTER, of Montreal, Que. Born at Motherwell, Scotland, Oct. 25, 1907. Educ.: B.Sc., Glasgow Univ., 1930; A.M., I.C.E., London; 1930-32, dftsman., C.P.R., drawing office, Winnipeg; 1933, engr., Dumfries County Council, electricity dept., Scotland; 1933-34, engr., James Laidlaw & Sons, bldg. contractors, Glasgow; 1934-37, engrg. asst., civil engr. in chief's dept., Admiralty, London (this experience was accepted as professional training by I.C.E.); 1937-38, sr. civil engr., constrn., Edmund Nuttall & Sons, London; 1938-43, asst. civil engr., on constrn., chief's dept., R.N. Armament Depot, Admiralty, England; 1943-49, chief engr., on misc. contracts, George Wimpey & Co., England; 1949, civil engr., at head office for short period, then job engr., reconstrn. of wharf No. 20, Quebec City; Oct. 1949 to date, civil engr., assisting in making report on improvements to water supply of a town, structl. calculations for factory bldg., general office work, Surveyer, Nenniger & Chenevert, Montreal, Que.

References: R. F. Shaw, B. Griesbach, J. G. Chenevert, H. Asselin, J. Tetreault.

ARMSTRONG—WILLIAM McCOLL, of Vancouver, B.C. Born at Hamilton, Ont., Oct. 27, 1915. Educ.: B.A.Sc., Toronto, 1937; R.P.E., B.C.; M., I.M. & M.; 1937-43, various positions leading to supervisor of metallurgical labs., Steel Co. of Canada, Ltd.; 1943-46, Dominion Foundries & Steel (research Fellow); 1946, British Columbia Research Council; at present, Associate Professor of Metallurgy, Univ. of British Columbia, Vancouver, B.C.

References: H. M. Howard, S. H. DeJong, J. N. Finlayson, O. W. Ellis.

BAKANOWSKI—VLADIMIR JOSEPH, of Montreal, Que. Born at Berdyczow, Poland, May 27, 1913. Educ.: Technolog-Mechanik, State College of Machine Constrn. & Electrical Engrg., Poznan, Poland, 1935; Member, Assn. Polish Engrs. in Canada; 1935-37, calculator and designer steam locomotives and anti-aircraft guns, H. Cegielski, Poznan, Poland; 1937-39, asst. to mgr., organization of aircraft mass production and organization of stock material for intensified war production, Aircraft Plant, L. W. S. Lublin, Poland; 1942, arrived in Canada, worked as chief designer, Bloctube Controls Ltd., Montreal; 1942-47, R.A.F., Great Britain, rank of Flying Officer, responsible for organization, adm., teaching on numerous technical vocational training courses; returned to Canada, 1947-Nov. 1947 to date, calculator and designer, diesel electric locomotive divn., Montreal Locomotive Works, Montreal, Que.

References: S. Wolf, B. Szczeniowski, G. W. Painter, G. Wong, G. H. Krupski, Z. H. Krupski.

BIRD—DONALD JAMES, of London, Ont. Born at Toronto, Ont., Sept. 19, 1924. Educ.: B.A.Sc., (Civil), 1949; 1946, (summer), soils technician. H.E.P.C. of Ontario; 1947, (summer), layout man, McKay-Cocker, genl. contractors; with Towland Construction, highway and road construction, as follows: 1948, (summer), instru'man., 1949 to date, supervision, surveying and promotion work, London, Ont.

References: H. A. McKay, N. W. Smith.

BLEACKLEY—FRANK JOSEPH, of Montreal, Que. Born at Radcliffe, Lancs., Eng., March 19, 1918. Educ.: Radcliffe Technical College. 1931-34; with Bleackley & Ingham Ltd., Radcliffe, as follows: 1935-39, jr. (apprent.), dftng., taking-off quantities, minor design, assisting with survey and setting out, 1939-40, designing industrial plant structures, 1941, res. engr., i/c constrn. of rubber processing plant; 1941-43, sr. design engr. (steel), Trafford Park Steel Works, Manchester; 1941-43 (evenings), part-time maths. lecturer, Air Training Corps H.Q., Salford; 1943-45, Air Navigator, R.A.F.; with Thos. Walmsley & Sons Ltd., Bolton, Lancs.. 1945 (July)-1947, asst. chief design engr. (steel structures), 1947-48, res. engr. i/c constrn. chemical plants for Albright Wilson Ltd., Birmingham; Oct. 1948-1949, detailing bridges, no particular responsibility (gaining experience of North American practise), Dominion Bridge Co., Ltd., Winnipeg, Man.; 1949 to date, sr. design engr., Shawinigan Engineering Co., Ltd., Montreal, Que.

References: R. E. Heartz, A. L. Patterson, W. H. Sharples, J. D. Stott, H. M. White.

BOLES—JAMES, of Fort Garry, Man. Born at Spy Hill, Sask., July 12, 1914. Educ.: B.Sc., (Elect.), 1940; R.P.E., Manitoba; 1940, (6 mos.), apprent. engr., circuit breaker design, Canadian Westinghouse Co., Hamilton, Ont.; 1940-45, Royal Candn. Corps of Signals i/c Communication Training, Antwerp, first as Lieut., then Major; 1945 to date, engr. and asst. to the dept. head of municipal signal dept., planning, instln., supvrn. of mtce. traffic signals, fire alarm systems, police signal system, City of Winnipeg.

References: A. Sandilands, R. Noonan, W. L. Wardrop, M. D. Young, S. G. Wicks, R. A. Stewart, N. A. Williams, E. V. Caton.

CHIKOFSKY—HERBERT, of Sturgeon Falls, Ont. Born at Toronto, Ont., Nov. 11, 1923. Educ.: B.A.Sc., (Mech.), Toronto, 1948; R.P.E., Ontario; 1946 and 1947 (summers), Aluminum Co. and Atlas Steels Ltd.; 1948 to date, jr. design engr., design of layout and constrn., mtce., Abitibi Power & Paper Co., Ltd., Sturgeon Falls, Ont.

References: J. E. Freeman, A. L. Farnsworth, E. R. Eaton.

CHRISTIAN—EDWIN WILLIAM, of Edmonton, Alta. Born at Dartmouth, N.S., July 12, 1912. Educ.: B.Eng., (Mech.), Nova Scotia Tech. College, 1936; with Imperial Oil Limited, as follows: 1936-37, testman, refinery lab., Halifax, N.S., International Petroleum, Talara, Peru, 1937-38, as refinery process operator, 1938-40, jr. engr., 1940-43, refinery inspector and instrument engr., 1943-44, refinery mtce. engr., Tropical Oil Co., Barrancabermeja, Colombia, 1944-46, as chief refinery engr., 1946-48, divisional engr., (Imperial), 1948, (4 mos.), engr. "A" Montreal East, 1948, (2 mos.) "A" develop't. dept., Sarnia. Ont., 1948 to date, genl. Imperial Pipe Line Co., Ltd., Edmonton, Alta.

References: S. G. Coultis, G. L. Macpherson, B. P. Rapley, J. Rowan.

CRYSLER—RALPH EDWARD, of Toronto, Ont. Born at Toronto, Ont., Nov. 15, 1926. Educ.: B.A.Sc., (Civil), Toronto, 1949; 1944, (summer), chainman, Dept. of Transport; 1945, (9 mos.), rodman, Dept. of Highways, Ontario; 1948, (summer), instru'man., Toronto and York Roads Commission; instru'man., Rayner Construction Co.; with National Harbours Board, Churchill, Man., as follows: 1949, (June to Dec.), engr., Grade I. at present, engr. Grade II.

References: E. G. Cameron, C. G. J. Luck, J. M. Breen, D. O. Robinsson.

HUSTWITT—SYDNEY ARTHUR, of Calgary, Alta. Born at Toronto, Ont., June 14, 1892. Educ.: B.A.Sc., Toronto, 1914. 1911, (summer), chainman, Toronto & York Roads Commission; 1912, (summer), rodman, C.N.R., Toronto; 1914, (summer), instru'man., layout of concrete sidewalks, City of Toronto; 1914-16, asst. in layout and supvrn. watertight embankments, concrete work, open steel sheet pile caissons, Dept. of Railways & Canals, Dominion Government (constrn. Welland Ship Canal); 1916-19, Canadian Engineers, rank of Lieut.; 1919-20, res. engr., location concrete dock walls, Toronto Harbour Commissioners; 1920-22, plan examiner, City Architect's Dept., Toronto; 1930-37, res. engr., supervn. constrn. of road, levelman, transitman, layout, etc., Dept. Northern Development; 1937-40, Ontario Dept. Highways, surveys branch; 1940-41, Dept. National Defence, Works & Bldgs. Dept., R.C.A.F. (civilian staff); 1941-44, F/O, R.C.A.F., 1945-1949 (Dec. 31), transitman, layout of track work, dftng. general rly. plans, bldg. inspector, layout and supvrn. of bldg. constrn., C.P.R., Calgary, Alta.; at present, chief engr., National Harbours Board, Ottawa, Ont.

References: H. R. Younger, J. J. Hanna, W. B. Trotter, L. J. Daniels, E. F. Good.

LARIN—LOUIS, of Montreal, Que. Born at Montreal, Que., Sept. 23, 1895. Educ.: B.A.Sc., C.E., Ecole Polytechnique, 1918; R.P.E., Quebec; 1918-19, Fraser Brace Co., dftsman.; with Montreal Technical School, as follows: 1919-34, teacher, 1934-48, director of studies, 1948 to date, acting director.

References: J. A. Lalonde, I. Brouillet, L. Duchastel, H. Gaudefroy, J. A. Beauchemin.

LIMBURN—JAMES CHARLES, of Vancouver, B.C. Born at Portsmouth, Eng., Nov. 17, 1904. Educ.: H. M. Royal Naval Dockyard School, Portsmouth, Eng., 1920-24; H.M.R.N. Dockyard, Portsmouth as follows: 1920-25, apprent'ship., technical duties, 1925-27, technical duties; 1927-30, shift mech. engr., Eynsham Sugar Beet Co., Eng.; with following companies, responsibility in connection with constrn. and operation of coal carbonization plants and ancillary equipt. involved: 1930-31, mech. constrn. supvr., Portsmouth Gas Works, 1931-32, operating engr., Wandsworth Gas Co., 1932-34, asst. chief operating engr., Brantford Works, London, 1934. asst. res. engr., Brough Gas Works, 1935, asst. chief operating engr., Stalybridge Gas Co. 1935-36 asst. res. engr., Lambton, Hetton & Joicey, Durham, 1936, asst. res. engr., Yorkshire Chemical & Coking Co., 1936-37, res. engr., Portsmouth Gas Co.'s works, 1937, research engr., Moss Bay Works, United Steel Corp., Workington, 1937 (part), chief operating engr., Abergavenny Gas Co., 1937-38, res. engr., Bridlington Works, U.K. Gas Co., 1938-42, res. engr., gas division, British Columbia Electric Rly., Vancouver, B.C.; 1942-45, res. engr. and mech. supt., Sorg Pulp Co., Ltd., Port Mellon, B.C.; with British Columbia Electric Rly. Co., as follows: 1945-46, constrn. engr., gas divn., Vancouver, 1946-47, master mechanic, gas divn., 1947 to date, res. engr. Carrall St. Works of the gas divn. (for Gas Chambers & Coke Ovens Ltd., London, Eng.)—constrn. and operation of new carbonization plant, Vancouver, B.C.

References: G. W. Allan, P. H. Buchan, F. M. Cazaler, R. A. McLachlan, R. C. Pybus, T. M. Moran, N. C. Sherman, J. E. Macdonald, H. T. Libby.

MALTBY—FRANCIS OBBARD, of Sarnia, Ont. Born at Toronto, Ont., Jan. 27, 1924. Educ.: B.A.Sc., (Chem. Engrg.), Toronto 1946; with Polymer Corporation, Sarnia, as follows: 1946, (5 mos.), process engr., 1946-48, economics, 1948-49, process engr., 1949, (5 mos.), project engr., 1949 to date, process design engr., production control dept.

References: H. G. Foucar, F. F. Walsh, G. R. Henderson, G. E. Elford, P. W. Cochrane, D. H. Welch.

NOWSKI—STAN, of Toronto, Ont. Born at Schumaker, Ont., Oct. 7, 1923. Educ.: B.A.Sc. (Civil), Toronto, 1949; 1948-49, preliminary investigation for dam site, diamond drilling operation, geologic interpretation, surveying, general dftng., Mountain Chute power develop't., H.E.P.C. of Ontario; 1949 to date, asst. constrn. engr., constrn. of new runway and taxi strips, Trenton Airport, Donald Inspection Ltd., Toronto, Ont.

References: C. F. Morrison.

PASKEVICIUS—ALBINAS, of Ottawa, Ont. Born at Ilauke, Lithuania, March 1, 1909. Educ.: Dipl. Civil Engr., Univ. "Vytautas the Great" in Kaunas, Lithuania, 1935; 1933-35, City and District Engr., Birzai, Lithuania (temporary—not yet graduated); 1935-39, same position Ukmerge; 1939-41, deputy chief city engr., Vilnius; 1941, engr.-Inspector, States Communal Bank; 1941-44, chief city engr., Vilnius (during period 1942-44 was also professor-teacher in Higher Technical School, Vilnius); 1944-48, D.P. camps in Germany; Oct. 1949 to date, Technical Officer, Grade 2 (as designer), R.C.A.F., Ottawa.

References: C. L. Ingles, A. Pakalnins, A. Vikmanis, H. Romans, J. C. Elliott.

PATTERSON—WILLIAM FRANK, of Arvida, Que. Born at London, Eng., Nov. 24, 1919. Educ.: B.A.Sc., (Chem. Engrg.), Toronto, 1949; with Imperial Oil Limited as summer student—1947 (4 mos.), responsible for calculations re material balances for pilot plant of technical and research dept., 1948 (4 mos.), carried out routine lab. tests and analyses together with some research work on accuracy of testing methods. Aluminum Co., as follows: 1949 (June to Nov.) special assignment, Kingston, Nov. to date, asst. tech. supvr., Arvida.

References: H. V. Page, M. Frederick, C. J. Tanner, F. G. Barker, R. D. McQuire, G. K. Clement.

PAWSON—DONALD HUGH, of Arvida, Que. Born at Toronto, Ont., May 19th, 1922. Educ.: B.A.Sc., (Metall.), Toronto, 1948, 1946, (summer), student, mill operator, Lakeshore Mines, Kirkland Lake; Aluminum Co. of Canada, Arvida, Que., as follows: 1947, summer student, potrooms, 1948 to date, supervisor, reduction division, Arvida, Que.

References: G. K. Clement, F. T. Boutilier, F. A. Dagg, A. H. Johnston, D. F. Nasmith, J. P. Estabrook.

PEETS—HANS, of Magog, Que. Born at Rapla, Estonia, Jan. 23, 1921. Educ.: Diplom Ingr., (Elect.), Technical Univ. of Karlsruhe, Germany, 1947; 1938 and 1939, (summers), lineman, Estonian Telephone Network; 1940, (summer), electrician in power plant, Poltsamoa, Estonia; 1941-43, asst. engr., Estonian Telephone Network; 1943-45, electrician and inspector, repair divn., Estonian Air Force; Aug. 1949 to date, engr., apprent., Southern Canada Power Co. Ltd.

References: D. Anderson, F. W. Tanton, J. G. Thibault, J. M. Richardson, M. W. Kerson.

PRICE—MICHAEL, of Glengrove, Ont. Born at Blantyre, Nyasaland Africa, Jan. 25, 1923. Educ.: B.Sc., (Civil), Birmingham Univ., 1948; Student, I.C.E., England; Oct. 1948-Dec. 1949, asst. engr., Roads & Drainage Br., City Engineer's Dept., Capetown, S. Africa, survey design, estimation of costs, setting out occasional supervision of works; works included, streets, footways, sewer extensions, etc.; at present, two month contract as demonstrator in hydraulics lab. of Mech. Engrg. Dept., Univ. of Toronto.

References: E. A. Allcut, G. R. Lord, R. C. Wiren.

QUANCE—JOHN ETHELBERT, of Sudbury, Ont. Born at Corwhin, Ont., Dec. 14, 1902. Educ.: B.Sc., (Civil), Queen's, 1925; R.P.E., Ontario; 1925-28, structl. dftsman., various companies in New York State; 1928-32, structl. dftsman., Standard Steel Construction Co., Welland; 1932-36, time study and cost accounting, Canadian Atlas Steel, Welland; 1936-37, structl. dftsman., Standard Steel Construction Co., Welland; 1938 to date, designer, structl. steel design, reinforced concrete design (minor), belt conveyor design, plant layout and design, International Nickel Co., Copper Cliff, Ont.

References: C. O. Maddock, E. R. Graydon, W. J. Ripley, P. G. Benjafield, F. A. Orange.

RAMORE—WILLIAM DAVID, of Toronto, Ont. Born at Port Arthur, Ont., Oct. 7, 1918. Educ.: B.A.Sc., (Civil), 1941; R.P.E., Ontario; 1938-1939-1940 (summers), chainman, road location survey, C. E. Bush; instru'man., airfield work, Dept. National Defence; levelman, road location survey, C. E. Bush; 1941, transitman, C.P.R.; constrn. field engr., Carter Halls Aldinger Co.; 1941-45, Lieut., R.C.E.; with Carter Construction Co., Deep River Ont., as follows: 1945-47, constrn. field engr., 1947-49, constrn supt.

References: T. N. Carter, J. M. Fleming, D. C. Beam, C. J. Lynde.

RICHMOND—WILLIAM OSBORN, of Vancouver, B.C. Born at Roulaeu, Sask., Oct. 26, 1907. Educ.: B.A.Sc., B.C., 1929; M.Sc. Univ. of Pittsburgh, 1933; M., A.S.M.E.; Westinghouse Electric, East Pittsburgh, as follows: 1929-30, graduate engr., 1930-34, research engr.; 1936-37, Instructor in Mechanics, Case School of Applied Science; with Univ. of British Columbia, 1937-43, Assistant Professor, 1943-46, Associate Professor, 1946 to date, Professor of Mechanical Engineering.

References: J. N. Finlayson, H. J. MacLeod, W. O. Scott, A. Peebles, W. A. Bain, P. N. Bland.

SHANDRO—MICHAEL N., of Calgary, Alta. Born at Shandro, Alta., Sept. 13, 1919. Educ.: B.Sc., (Elect.), Alberta, 1940; R.P.E., Alberta; 1938 and 1939 (summers), student asst., Dept. Mines & Resources, Topographical Br., Jasper Park; 1940-41, jr. engr., H.E.P.C. of Ontario; 1941-45, Lieut., R.C.E.; 1945-46, designing engr., H.E.P.C. of Ontario, Toronto; 1946-47, Lecturer in Elect. Engrg., Univ. of Alberta; 1948 to date, sales engr., manager, pump and engine dept., Fairbanks Morse Co., Calgary, Alta.

References: C. A. Stollery, S. M. Bolton, H. Ripley, R. M. Hardy.

SOLOMON—J. D., of Toronto, Ont. Born Mar. 22, 1921. Educ.: B.A.Sc., Toronto, 1942; R.P.E., of Ontario; with Hamilton Bridge Co., Ltd., Hamilton, as follows: 1941, (summer), detail dftsman., 1942-44, design and detail of armoured fighting vehicles; 1944-45, tool designer on aircraft assembly fixtures, Victory Aircraft Ltd., Malton, Ont.; 1946-48, asst. tool engr. on aircraft tooling, A. V. Roe Canada Ltd., Malton; 1948-49, project engr. i/c housing develop't., Suburban Engineering Co., Toronto; 1949 to date, structl. engr. on railway bridges, central region, Canadian National Railways, Toronto.

References: T. H. Jenkins, W. B. Redman, W. I. Phemister, W. S. McNamara, R. F. Legget.

WILLETT—SYDNEY FLETCHER, of St. John's, Nfld. Born at Moncton, N.B., July 2, 1896. Educ.: King's Univ., 1912-14; M., Military Engineers Assn. of Canada; Registered Nfld. Crown Land Surveyor; 1912-14, chainman, rodman, levelman, instru'man. and estimate man, Dept. Railways & Canals, Ottawa; 1914-19, Surveying Officer, Canadian Artillery; 1919-21, instru'man., engrg. br., Intercolonial Rly.; 1921-23, draining system at barracks, Regina, R.C.M.P.; 1923-25, instru'man., Dept. Highways, Sask.; 1925-29, res. engr., Dept. Highways, Sask.; 1929-30, asst. mtce. engr., C.P.R., Moose Jaw Divn.; 1931-34, survey engr., under James Cameron, private engrg. practice at Ituna, Sask.; 1934-35, engr. i/c survey File Hills Indian Reserve for Dept. Natural Resources, Sask.; 1935, practised engrg. in Springfield, Mo., canal quantity survey, etc.; 1935-37, engr. i/c constrn. Amador Hydraulic Gold Mine, Stanley, B.C.; 1937-39, surveying and genl. engrg., Stanley, B.C.; R.C.E., as follows: 1940-41, Works Officer No. 6 Coy., R.C.E., Halifax, 1941-43, 2nd in Command 2nd Fortress Coy., Halifax, 1943-45 O/C 5th Fortress Coy., St. John's, Nfld., 1945-47, Sr. Engrg. Office "W" Force, O/C 16th E.S. & W. Coy., St. John's, Nfld.; 1947, formed Willett Engineering & Surveying Co., St. John's, Nfld.—Nfld. Gov't. granted license to practise as Nfld. Crown Land Surveyor—Oct. 1948 appointed to position of supervising engr. to St. John's Housing Corp., $3,000 000 corp.

References: H. Forbes-Roberts, G. Jack, P. C. Ahern.

FOR TRANSFER FROM THE CLASS OF JUNIOR

MORSE—CLIFFORD ERIC, of Montreal. Born at Montreal on Nov. 27, 1917. Educ.: B.Eng. (Elec.), McGill, 1941; R.P.E., Que.; summers, 1936, linesman's helper, Shaw. Water & Power

Co.; 1938, dftsman., Noranda Mines Ltd.; with Shawinigan Elec. Co. as follows: summers, 1939, dftsman. and jr. engr., construction; 1940, meter repair man, Shaw. Water & Power; 1941-42, test engr., Cdn. General Elect.; 1942, aeronautical test course; 1942-43, P/O R.C.A.F., servicing squadron; 1943-44, F/O Squadron Engr. Officer; 1944-46, F/Lt., Wing Servicing Engr. Officer; with Dominion Glass Co. Ltd., as follows: 1946-47, industrial engr.; 1948-50, asst. tech. engineer, Mtl. (St. 1940, Jr. 1946)

References: G. P. Cole, W. O. Sorby, T. J. Kennedy, A. S Runciman, R. A. Dunn, H. H. L. Creighton.

PEARCE—ELDRIDGE BURTON, of Deep River, Ont. Born at Sprucedale, Ont., on July 13, 1915. Educ.: B.Sc. (Mech.), Queen's Univ., 1940; R.P.E., Ont. 1940-41, dftsman., Horton Steel Works; with Cdn. Car & Foundry Co. as follows: 1941-42, tool dftsman.; 1943-44, tool planning and control; 1944-45, E.M.E. Offrs. course—Lt. R.C.E.M.E.; 1946-47, dftsman., Babcock-Wilcox & Goldie McCulloch; 1947, combustion control equipt. engr., S. A. Armstrong Ltd.; 1948 to date, design engr., National Research Council, Atomic Energy Project. (St. 1940, Jr. 1942)

References: C. S. Boyd, A. Jackson, I. N. MacKay, H. S. Milne.

TIVY—ROBERT HARRISON, of St. Boniface, Man. Born at Rivers, Man., on June 23, 1921. Educ.: B.Sc. (Elect.), Manitoba, 1943; R.P.E., Man.; summers 1940 and 41, dftg. and bldg. inspection, Dept. Nat'l. Defence, Rivers, Man.; 1942, machine shop apprentice, Can. Loco. Works, Kingston, Ont.; 1943, summer, Elect. Officer's training, R.C.N.V.R.; 1943-44, R.C.N.V.R., Elect. Officer, specialized in Gyro Compass and allied equipt.; 1944-45, Gyro Base Mtce. Officer, Halifax; June, 1945-Dec., Elect. Officer, H.M.C.S. Algonquin; with Manitoba Power Commission as follows: 1946-48, work in design and operating depts., six mos. as operating engr.; 1949 to date, elect. engr., River, Man. (St. 1942, Jr. 1945)

References: L. B. Mackay, J. W. Tomlinson, E. P. Fetherstonhaugh, T. L. Woodhall, R. Noonan.

FOR TRANSFER FROM THE CLASS OF STUDENT

MOFFORD—C. LAWRENCE, of Dartmouth, N.S. Born at Saint John, N.B., on June 15, 1917. Educ.: B.Sc. (Civil), New Brunswick, 1949. 1935-39, layout dftsman., carton designs, D. F. Brown Box Co.; 1939-41, dftsman., Structural Steel, Saint John Drydock and Shipbuilding Co.; 1941-45, Navigation Officer, Frigate later Commanding Officer Corvette; 1945 (4 mos.) and 1946 (4 mos), dftsman., structural steel, Saint John Drydock and Ship Bldg. Co.; lecturer (while attending university), 1945 and 46, drafting; 1947, surveying; 1948, survey drawing; 1947 (5 mos.) and 1948 (5 mos.), asst. hydrographer, i/c one party, Hydrographic Service, Federal Government; 1949-50, civil engr., adminstr. staff of mgr. civil engrg. and mtce. for the Naval Service in Eastern Canada, supervising contracts, design; at present, resident engr. supervising the rehabilitation and mtce. of naval properties in Saint Johns, Nfld. (Staff of 123). (St. 1947)

References: E. O. Turner, H. Moore, S. Ball, D. McN. Lowe, J. G. Belliveau, A. G. Watt, C. J. Carey, D. O. Turnbull.

REMINDER!

The dates of the Annual Meeting are July 12, 13, 14. Mark your Appointment Pad ***NOW!***

Employment Service

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

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

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

Situations Vacant

CHEMICAL

CHEMICAL ENGINEERS with experience in any of: applied chemistry; chemical engineering design, process development; chemical production. Salary from $2,900.00 to $5,100.00. Positions in Ottawa. Apply to File No. 1405-V.

SENIOR CHEMICAL ENGINEER required in Ottawa, Ontario, with a minimum of ten years experience to supervise chemical engineering development work. Salary range from $5,300.00 to $5,300.00 depending upon qualifications. State particulars, including age, marital status, and qualifications to File No. 1405-V.

CHEMICAL ENGINEER for the application of radio-isotopes to technical problems in the pulp and paper industry, located in Montreal. Excellent opportunities for advancement. At least 3 years experience in research and development work and conduct of experiments on mill scale. Reply giving full personal details and photograph, salary required and date available to File No. 1408-V.

ELECTRICAL

FULLY EXPERIENCED ELECTRICAL ENGINEER required by textile industry located outside Montreal. Applicant must have some real practical experience, about 15 years in a manufacturing plant, preferably a textile mill. Excellent opportunity offered. Apply to File No. 1418-V.

ELECTRICAL ENGINEER to act as foreman for construction and maintenance of electrical equipment, including motors up to 300 h.p. gas driven generators up to 1,000 k.w. transformers up to 2,000 k.w. and possibly steam turbines up to 2,500 k.w. The position is a supervisory calling for a man who has had good, all round experience in heavy industry or a large industrial plant. Location Toronto. Apply to File No. 1409-V.

ELECTRICAL ENGINEER required by large firm in Montreal, with about 4 to 5 years experience. Applicant would be obliged to design installation of electrical equipment in conjunction with machinery of various types. Salary open. Apply to File No. 1422-V.

ELECTRONICS ENGINEER experienced on the design and construction of radar, servos, computers or similar specialized electronic apparatus. Permanent employment in a rapidly expanding development laboratory located in Toronto. Apply to File No. 1423-V.

MECHANICAL

MECHANICAL ENGINEER required by provincial government, West Coast, for design, construction, maintenance of refrigeration, ventilation and heating installation. Must be eligible for registration as a professional engineer in B.C. Salary $4,176.00 rising to $4,776.00 per annum (inc. current cost of living bonus) applications obtainable from B.C. Civil Service Commission, Weiler Building, Victoria, B.C., not later than April 22, 1950. Apply to File No. 1411-V.

MECHANICAL ENGINEER experienced on the design and construction of fine instruments, cameras, computers or servo systems. Permanent employment in a rapidly expanding development laboratory located in Toronto. Apply to File No. 1423-V.

METALLURGICAL

METTALLURGIST required by Ontario Chemical and Refinery Company to work in a consulting capacity or as an employee. Salary open. Apply to File No. 1394-V.

MISCELLANEOUS

SALES ENGINEER required by firm in Montreal, representative of British owned manufacturer. Applicant would be obliged to sell material to Canadian Market. Salary open. Apply to File No. 1397-V.

PATENT ATTORNEY, preferably graduate in Electrical Engineering Physics, capable of preparing and prosecuting electrical and mechanical patent applications, for patent law firm located in Toronto. Applicant should furnish full particulars of qualifications and experience to File No. 1400-V.

CHEMICAL ENGINEER required by company in Montreal for the industrial centrifugal department which embraces oil purification and refining, pharmaceutical problems, starch manufacture, etc. The field is new and expanding and offers wonderful opportunities. Applicant must have sales ability and able to meet company officials. Preferably bilingual. Age 24 to 35 years. Apply to File No. 1430-V.

SALES ENGINEER preferably mechanical for Canadian manufacturer and distributer of power plant equipment. Territory includes Toronto and Southern Ontario. Salary open. Apply to File No. 1402-V.

SALES ENGINEER, required for the selling of water treatment chemicals and water treatment equipment of all types. Territory Quebec City. Must be bilingual. Salary open. Apply to File No. 1404-V.

SALES ENGINEER (Representative) required by an old established firm supplying the paper industry. Must be willing to travel up to 6 months per year, throughout the Canadian Pulp and Paper Mills. Preference for single man with pulp and paper mill experience. Good future assured. Asking salary of interest. Apply to File No. 1406-V.

ENGINEER required as production manager for one of Canada's most progressive companies to head up production for a new division. This company offers a genuine future to a capable man. Location Western Ontario. Salary open. Outline your experience including age to File No. 1407-V.

GRADUATE MECHANICAL OR CHEMICAL ENGINEER with some plant experience in the process industries, or experience with an instrument and control equipment manufacturer, for a position as sales engineer with a company located in Toronto. Territory outside of Toronto. Salary open. Apply to File No. 1410-V.

CONSTRUCTION MANAGER, required in Ontario for a $2 million extension programme. The term of employment would be from 2½ to 3 years. Some hospital experience desirable. Salary open. Apply to File No. 1412-V.

Chartered Electrical & Mechanical Engineer and Administrative Manager

Professional Engineer—Ontario & Quebec (Grade VIII). M.I.E.E., M.E.I.C., Member:—Institute of Industrial Administration, Assoc. of Military Engineers, Canada, etc. World wide experience and connections:— extensive projects, electrification and executive administration relative to manufacture of high capacity equipment and its application. Shortly available. Consider association with first class consulting, manufacturing or industrial concerns in advisory, administrative, sales management or liaison capacity. Immediate interview, enquiries confidential. Location Montreal. Apply to File No. 1697-W.

ELECTRICAL DRAUGHTSMAN required by firm in Montreal, manufacturers of small electrical specialties. Salary open. Apply to File No. 1414-V.

MECHANICAL OR CIVIL ENGINEER, required for Toronto office of firm located in Montreal, with 3 to 5 years industrial experience as welding engineer. Applicant would work in the developing engineering department as development engineer. Apply to File No. 1415-V.

SALES ENGINEER, preferably with mechanical background, experience in pulp and paper mill desirable but not essential. Duties involve selection and sale of mechanical handling equipment, considerable travelling in Quebec Province involved. Car necessary. Salary open. Apply to File No. 1416-V.

GRADUATE ENGINEERS experienced in design of mechanized foundry or similar equipment. Work includes estimating, draughting and experimental studies on equipment. Must be capable of developing own designs within a reasonable time. Location Ontario. Apply to File No. 1417-V.

GRADUATE ENGINEERS or men with training and experience as follows: developing of process data and machine specifications for tooling programmes, improving and developing manufacturing equipment. Location Ontario. Apply to File No. 1417-V.

GRADUATE ENGINEER experienced in design work and estimating on buildings, roads, structure, etc. Also design engineer or draughtsman experienced in exhaust and fresh air supply systems, paint spray booths. Architectural draughtsman experienced on structures Location Ontario. Apply to File No. 1417-V.

PROCESS ENGINEERS experienced in methods, machine techniques and automotive sheet metal processing, knowledge of die design. Graduate engineer or equivalent required in Ontario. Apply to File No. 1417-V.

SALES AND TECHNICAL SERVICE REPRESENTATIVE (senior) to work in Europe. Graduate in chemistry or chemical engineering required. Experienced in the rubber industry would be desirable. Applicant should be between 26 and 40 with good sales personality and the ability to speak English and German. Apply to File No. 1419-V.

SALES AND TECHNICAL REPRESENTATIVE (junior) in the rubber industry located in Ontario. A man between 24 and 30 years, with a university degree in chemistry or chemical engineering, to complete a training period with the production and research division, to prepare for technical service work. Apply to File No. 1419-V.

OPPORTUNITY FOR YOUNG GRADUATE ENGINEER, about 30 years to join well established and growing building construction company operating in the Province of Quebec, outside of Montreal. Must be able to estimate and direct jobs with minimum assistance. Must have some business and executive ability and a working knowledge of French. Apply to File No. 1420-V.

SALES ENGINEER required with good basic knowledge of electrical engineering by manufacturer located in Montreal. Must be fluently bilingual. Age 25 years to 35. Salary open. Apply to File 1421-V.

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

CHEMICAL

CHEMICAL ENGINEER required in Ontario. Some experience in industrial and control departments with somewhat a mechanical background desirable. Salary $300.00. Apply to File No. 1350-V.

CIVIL

CIVIL ENGINEER required by firm located in Montreal. Applicant should have some structural steel experience. Salary open. Apply to File No. 1373-V.

GRADUATE CIVIL ENGINEER with about eight years experience in structural steel required by firm engaged in the manufacture and sale of prefabricated steel structures in Toronto. Salary open. Apply to File No. 1375-V.

GRADUATE CIVIL ENGINEER required by large pulp and paper mill in Ontario. Recent graduate preferred with at least two years experience in structural design. Future promising for right man. Salary open. Apply giving full particulars of education and experience to File No. 1389-V.

ELECTRICAL

GRADUATE ELECTRICAL ENGINEER, required by firm in Montreal manufacturing electrical equipment. Applicant should have some experience in communication radio, telephone, etc. Salary open. Apply to File No. 1346-V.

ELECTRICAL ENGINEER with experience in the Public Utilities field, as engineer in the electric department of a public utility in a medium size Western Ontario city. Give details, references and salary expected. Apply to File No. 1351-V.

ELECTRICAL ENGINEER recent graduate required by large firm in Montreal. Applicant should specialize in D.C. Power Plants and Control Devices for transportation equipment. Salary open. Apply to File No. 1386-V.

GRADUATE ELECTRICAL ENGINEER required in Ontario for design and development of instrument transformers and watthour meters. Two or more years experience necessary. If satisfactory position is permanent with future prospects excellent. Apply to File No. 1388-V.

MECHANICAL

SENIOR MECHANICAL ENGINEER required in Ontario to assist in layout and design of petroleum refining equipment and facilities. Must be qualified in this field. Age 30 to 35 years. Salary open. Apply to File No. 1360-V.

MECHANICAL ENGINEER required by firm located in Province of Quebec, conversant with machine shop grey iron foundry, light structural steel and sheet metal work, bilingual, to take charge of production. Apply in writing giving qualifications and references, stating remuneration expected to File No. 1378-V.

MECHANICAL ENGINEER, recent graduate required by large firm in Montreal. Applicant to specialize as calculator and designer for transportation equipment. Apply to File No. 1336-V.

MINING

MINING ENGINEER required in Quebec with eight to ten years experience, the work to consist of undeground production and engineering work, using the block caving method of mining. Salary open. Apply to File No. 1352-V.

MINING ENGINEER required by a large company in the Province of Quebec. Preferably with two years experience in underground mining, his duties will be to make engineering and time studies of undeground operations with the purpose of improving mining methods and installing wage incentives. Firm will train the engineer in time study. Good opportunities for advancement. Starting salary $3,000.00 to $3,500.00 age 25 to 30 years. Apply to File No. 1376-V.

MISCELLANEOUS

DRAUGHTSMEN REQUIRED by General Electric Company, Switchgear Dept., Engineering Works, Witton, Birmingham 6, England. Must have good experience in any class of switchgear design or layout. Permanency and good opportunities for capable men. Apply stating age, experience and technical qualifications. Apply to File No. 1157-V.

STRUCTURAL STEEL DRAUGHTSMAN and checkers, preferably graduate engineers are required for a steel fabricating company in Manitoba. Salaries open. Apply to File No. 1285-V.

GRADUATE ENGINEER, with municipal experience to act as assistant to the city engineer. Location Western Canada. Salary based largely on experience and qualifications, minimum of $4,000.00 per annum. Apply to File No. 1347-V.

STRUCTURAL STEEL detailers and checkers required in Windsor, Ontario, by established fabricating firm. Salaries open. Apply to File No. 1357-V.

FIELD ENGINEER required by Provincial Capitals and principal cities throughout Canada. Salary ranges from $3,840.00 to $6,300.00 per annum depending on experience and qualifications on highway and road construction. Apply to File No. 1353-V.

RUBBER CHEMIST required by large firm in Montreal. Must have minimum of five years experience in compounding, developing and factory processing. Salary according to qualifications. Apply to File No. 1361-V.

ELECTRICAL DRAUGHTSMAN required in Montreal who is familiar with explosion proof installations. The work consists principally of wiring motors and lighting. Salary open. Apply to File No. 1363-V.

ESTABLISHED MANUFACTURER of domestic appliances requires two or more engineers for development of major household appliances, electric refrigerators, ranges and allied lines. Knowledge of manufacturing processes desirable. Will also consider one or two recent graduates. Personal and business history, salary requirements, etc., to be contained in first letter. Location Western Ontario. Apply to File No. 1366-V.

FIVE APPOINTMENTS for operational research on problems of defence at initial salaries of $2,580 to $6,300 dependent on qualifications. First appointment for one year, subsequently by three-year terms. Superannuation provisions. Applicants with post graduate training in applied mathematics and mathematical statistics, biology, physical science, economics or engineering may obtain further information from: Apply to File No. 1367-V.

MECHANICAL OR ELECTRICAL ENGINEER required in Ontario, or electrical engineer holding a first class stationary engineer's certificate, to take charge and supervise the operation and maintenance of a steam heating plant of 1020 h.p. and low temperature refrigeration equipment of 1000 h.p. A person with three or five years experience is desired. Salary open. Apply to File No. 1369-V.

DESIGN AND DETAIL ENGINEER or draughtsman, one that has had a combination of mechanical and light structural experience required. This is an opening for a fully experienced and capable man with an old, well established firm of engineers and manufacturers in Ontario. Salary open. Apply to File No. 1370-V.

SENIOR SALES ENGINEER required by firm located in Toronto, manufacturers of heating equipment. Applicant should be bilingual, with sales experience. Territory covers Quebec and Maritimes. Salary open. Apply to File No. 1372-V.

MECHANICAL OR MINING ENGINEER required by large firm in the Province of Quebec. Three or four years experience in methods engineering either in mining or other type of industry. Duties include studies of milling and mining operations with the purpose of improving operating methods, equipment materials handling, layout, etc. Good opportunity for advancement. Salary range $3,500.00 to $4,000.00 to start. Apply to File No. 1377-V.

DESIGN ENGINEERS, chief draughtsman and detailers required by large Western Canadian steel fabricating shop. Must be experienced in design and detail of boilers and pressure vessels, material handling equipment, structural steel and/or mechanical design and details. A knowledge of design of oil refinery equipment would be an asset. Apply giving full particulars of education and experience to File No. 1379-V.

ENGINEERS: electronics and radar fields, with considerable experience in inspection methods and organization. Salaries $3,480.00 to $4,480.00 depending on qualifications. Positions in Ottawa, Toronto and Montreal. Apply to File No. 1382-V.

SALES ENGINEER required by Montreal firm of inspection engineers. Applicant should have preferably a civil background. Territory would consist of mainly Quebec. Age 30 to 35 years. Salary open. Apply to File No. 1385-V.

SENIOR DRAUGHTSMAN experienced in making full size layouts from automotive body parts drawings; knowledge of body fixture design desirable. Apply by letter stating experience, age, education, employment references to File No. 1387-V.

Assistant Plant Engineer

Assistant Plant Engineer is required for a Kraft Pulp and Paper Mill making specialties in Eastern Canada. Duties of the Assistant Engineer include supervision of Draughting Office, laying out pulp and paper mill equipment, design of equipment where necessary, technical investigations in the mechanical field in connection with problems affecting production, studies of maintenance cost and the like. He must be sufficiently competent to assume the responsibilities of the Plant Engineer in the latter's absence.

Preferred qualifications are a Mechanical Engineering degree, coupled with a good knowledge of electrical maintenance practice and some knowledge of electrical engineering generally. Paper mill experience is desirable. A knowledge of French is also desirable, but fluency in this language is not necessary.

Preference will be given to a candidate from 30 to 40 years old, other things being equal. Salary will be determined in relation to the experience and qualifications of the successful applicant.

In your application please give full details of educational background, age, experience, both military and civil, and expected salary. File No. 1390-V.

CIVIL ENGINEER required by large firm in Montreal, for the supervision of highway construction and to take charge of survey party. Location Abitibi district. Applicant must be experienced and bilingual. Salary according to qualifications. Apply to File No. 1431-V.

ENGINEER not over 33 years required by Canadian owned hydro electric utility company operating in Bolivia. Must have at least 5 years experience in this field. Salary open. Excellent opportunities. Apply to File No. 1391-V.

YOUNG MECHANICAL OR ELECTRICAL ENGINEER required by pulp and paper company located in Montreal. Some experience in industry desirable. Excellent opportunity for advancement. Salary open. Apply to File No. 1392-V.

Sales Executive

(MECHANICAL)

Required by well-known Montreal firm handling mechanical equipment used by contractors, road builders, industrialists and pulp and paper industry. Must be fully experienced in mechanical engineering and capable of directing sales organization. Applications treated in strict confidence. Apply with complete information to File No. 1434-V.

Situations Wanted

MECHANICAL ENGINEER (Sask. 1947). Age 28, married, family 1. At present employed near Montreal desires position with good future, in Western Canada. Five years varied experience including sound background in maintenance engineering. Interested in plant or shop design, engineering and development of sales and service. Willing to undergo training period with Eastern company with good prospect of eventual employment in Western Canada. Apply to File 60-W.

ELECTRICAL ENGINEER, S.E.I.C., A.I.E.E., B.Sc., in E.E. (Power Option). University of New Brunswick, '49. Service with R.C.A.F. as Aircraft Electrician. Experience during summer includes plant maintenance and telephone installation. Age 27, single, bilingual. Desires work in power or sales. Available immediately. No location preference. Apply to File No. 79-W.

MECHANICAL ENGINEER (University of Toronto), Registered Prof. Eng. Ontario and Quebec, having wide experience in design, management, production control (both metal and woodworking), married, 38 years old is available at once. Salary according work and responsibilities involved. Apply to File No. 140-W.

PETROLEUM ENGINEER, S.E.I.C., University of Alberta, 3rd year undergraduate, age 26, married. Experience in surveying and operation of underground mining machinery. Desires connection with engineering concern in oil field development, control or production. Edmonton area preferred. Apply to File No. 543-W.

PROFESSIONAL ENGINEER wishes part time consulting work. Plans made for new jobs, alterations in existing layouts, Montreal area. 12 years experience in electrical and general projects. Apply to File No. 565-W.

CHEMICAL ENGINEER, S.E.I.C., graduating in May 1950, desires permanent position in which good prospects would reward initiative and hard work. Interested in production, sales or public relations. Age 22. Single, and willing to go overseas. Experience includes three years in sales, administrative and public relations work. Now part-time overseas correspondent for British technical journal. Apply to File No. 582-W.

CIVIL ENGINEER, S.E.I.C., will graduate from N.S. Tech. in May 1950. Age 23. Single. Summer experience with the N.S. Dept. of Highways, an electric public utility, and office routine. Apply to File No. 583-W.

CIVIL ENGINEER, M.E.I.C., P.Eng., (Alberta), age 41, married, wishes to consider change of employment with degree of permanency, Alberta or B.C., preferred. Wide experience asphalt and concrete pavement construction, soil compaction etc., also buliding, sewer and water lines etc. Presently employed as Resident Engineer in charge of Airport development, with ten years experience in this field. Apply to File No. 634-W.

SALES ENGINEER, Civil Engineering graduate, University of New Brunswick 1950, B.Sc., S.E.I.C. Age 32. Married. R.C.A.F. veteran. Experience: 5 years with Bank of Nova Scotia, 1 year on radar, 3 years in electrical machine shop, one summer as rodman on highway, one on hydrographic survey, and one as inspector on asphalt road. Available May 22 or shortly later. Apply to File No. 688-W.

ELECTRICAL ENGINEERING STUDENT, S.E.I.C., graduating in May 1950, from McGill University. Age 22. Single. Three summers with local electrical firm. Desires employment in power field. No objection to travel. Available after May 15, 1950. Apply to File No. 730-W.

GRADUATE CIVIL ENGINEER, Jr.E.I.C., B.Sc. (Civ. Eng.) (Edinburgh) 1949, ex-serviceman, age 27. Some experience in surveying, soil mechanics, organization and setting out of engineering works and hydraulic models. Desires employment preferably in hydraulic or structural engineering field. Arriving Canada end of April. Will consider any type of work with reliable concern. Apply to File No. 746-W.

GRADUATE CIVIL ENGINEER and land surveyor with proven ability to carry out responsibilities. Available on short notice. Over 23 years of wide experience on four continents. Experience includes design layout and field supervision of: roads, dams, buildings, drainage, irrigation works. Veteran ORE and EAE, married, bilingual. Situations held in Canada: chief of survey parties, resident engineer. Abroad: as district and assistant chief engineer for over 19 years in the British Turkish, Iragi, Government Services. Apply to File No. 763-W.

CHEMICAL ENGINEERING GRADUATE, S.E.I.C., Jr.C.I.C., B.E. (Chem.) N.S. Tech. '49, age 24, single. Experience: summer work in aluminum, petroleum, rubber and steel industries; 7 months in pulp and paper industry. Desires permanent position and will consider any reasonable offer either sales or where background can be used to best advantage. Available immediately. Prefer to locate in Eastern Canada or U.S. Apply to File No. 775-W.

GRADUATE ENGINEER, M.E.I.C., with thorough management experience in large industrial plant, desires position with good money making possibilities. Apply to File No. 852-W.

METALLURGICAL ENGINEERING STUDENT, S.E.I.C., Queen's, veteran, age 28, single, graduating this spring. Desires metallographic work with research firm or production plant. No limit as to location. Experienced in metallography, welding, sheet metal work. Apply to File No. 854-W.

MINING ENGINEER, Jr.E.I.C., Jr.M.E.I.C., P.Eng. Quebec. Montreal 1948. Married. Bilingual. Canadian. Age 28. Past experience in nickel and gold mines prospection and exploration on a big ilmenite project. Past two years with an iron ore company in Michigan. At present in charge of engineering work at two important underground producers; layout, estimating, surveying, mapping, geology. Desires position in Quebec or Ontario. Available on reasonable notice. Apply to File No. 957-W.

PATENT LAWYER desires position with company. Experienced in patent, trade mark, corporation and court practice. B.A.Sc., registered patent attorney in Canada and U.S.A. Apply to File No. 958-W.

GRADUATE CIVIL ENGINEER, S.E.I.C., University of Manitoba, 1949, age 22 unmarried. Experience includes two summers land surveying as chainman and levelman on townsite and section line surveys; eight months collecting hydrological data and water power control work. Interested in gaining experience in municipal, foreign or domestic. Apply to File No. 961-W.

MECHANICAL ENGINEER, Jr.E.I.C., P.Eng. (Ontario), Saskatchewan 1947. Age 23, single. Varied experience in production research, development, design and plant layout. Desires position in municipal engineering or field work in exploration, development and surveying. Prefer Western Canada. Available on short notice. Apply to File No. 1014-W.

GRADUATE CIVIL ENGINEER, S.E.I.C. (B.Sc. Mount Allison 1947); (B.E. Nova Scotia Tech. College 1949). Age 23, single. Two summers installation and maintenance automatic signal equipment, C.N.R.; two summers hard rock mining in Northern Manitoba; 3 months bridge baseline and topographic surveys; 3½ months field engineer 150 housing project; 8 months of general municipal work. Desires opportunity in sales or municipal engineering. Available on short notice. Apply to File No. 1028-W.

MECHANICAL ENGINEER, S.E.I.C., A.S. M.E. Age 34, married, graduating from The University of British Columbia, May 1950, desires permanent employment. Three years experience maintenance of concentrator and crushing plant equipment. 6 years service with R.A.F., R.C.A.F. operation & maintenance of aircraft engines. Interested in maintenance and installation of mechanical equipment. Willing to undertake any required training, will work anywhere in Canada. Apply to File No. 1032-W.

ELECTRICAL ENGINEERING STUDENT, S.E.I.C., graduating in May 1950 from the University of Alberta, age 25, married, veteran. Electrical experience with R.C.A.F. (4 years). Desires employment in power or electronics. Apply to File No. 1033-W.

GEOLOGICAL ENGINEER, B.Sc., shall graduate in April 1950. Experienced in exploration, detail mapping and property examination. Also experienced in general construction and civil engineering. Single status, 25 years and bilingual. Seeks position in mining industry or in sales engineering. Apply to File No. 1034-W.

MECHANICAL ENGINEER, M.E.I.C. graduate, McGill, age 33, married, seven years practical experience in machine design. Speaks, reads and writes Spanish fluently. Available on May 1st. Apply to File No. 1039-W.

ENGINERING PHYSICIST, S.E.I.C., graduating from the University of Toronto, April 1950. Age 27. Married. Ex-R.C.A.F. officer. Experience includes design of experimental electrical instruments and circuits. Interested in development or production in electronics, radio, or communications field. Location immaterial. Apply to File No. 1046-W.

GRADUATE CIVIL ENGINEER, B.Sc. (Manchester '46) Stud. M. Inst. C.E. (1946). British subject now in England, requires position as assistant; executive or sales. 2 years experience, building, civil engineering. Knowledge of mechanical side and some electrical. Ex-R.E. Apply to File No. 1070-W.

MECHANICAL ENGINEER, S.E.I.C., graduating from University of British Columbia, May 1950, desires permanent employment. Three years experience as underground mechanic in coal-mine on compressed-air machines. Five years in R.C.A.F. as pilot and navigator. Single and with desire to travel. Apply to File No. 1071-W.

GRADUATE MECHANICAL ENGINEER '48, desires part time work for evenings and week-ends. Experience in preparing maintenance schedules for large trucks or car fleet. Also consider surveying, calculations, draughting, etc. Apply to File No. 1073-W.

ELECTRICAL ENGINEER seeks opportunity with a consulting or electrical contracting firm preferably in the West. Age 29, 7 years post-graduate experience, test course, extensive training in illumination field, 3 years university teaching 2 seasons resident engineer on heavy power line construction. For details apply to File No. 1084-W.

ELECTRICAL ENGINEER, S.E.I.C., Manitoba 1950. Age 24. Three summers experience in field of electronics and communications with R.C.A.F. Interested in technical and business aspects of communications field. Desire to locate in Montreal, Quebec. Available May 1st, 1950. Apply to File No. 1091-W.

ENGLISHMAN, 35, D.F.H., A.M.I.E.E., now concluding contract Malaya as chief electrical engineer for agents of large group British electrical and diesel manufacturers, prior arrival Canada April, desires responsible position. Experienced sales, service, administration technical staff. 3½ years pre-war at present employers' U.K. factory. 6 years electrical officer R.N.V.R. Wife Canadian. Apply to File No. 1093-W.

MECHANICAL ELECTRICAL ENGINEER, age 27, Jr.E.I.C., Polytechnique '48, fluently bilingual, presently employed since graduation with large industrial firm in Montreal. Experience includes planning, design of steel and reinforced concrete, piping, heating and ventilating, lighting layouts. Supervision of construction, installation of industrial equipment, general plant maintenance and operation, materials handling. Thorough knowledge of mechanical refrigeration, design and operation. Four summers employed with Hydro Electrical Engineering Dept., experience in generation and distribution, protection equipment and industrial electronics. Ability and initiative to get things done. Desires a good opening preferably with construction contractors or consulting engineers for both design and field work and where a wide experience is a definite asset. Willing to travel and available at a month's notice. Apply to File No. 1097-W.

MECHANICAL ENGINEER, McGill 1949, thoroughly bilingual, one year experience, design and layout, maintenance. Age 29, married. Four years in R.C.A.F. as pilot. Desires position in industry or technical sales with promising outlook. Montreal area. Available short notice. Apply to File No. 1198-W.

ELECTRICAL AND MECHANICAL ENGINEER, M.E.I.C., 42, English graduate, A.M.I.E.E. Wide experience. Mechanical design, electrical control systems, heating, ventilating, and air conditioning, steam and hot water boilers, technical sales, administration, planning. Consulting engineer 3½ years. Presently senior design engineer large company. Available on reasonable notice. Apply to File No. 1200-W.

CIVIL ENGINEER, Jr.E.I.C., Queen's graduate, married. Since 1948 have been resident engineer for the Fraser Valley Dyking Board with experience in earth moving, pile driving, and small earth dams. Previous experience has provided complete knowledge of building trades, steel and concrete construction, and estimating for building construction. Available June 30th, when present work concludes. Foreign service desired. Apply to File No. 1217-W.

MECHANICAL ENGINEER, M.E.I.C., graduate University of B.C., 1946, age 26, married, no children. 1 year original design, estimating and supervision of manufacture of earth-moving equipment and custom repairs and modifications. 3 years and still employed with Head Office of large retail firm planning and supervision of heavy equipment installations and construction projects, conveyors, lighting, general maintenance and alterations. Pregraduation experience 1½ years machine shop practice. Desires positon wth good future prospects depending on ability. Apply to File No. 1225-W.

ELECTRICAL ENGINEER, S.E.I.C. Married, age 28, graduating from University of British Columbia May 1950 desires permanent employment in electrical power field. Some summer experience in substations and 14 months D.C. power maintenance aboard ship, R.C.N. V.R. Apply to File No. 1230-W.

ELECTRICAL ENGINEER, S.E.I.C., graduating from University of Manitoba, May 1950, desires permanent employment. Veteran, married, age 32. Ten years experience includes work as mechanic, inspector supervising manufacturing processes and two years on communications. Interested in production or sales engineering. Apply to File No. 1255-W.

CIVIL AND ELECTRICAL GRADUATE 1933 with construction experience, business background in construction and industrial machinery and managerial experience. Seeks change of work and location. Interested in broadening experience in contractors or engineers office, business engineering and economic studies, business administration or other interesting work. Opportunity and useful work is object of change. Present salary over $5000.00 per year. Single and in good health. Apply to File No. 1266-W.

MECHANICAL ENGINEER, S.E.I.C., graduating from the University of British Columbia in May 1950, desires permanent employment. Qualified machinist and draughtsman with some experience in production methods. Practical experience in steam power plant operation and maintenance. Summer employment instrumentman and draughtsman British Columbia P.W.D. Apply to File No. 1276-W.

MECHANICAL AND ELECTRICAL ENGINEER, 30, South American, graduated 1943, presently in the U.S.A. on a training sponsored by the U.S. Department of State (to end about middle April 1950), with solid background and experience in erection and maintenance of industrial plants and intensive training in hydro-electric installations, speaking fluently English and French, desires permanent connection with company that needs reliable, energetic man to work here or in South America. Apply to File No. 1280-W.

CIVIL ENGINEER, Jr.E.I.C., R.P.E. (Ont.) Queen's, '48. Proceeding to England in July for year and a half. Willing to undertake part time representation, contact or sales assignment for a Canadian firm while in England. Apply to File No. 1294-W.

MECHANICAL ENGINEER, S.E.I.C., B.Sc. in M.E. University of Manitoba 1949. Would like to enter heating, ventilating, air conditioning, or refrigeration fields. Presently employed as an administration and production control engineer in an electrical manufacturing company. Summer experience with a consulting engineering office, drafting, development work, structural design, industrial design, illumination work, and internal sales experience. Ontario or Western Canada preferred — best references. Apply to File No. 1300-W.

CHEMICAL ENGINEER, B.Sc. 1942, M.C.I.C., M.E.I.C. Equal knowledge of English & German; fuel technologist (petroleum and gas), 8 years experience in process development work, including design and operation of pilot plants; in charge of most work. Desire position as process engineer with oil company, or gas manufacturing company. Available in one month's notice. Apply to File No. 1314-W.

ELECTRICAL ENGINEER, S.E.I.C., graduating from University of British Columbia, May 1950, desires permanent employment, preferably in Canada. Age 30, married, no children, excellent health. Electrical graduate of Provincial Institute of Technology and Art, Calgary, 5 years R.C.A.F. signals, mostly overseas, employed summer months with large Canadian Electrical Manufacturer and distributor. Prefer utility or manufacturing concern, salary secondary to experience and opportunity offered. Apply to File No. 1319-W.

MECHANICAL ENGINEER, Jr.E.I.C., Queen's '48, veteran, age 27, married. Two years plant layout and development. Good background in machine shop and maintenance practice and pulp and paper industry. Presently employed but desirous of improving position. Will seriously consider any position with aggressive firm where individual ability and effort is recognized and rewarded. Particularly interested in production control methods investigation and sales engineering. Location

—Southern Ontario or Montreal. Apply to File No. 1321-W.

CIVIL ENGINEER, Jr.E.I.C. '45, with varied experience in fabrication of structural steel, experience includes structural detailing design and general plant work in positions of responsibility. Would like position utilizing this experience, preferably in connection with industrial work. Apply to File No. 1323-W.

ELECTRICAL ENGINEER, S.E.I.C., to graduate from Nova Scotia Technical College May 11, 1950 desires position on staff of a Canadian mining company or small industrial plant in Canada. Age 30, married veteran, in good health. Academic standing high, industrious worker with intense interest in electrical machinery of all kinds. Wide experience in operation of electrical machines, two years in coal mines and two years or more surveying experience. Would appreciate an offer before mid-April. Apply to File No. 1325-W.

MECHANICAL ENGINEER, S.E.I.C., graduating from U.B.C., May 1950, desires position where initiative and hard work will bring advancement. Experience includes two years of office administration, light structural and mechanical design and draughting, internal combustion engine and power transmission maintenance and operation. Age 24. Single. Apply to File No. 1327-W.

EXECUTIVE, M.E.I.C., P.Eng., civil and mechanical engineer. Graduate 1929. Married, three children. Age 42. Past 14 years in pulp and paper industry. Experience covers construction, maintenance, plant engineering, purchasing, mill design and management. Employed in Ontario location. Available shortly. Apply to File No. 1384-W.

MECHANICAL GRADUATE, M.E.I.C., P.Eng. Ontario, early forties. With experience in mechanical design, plant maintenance, administration and planning. Presently employed ten years field service and travel. Desires change. Would like connection with small metalworking plant on production or administration. Ontario location preferred. Apply to File No. 1543-W.

GRADUATE P.Eng. (Civil, Mechanical, Chemical) seeks work with consulting engineer, municipality, public utility, industrial plant, oil refinery, general contractor or university. Will consider estimating, design, inspection, field engineer, or consulting practice. Keenly interested in research, tool design, machine production, pulp and paper industry, aircraft and airport engineering. Wide experience, age 50, active, aggressive, progressive, determined to achieve results. Salary desired $375 per month. Apply to File No. 1935-W.

MECHANICAL ENGINEER, M.E.I.C. Thorough knowledge of paper and board industries. Wide experience in plant development, design, maintenance, operation; organization and control of labour and staff. Available for position of responsibility. Special interest in development of new processes and equipment. Further details, apply to File No. 2642-W.

CIVIL ENGINEER, B.C. P.Eng. (B.C.) M.E.I.C. and Assoc. M.A.S.C.E. Veteran R.C.E. 34, married. Experience in Topographic and legal surveys, 2 years on dam construction and irrigation surveys followed by 2 years as junior engineer on airport construction, paving, water supply and drainage. Army experience includes instructing at R.C.E. survey schools, airport construction and bridging. Post war work includes 2 years as resident engineer on highway location and construction. For the past 3 years have been working as hydraulic engineer on hydro-electric and irrigation surveys and reports. Other work consists of planning water supplies for small communities and photogrammetry applied to large scale mapping. Interested in obtaining responsible position in hydraulic, town planning or municipal field preferably in western Canada. Available on reasonable notice to present employer. Apply to File No. 2772-W.

MECHANICAL ENGINEER (Sask. 1945) Jr.E.I.C. Four years general and draughting experience. Age 30, married. Wish to specialize in heating and air conditioning or allied field. Willing to work for moderate salary to gain experience. Location Montreal. Apply to File No. 2829-W.

MECHANICAL ENGINEER, Jr.E.I.C., P.Eng. (Que.) University of Saskatchewan, 1944, age 28, married, with 6 years experience in cost control, material and equipment ordering and scheduling, and supervision of skilled trades, and labor; in connection with mill maintenance and construction; in the pulp and paper, textile and oil industries. Desires permanent position with responsibility and opportunity for advancement. Available on short notice. Apply to File No. 2928-W.

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

CIVIL ENGINEER, B.E. (N.S. Tech. '46), S.M. (M.I.T. '48), P.E.Q. Jr.E.I.C., Jr. A.S.C.E., young, single. One year in railway maintenance, two years in general structural design, limited experience in steel erection Good knowledge of structural design and soil mechanics. Willing to go anywhere on permanent assignment or to travel. Apply to File No. 2965-W.

NOVA SCOTIAN desires employment in Nova Scotia. Professional Engineer (Electrical) but wide range of interest. Present salary $3,100 two years after graduating from Nova Scotia Technical College. Presently located in Montreal. Available beginning July or August 1950. Apply to File No. 3156-W.

ELECTRICAL ENGINEER, S.E.I.C., B.Sc. (Alberta '49), single, ex-Naval Officer. Five years commercial radio operating experience. Hydro-electric and plant maintenance experience. Familiar with general business and accounting procedure. Evening student conversational French and Spanish. Interested in estimating and sales engineering. Desires employment which might lead to foreign service. Available on reasonable notice. Apply to File No. 3236-W.

ELECTRICAL ENGINEER, S.E.I.C. Sask. 1949. Age 26. Married. Experience includes: Operation and maintenance hydro electric plant, electrical repair and contracting, wireless and radar (R.C.A.F.), also very willing to learn and take an active interest in his work. Apply to File No. 3238-W.

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BOOK REVIEW

A History of Chemistry in Canada:

J. C. S. Warrington and R. V. V. Nicholls. Toronto, Sir Isaac Pitman & Sons (Canada), 1949. 502 pp., 6 x 9 in., cloth, $4.50.

Reviewed by J. R. Donald, M.E.I.C.*

The title fails to indicate the scope or interest of this volume. It is considerably more than a history of Canada: It is a review of the natural resources of Canada in relation to chemical industry, a history of the development of those industries in which chemistry plays an important part, and a history of the development of chemical services in government and of chemical societies. Interwoven throughout is the story of the personalities and organizations participating in the notable progress in chemistry outlined in this volume.

The book is divided into twenty chapters, each dealing with one phase of the subject — for example, "Chemistry and Metals", "Chemistry and Wood Products", "Explosives, Ammunition and Pyrotechnics", "Chemistry and Public Services", etc. The arrangement is excellent, the type is large and easily read, and there are a number of interesting drawings, sketches and photographs.

Preparation of this book was undertaken at an opportune time as most of the events recorded and personalities discussed are still vivid memories.

Publication of this work was sponsored by the Chemical Institute of Canada and made possible through the generosity of Canadian Industries Limited.

The joint authors, C. J. S. Warrington of Canadian Industries Limited and Professor R. V. V. Nicholls of the Chemistry Department of McGill University, by training and experience, were well equipped for their self-imposed task. Their enthusiasm for their subject is reflected throughout the volume and cannot fail to infect the reader. They are to be congratulated on having been able to present this subject in a highly interesting and readable form and, at the same time to provide an historical reference book which will be of increasing value as time passes. Every chemist in Canada has reason to be proud of this well written "History of Chemistry in Canada", and all those interested in chemistry or chemical industry will find it and authoritative and illuminating story.

**President, J. T. Donald & Co. Ltd., Montreal.*

ABSTRACT

Bids Confirm 15 Per Cent Estimated Saving in Jacketless Tunnel Tube:

S. A. Thoresen; Civ. Eng: Jan. 1950: pp. 26-29.

The Texas State Highway Department is building a tunnel under the Houston Ship Channel between Baytown and La Porte, consisting of 3,009 feet of circular steel tube, 34 ft. 10 in. in diameter, lined with concrete, and 1,102 feet of open cut approaches. About 80% of the tube section is made up of sections 250 or 300 feet long, built on shipways, lined with concrete, launched and floated into place, sunk in a previously dredged trench and back-filled. The novelty of this process lies in the fact that the steel tube has no outside concrete jacket, contrary to previous practice. The omission of the jacket saves forms and the high cost of underwater concrete. In this case the saving is about a million dollars.

The skin is ½ in. thick stiffened by internal ring girders welded to the shell. The concrete lining varies in thickness from 2 ft. 9 in. at the crown to 3 ft. 10 in. at the centre of the invert, lowering the metacentre and increasing the stability of the tube when floating. Heavy reinforcement in the concrete lining helps the steel shell and girders carry all loads.

Joints between the tubes are made by external transverse diaphragms at the ends of adjacent tubes, connected along their vertical edges by steel plates to form a box without top or bottom. The adjoining tubes are also bolted together on their horizontal axis, merely to keep them in line. The box between the diaphragms is filled with tremie concrete.

The tunnel has a 22-foot roadway, a narrow walkway at one side over a bank of electrical conduits, a small main for tunnel water supply and a drain line. The space under the roadway slab serves as a ventilation duct. Finish is white tile.

The final paragraphs of this paper compare the features of the Oakland-Alameda (California), Maas, (Rotterdam), Michigan Central, (Detroit), State St., (Chicago), Harlem River, La Salle St., (Chicago), Detroit-Windsor, Bankhead (Mobile), and Pasadena (Texas) highway tunnels, built between 1906 and today.

R.D.F.

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TECHNICAL BOOKS, ETC.

Acoustical Designing in Architecture:
Vern O. Knudsen and Cyril M. Harris. New York, Wiley; London, Chapman, c1949. 457 pp., illus., cloth.

Fire in Buildings:
Eric L. Bird and Stanley J. Docking. London, Adam & Charles Black, 1949. 295 pp., illus., cloth.

Handbook for Welded Structural Steelwork:
Institute of Welding. London, The Institute, 1949. 216 pp., illus., cloth.

Industrial Chemistry of the Fats and Waxes, 3rd ed.:
T. P. Hilditch. London, Bailliere, Tindall and Cox. 604 pp., cloth.

Introduction to the Engineering Profession; Concerning Engineering Orientation and Engineering Problems:
John G. McGuire and Howard W. Barlow. Cambridge, Mass., Addison Wesley, 1950. 207 pp., illus., cloth.

Heat Pump:
J. B. Pinkerton. London, Princes Press, c1949. 257 pp., illus., cloth.

Legal Phases of Engineering; Contracts and Specifications:
Ivan C. Crawford. New York, Macmillan, 1950. 346 pp., illus., cloth.

Materials Engineering of Metal Products:
Norman E. Woldman. New York, Reinhold Publishing Corp., c1949. 583 pp., illus., cloth.

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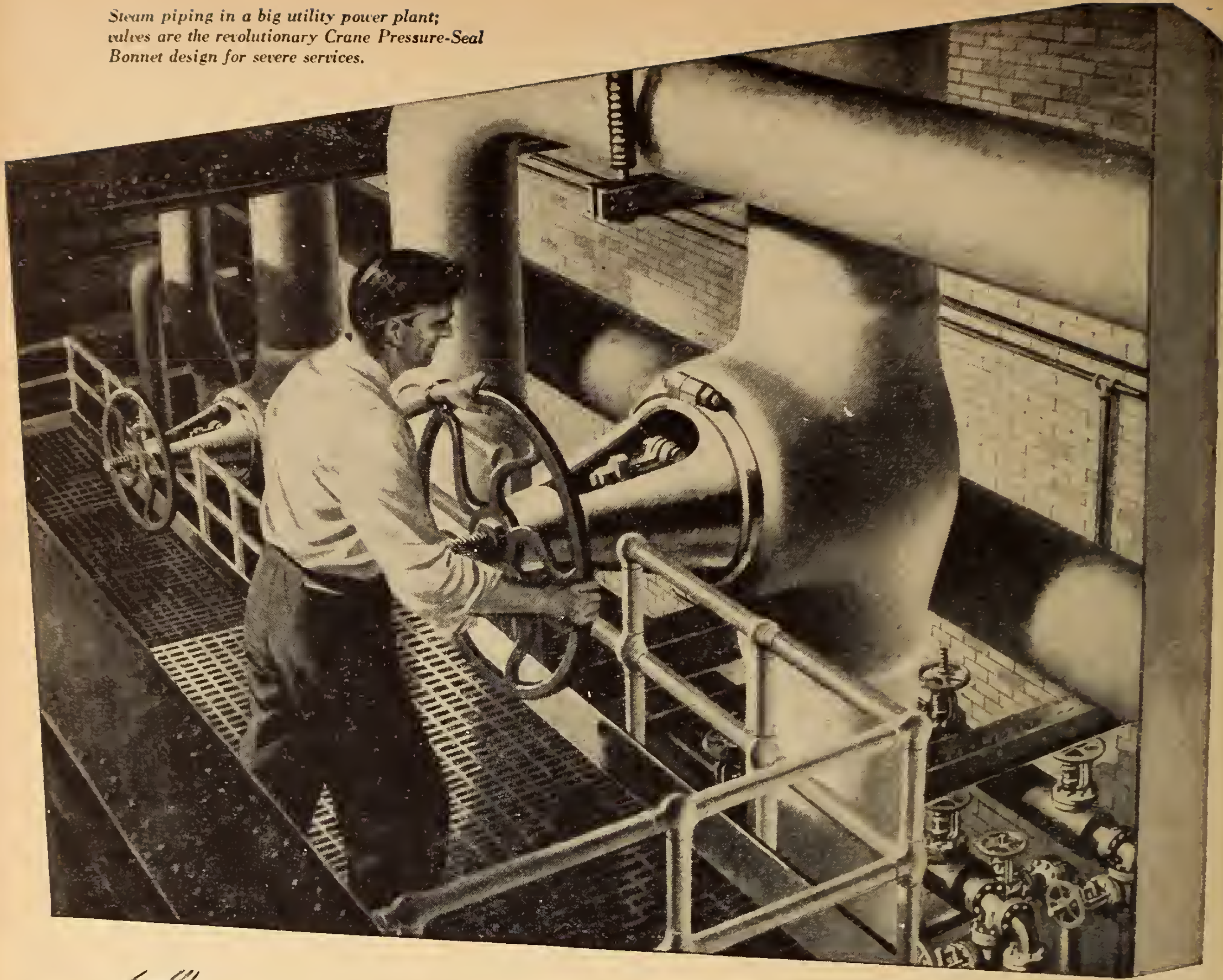

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Phenomena, Atoms and Molecules; An Attempt to Interpret Phenomena in Terms of Mechanisms or Atomic and Molecular Interactions:

Irving Langmuir. New York, Philosophical Library, c1950. 436 pp., illus., cloth.

Photoelasticity; Principles and Methods:

H. T. Jessop and F. C. Harris. London, Cleaver-Hume Press, 1949. 184 pp., illus., cloth.

Practical Petroleum Engineers' Handbook, 3rd ed.:

Joseph Zaba and W. T. Doherty. Houston, Texas, Gulf Publishing, 1949. 654 pp., illus., cloth.

Practical Spectroscopy:

C. Candler. London, Hilger & Watts, 1949. 190 pp., illus., cloth.

Question of Establishing United Nations Research Laboratories:

United Nations. Dept. of Social Affairs. Lake Success, N.Y., 1948. 290 pp., paper.

Radar Systems and Components:

Members of the Technical Staff of Bell Telephone Laboratories. New York, Toronto, D. Van Nostrand, 1949. 1042, pp., illus., cloth.

Theory and Design of Electron Beams:

J. R. Pierce. New York, Toronto, D. Van Nostrand, 1949. 197 pp., illus., cloth.

DIRECTORIES, ETC.

American Men of Science; A Biographical Directory, 8th ed.:

Edited by Jaques Cattell. Lancaster, Pa., 1949. 2,836 pp., cloth.

F B I Register of British Manufacturers, 22nd ed., 1949/50.

London, Kelly's Directories Iliffe & Sons Ltd., (n.d.) 807 pp., illus., cloth.

M.M. Year Book. 1950; A Comprehensive Guide to Sources of Supply of New and Second-Hand Machinery of British and Foreign Origin.

London, Machinery Market Ltd., (n.d.). 592 pp., illus., hard.

TECHNICAL BULLETINS, ETC.

American Society for Testing Materials:

Committee D-3—Standards on Gaseous Fuels. Committee D-19—Standards on Industrial Water. Committee D-2—Standards on Petroleum Products and Lubricants (with Related Information).

American Society of Mechanical Engineers:

A S M E Boiler Code Interpretations (Corrected to January 1, 1950).

British Electrical and Allied Industries Research Association. Technical Reports:

Reference L/T186—Impact Testing; Critical Resume, W. Lethersich. L/T213—Measurement of the Coefficient of Internal Friction of Solid Rods by a Resonance Method, W. Lethersich and H. Pelzer. Q/T108—Design of a Capacitive Voltage Transformer, E. Billig. C/T101—Large-scale Generation of Electricity by Wind Power—Preliminary Report, E. W. Golding. W/T16—The Potentialities of Wind Power for Electricity Generation (with Special Reference to Small-scale operation), E. W. Golding and A. H. Stodhart. W/T18—Electric Fences, A. E. Canham and R. G. Parr.

Chalmers Tekniska Hogskolas. Handlingar:

(Chalmers University of Technology. Transactions).

Nr. 92, 1950. Experimental Investigation of a long Electron Beam in an Axial Magnetic Field, J. Sigvard A. Tomner.

Connecticut. University. Engineering Experiment Station:

No. 5—Transmission-line Circle Diagram of a Uniform Line, Frederick P. Fischer.

Edison Electric Institute:

Specifications for Douglas Fir Crossarms Treated or Untreated. Approved by Transmission and Distribution Committee Edison Electric Institute. (TD-90, 1949).

Harvard University. Dept. of Graduate Engineering:

Publication No. 476. Analysis of Pore Pressure and Settlement Observations at Logan International Airport, J. P. Gould. (Harvard Soil Mechanics Series, No. 34, December 1949).

Illinois. University. Engineering Experiment Station. Bulletin Series:

No. 382. Fatigue Strength of Various Details Used for the Repair of Bridge Members, Wilbur M. Wilson and William H. Munse.

...Circular Series *No. 57. A Survey of Electrical Insulation Practices, Max A. Faucett, Constantine Houpis and George E. Leibinger.—No. 58.—Papers Presented at the Eighth Conference on Coal Utilization held at the University of Illinois, September 27-28, 1948.*

...Reprint Series *No. 45. Highway Bridge Floors, Frank E. Richart, Nathan M. Newmark and Chester P. Siess.*

Institute of Metals. Reprints:

No. 1219—Aluminium-Tin Phase Diagram and the Characteristics of Aluminium Alloys Containing Tin as an Alloying Element, A. H. Sully, H. K. Hardy and T. J. Heal. 1213—Application of X-Ray Methods to the Determination of Phase Boundaries in Metallurgical Equilibrium Diagrams, E. A. Owen and D. P. Morris.—1214—Equilibrium Diagram of the System Chromium-Manganese, S. J. Carlile, J. W. Christian and W. Hume-Rothery.—1217—Mechanism of Deformation in Metals, with Special Reference to Creep, W. A. Woods and W. A. Rachinger.—1215—Note on the Effect of Nitrogen on the Structures of Certain Alloys of Chromium and Manganese, and on the Existence of an Intermediate Nitride Phase, S. J. Carlile and W. Hume-Rothery.—1218—On the Mechanism of Oxidation of Nickel-Platinum Alloys, O. Kubaschewski and Ortrud Von Goldbeck. 1216—Overheating Phenomena in Aluminium-Copper-Magnesium-Silicon Alloys of the Duralumin Type, J. Crowther. 1212—Recrystallization of Single Crystals After Plastic Bending, R. W. Cahn.

Institution of Electrical Engineers. Papers:

930—Cost and Efficiency of Earthing on Low-and-Medium-Voltage Overhead Line Systems, L. Gosland.—910—Design, Specification and Performance of High-Voltage Surge Diverters, H. F. Jones and C. I. O. Garrand.—946—Fault-Throwing Tests on the 132-KV Grid System Under Normal Working Conditions, W. Casson and F. H. Birch.—794—Ground-Wave Propagation Over an Inhomogeneous Smooth Earth, Part 1. G. Millington.—909—Ground-Wave Propagation over an Inhomogeneous Smooth Earth, Part 2—Experimental Evidence and Practical Implications. G. Millington and G. A. Isted.—940—Instrument for the Measurement of Rate of Change of Power-System Frequencies, E. Bradshaw and M. Tanyeloglu—929—New Precision A. C. Voltage Stabilizer, G. N. Patchett.

Institution of Mechanical Engineers. Advance Papers:

Simplification Creates New Problems for Top-Management, H. E. Merritt.—Some Considerations in the Provision and Operation of an Overseas Mail Service, James Gray.—Some Factors in the Use of High Temperatures in Gas Turbines, T. W. F. Brown.—Investigation of the Performance and Design of the Air Ejector Employing Low-Pressure Air as the Driving Fluid, L. J. Kastner and J. R. Spooner.

Iowa State College. Engineering Experiment Station. Engineering Rpt.:

Engineering Rpt. No. 1. Thermodynamic Criteria for Heat Pump Performance, John F. Sandfort.

Iowa State College. Engineering Extension Service. Bulletins:

No. 120. Tele Vision in Iowa.—No. 121. Frequency Modulation in Iowa.

North-East Coast Institution of Engineers and Shipbuilders. Advance Paper:

Diesel Engine Crank-Case Safety Precautions, C. C. Pounder.—Modern Tanker Construction, N. Carter.—Review of Ship Model Data, A. Emerson and N. A. Witney.

Princeton University. Industrial Relations Section. Research Report Series:

No. 80—Job Modifications under Collective Bargaining; A Survey of Company Experience and Four Case Studies.

Purdue University. Engineering Extension Dept. Extension Series:

No. 67. Proceedings of the Personnel and Industrial Relations Conference held at Purdue University, May 16-17, 1949.

Purdue University. Engineering Experiment Station. Research Series:

No. 108. Equilibrium Constants for Seventeen Gas Reactions, G. A. Hawkins and J. M. Smith.

Statens Skeppsprovningsanstalt. Meddelanden. (Swedish State Shipbuilding Experiment Tank). Publication.

Nr. 14. Further Tests with Models of Fast Cargo Vessels; Influence of Longitudinal Position of Centre of Buoyancy, H. F. Nordstrom.

U.S. Highway Research Board. Research Report.

No. 9-A.—Time and Gasoline Consumption in Motor Truck Operation as Affected by the Weight and Power of Vehicles and the Rise and Fall in Highways. Report of Committee. Presented at the Twenty-ninth Annual Meeting.

PAMPHLETS

Atomic Energy in Industry:

H. A. Winne. Reprinted from The Smithsonian Report for 1948.

Geography of Oil and Gas in Western Canada:

Canadian National Railways. Montreal, 1949.

Mechanical Computing Mechanisms:

Robert R. Reid and Du Ray E. Stromback. Reprinted from Product Engineering.

Natural Gas Flow at Supersonic Velocity:

Floyd K. Beach. Reprinted from Petroleum Engineer.

Produced in Canada Transportation Equipment:
Canadian Manufacturers' Association, Reprinted from Industrial Canada.

Report on Lakeshore Erosion; Lake Ontario from Niagara to Cobourg:
Langford, G. B. Toronto, Ont., Dept. of Planning and Development, 1949.

Residual Stresses in Metals:
William Marsh Baldwin, Jr. (Edgar Marburg Lecture) Philadelphia, A.S.T.M., 1949.

Round Table Discussion on the Need for Standards for the Examination of Water-Borne Industrial Wastes.
L. Kermit Herndon, George D. Beal and others. Reprinted from A.S.T.M. Bulletin Dec. 1949.

Scientist and the Engineer:
Karl Taylor Compton. University of Toronto. (Second Wallberg Lecture, 1949).

Some Considerations on the Organization of a Special Library:
Special Libraries Association. New York

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.

APPLIED EXPERIMENTAL PSYCHOLOGY: HUMAN FACTORS IN ENGINEERING DESIGN:

Alphonse Chapanis and others. N.Y., Wiley, 1949. 434 pp., 9½ x 6 in., illus., cloth, $4.50.

Applied Experimental Psychology tells what experimental psychologists have learned about how men see, hear, and move. It then shows how this information can be applied in the making of better machines for human use. The authors first give basic information about man's capacities, and then indicate how this information can be applied to practical design problems. Statistical methods, necessary to the understanding of the rest of the book, are covered in special chapters.

BIBLIOGRAPHY OF BLACKOUT AND DIMOUT LIGHTING PRACTICES DURING WORLD WAR II, INCLUDING AN ENGINEERING DIGEST OF DEFENSE LIGHTING:

Special Committee on Wartime Lighting Practices During World War II. N.Y., Illuminating Engineering Society, n.d. 30 pp., (digest), 11 pp., (bibliography), 11 x 8½ in., paper.

The chapters of the "Digest" are intended to summarize the significant illuminating engineering data connected with defense lighting. The bibliography contains four parts: blackout; dimout; blackout and dimout; civilian defense. It lists bulletins, reports, manuals, governmental studies, standards and specifications, etc.

BIBLIOGRAPHY ON PALLETS USED IN MODERN MATERIALS HANDLING:

Engineering Societies Library, N.Y., 1949. 15 pp., 11 x 8½ in., paper, $2.00. (ESL Bibliography No. 4).

A comprehensive list of 114 books and periodical articles published from 1937 to date and covering all aspects of the subject of pallets, including the design and construction of the different types, the handling of various materials on pallets, the savings achieved in materials handling, and details of present-day applications in individual plants in a large number of industries.

NEW BRITISH STANDARDS

British Standards Institution, London, England.

B.S. 1133: Section 15: 1949—Tensional Steel Strapping. *2/–.*

This standard outlines a set of recommendations for the immeasurables of packaging practice, as well as applying standards of performance and test for the materials used. Strapping machines and tools are discussed, as well as the types of strapping materials and their manifold uses.

B.S. 1486: Part 3: 1949—Light-Weight Miniature Lubricating Nipples. *2/–.*

This is the third of the series of British Standards which has been drawn up to standardize the over-all dimensions and thread sizes of lubricating nipples. This standard deals with the aluminium alloy lubricating nipple which is suitable for use where a small, lightweight nipple is required. It is identical with that used in aircraft (AGS 554). It does not deal with the internal construction of the nipple.

B.S. 1574: 1949—Split Cotter Pins. *2/–.*

Gives the dimensions for ferrous and non-ferrous cotter pins from 1/32 in. to 1½ in. diameter, and prescribes the tolerances on the diameter, on the length and on the form of the eye. A table is included showing the standard sizes of mild steel split cotter pins normally stocked by the manufacturers.

BRITISH STANDARDS INSTITUTION YEARBOOK, 1949:

British Standards Institution, London, 1949. 362 pp., illus., 8½ x 6 in., cloth, 5/–.

This 1949 yearbook gives a subject index and a synopsis of each of the 1,500 British Standards now current. It includes lists of members of the General Council, the Divisional Councils and the Industry Committee of the Institution as well as other information about its work. The standards are listed by order of number, and for each one, a short review is included.

BUSINESS HELPER FOR THE MODERN MAN OPERATING A SMALL BUSINESS:

Leslie C. Rucker. N.Y., Rider, c1949. 138 pp., 8 x 5½ in., cloth, $2.00.

This book is intended to help the business man to operate his business profitably. From his thirty-two years of meeting everyday business problems, the author has devised practical ways and means of overcoming losses and turning them into profits. All the subjects contained in this work have been covered by many writers, but seldom have they been compiled in a handbook directed to the small business-man.

CONQUEST OF SPACE:

Willy Ley. N.Y., Viking Press, Toronto, Macmillan, 1949. 160 pp., 11 x 8½ in., illus., cloth, $4.95 (in Canada).

Willy Ley is well known for his research on rockets and his previous book "Rockets; the Future of Travel Beyond the Stratosphere". This book brings the layman on a visit to such far-away places as the moon, Venus, and other planets. The paintings of Chesley Bonestell, architect, artist and astronomer, show Jupiter from its large moon, the landscape of Mars, and the results of a meteorite-hit on Manhattan. Each Section of the text is followed by pages of parallel illustrations, together with explanatory captions by the collaborators. There are forty-eight pages of illustrations, sixteen of them being in full colour.

ENROULEMENTS INDUSTRIELS DES MACHINES A COURANT CONTINU ET A COURANT ALTERNATIFS, 3rd ed.:

Eugene Marec. Paris, Gauthiers-Villars, 1949. 296 pp., illus., 10 x 6½ in., paper, 950 fr.

This book deals with industrial practice of windings on AC and DC machines. It is divided in two parts, the first covering the theory and practice of DC machines, while the second covers the theory and practice of AC machines. In the first part, there are chapters on general considerations, coil induction, symmetry of winding, necessity of winding making a closed circuit, equipotential connections, etc. In the second part, there are chapters on production of AC, windings in the moving and static parts of the motors, conductors, etc.

LE FRAISAGE; 5ième éd.:

J. Hanen, rev. by L. Ramel. Paris, Dunod, 1949. 207 pp., illus., 8½ x 5½ in. paper, 850 fr.

A theoretical and practical documentation is given in this work on cutters, reamers, taps, special cutters for light alloy machining, form cutters, inserted tooth cutters, bevel-gear cutters, etc. Very helpful tables are given for some particular kinds of cutting.

INDUSTRIAL MINERALS AND ROCKS, 2nd ed. rev.:

Samuel H. Dolbear, Chairman, Editorial Board. N.Y., American Institute of Mining and Metallurgical Engineers, 1949. 1,156 pp., 9 x 6 in., illus., cloth, $8.00.

This work on Industrial Minerals and Rocks is composed of 51 chapters written by recognized specialists in their respective fields. It is the only publication grouping so complete a collection of data on non-metallic minerals. In each case, the chapter on a mineral or family of minerals is further subdivided in classification, types, composition, properties, mode of crystallization and occurrence, geographical distribution, preparation for market, uses, etc. Statistics and curves are included whenever possible, for production, prices, and composition. An exhaustive bibliography is also enclosed in each chapter. This book will be useful to those engaged in the production and use of industrial minerals, and to the rising engineers and students who desire to take advantage of the growing number of opportunities for engineers trained in these subjects.

MULTITUBULAR AND LOCOMOTIVE BOILER DEFECTS AND REPAIRS:

Sydney D. Scorer. London, John D. Troup, 1949. 45 pp., 9 x 6 in., illus., paper, 7/6. (Reprinted from The Steam Engineer (London), Nov., 1948, to June, 1949.)

This publication has chapters on the various troubles related to these boilers: shell defects; blow-off; explosion; tube-end troubles; corrosion; end-plate distortion; lap fractures; crown collapses; shell-seam leakages; smoketube and firebox pitting and corrosion, etc. In most cases, elaborate trouble-shooting and curing indications are given. The book is illustrated with drawings and contains furnace tables for rapid calculation of safe working pressure.

PHOTOGRAPHY IN ENGINEERING:

C. H. S. Tupholme. London, Faber and Faber, 1945. 276 pp., 10 x 7½ in., illus., cloth, $6.50.

Progress in industrial photography has been great in recent years, and "Photography in Engineering" records what is being done now and suggests what can be done in the future to make the works photographic department one of the most reliable factors in maintaining quantity and quality of production. The photographic techniques described and illustrated are now being used successfully. They suggest how the same or similar techniques can be applied to other engineering processes. A bibliography is included.

RADIO AND TELEVISION MATHEMATICS:

Bernhard Fischer. N.Y., Toronto, Macmillan, 1949. 484 pp., 8½ x 5½ in., illus., cloth, $7.00 (in Canada.)

A practical handbook and reference book for anyone working in radio, television, or other branches of electronics. This book gives the solutions for nearly 400 problems typical of those encountered in the construction, operation, and servicing of radios, television and other electronic equipment. The problems, arranged conveniently under electronic headings, include most calculations commonly encountered in electronics, from those involving basic circuit components to those concerned with specialized elements in television and in modern control apparatus.

REVIEWS OF PETROLEUM TECHNOLOGY. Vol. 8 (covering 1946):

F. H. Garner ed. and others. London, Institute of Petroleum, 1949. 445 pp., 9½ x 6½ in., cloth, 27s. 6d.

In this volume changes and additions have been made to the 1941-5 volume. The chapter on lubricants and lubrication (1941-46) now occupies 73 pages and contains references to over 1,000 articles in the literature and patent specifications. The present volume contains over 3,000 references to articles which have appeared in the literature in relation to developments in the periods reviewed.

STYLE MANUAL FOR AMERICAN STANDARDS:

American Standards Association, N.Y., 1949. 28 pp., 11 x 8½ in., paper, $1.00. (A.S.A. P M 117).

The manual is a guide to bring about greater uniformity in presentation of technical data, particularly in those generally agreed upon standards which have been given approval as "American Standards". Although primarily intended for use by the technical committees working under the procedure of the Association, the manual contains recommendations and suggestions which may be helpful to any organization responsible for editing and publishing technical documents.

TRANSMITTING INFORMATION THROUGH MANAGEMENT AND UNION CHANNELS; TWO CASE STUDIES:

Princeton University, Industrial Relations Section, Princeton, New Jersey, 1949. 140 pp., 9½ x 6 in., paper, $2.50. (Research Report No. 79).

The two cases studied are Johnson & Johnson and local 630, Textile Workers Union of America; Esso Standard Oil Co., and the independent petroleum workers. In both cases there are chapters on the background of the case, the company's informational programme, review of findings, etc.

TRENDS IN INDUSTRIAL RELATIONS:

Alexander R. Heron, and others. Pasadena, California Institute of Technology, Industrial Relations Section, 1949. 88 pp., 9 x 6 in., paper, $1.00. (. . . Bulletin No. 16).

This publication is the result of a special conference on "Profitable Personnel Policies". It contains seven articles on industrial relations, by Alexander R. Heron, Leo Wolman, Lawrence A. Appley, Dale Yoder, Lee A. DuBridge and Robert D. Gray.

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 TEXTILE MATERIALS:

Prepared by A.S.T.M. Committee D-13; Specifications, Tolerances, Methods of Testing, Definitions and Terms, October, 1949. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 374 pp., illus., diagrs., charts, tables, 9 x 6 in., paper, $4.50.

Definitions and terms, methods of testing, and specifications for textile and related materials are given. Additional material appearing in appendices as information includes tables on basic properties of textile fibers, on yard number conversion, and on relative humidity. Proposed recommended practices and specifications in this field are also included.

A.S.T.M. STANDARDS ON COAL AND COKE:

Prepared by A.S.T.M. Committee D-5 on Coal and Coke, October, 1949. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 729 pp., illus., diagrs., charts, tables, 9 x 6 in., paper, 2.00.

This booklet brings together all of the A.S.T.M. standards on coke and coal. It gives 28 test methods, specifications, definitions of terms, and numerous proposed methods. Coal sampling, analysis for volatile matter in connection with smoke ordinances, grindability, drop shatter test, tumbler test, screen analysis, size, sieve analysis, cubic foot weight, index of dustiness, and free-swelling are covered for coal and coke.

BEAMA CATALOGUE 1949-50:

Published for the British Electrical and Allied Manufacturers' Association, 36 and 38 Kingsway, London, W.C.2, by Iliffe & Sons Limited, Dorset House, Stamford Street, London, S.E.1. 852 pp., illus., diagrs., tables, 11¾ x 9 in., cloth, for private distribution.

The comprehensive range of products which members of BEAMA can supply is illustrated and described in this collective Catalogue which brings together in a compact and convenient manner information for the overseas buyer on products and services of a great industry. Data are grouped alphabetically by firms in three broad divisions: Power Plant; Industrial equipment; Domestic and commercial apparatus and appliances. A short account of the history and work of the BEAMA is also included.

DE LAVAL HANDBOOK:

Compiled by the Engineering Staff of the De Laval Steam Turbine Co. Edited by A. H. Church and H. Cartmann. De Laval Steam Turbine Company, Trenton 2, N.J., 1947. Paged in sections, illus., diagrs., charts, tables, 8 x 5½ in., cloth, $2.00.

This handbook of reference data, information and formulas was compiled to facilitate the work of power plant, industrial and design engineer. Following a general information section are sections devoted to steam turbines, centrifugal pumps, IMO pumps, centrifugal compressors, helical reduction gears, and worm reduction of gears.

ENGINEERS' DICTIONARY, SPANISH-ENGLISH AND ENGLISH-SPANISH.

L. A. Robb. 2 ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 664 pp., 8½ x 5½ in., cloth, 12.50.

This volume is designed to give the North American technical man the accepted engineering terminology of Spanish America and vice versa. The new edition has been enlarged: 1) to cover more thoroughly electrical and mechanical engineering terminology, including radio and television; 2) to bring all branches of civil engineering up to date — particularly soil mechanics, photogrammetry, and airport construction; and 3) to include the important terms peculiar to mining, shipbuilding, logging, sugar milling, and oil-field operations.

GIANT BRAINS OR MACHINES THAT THINK:

E. C. Berkeley. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 270 pp., diagrs., tables, 8½ x 5½ in., cloth, $4.00.

Describing several existing large-scale mechanical computers, this book presents their general operating procedure, history and principles. Future possibilities and their significance are considered. The nature of language and of symbols, the meaning of thinking, the human brain and nervous system, and other allied topics are also included.

HANDBOOK OF CHEMISTRY:

Compiled and edited by N. A. Lange and G. M. Forker. 7th ed. Handbook Publishers, Sandusky, Ohio, 1949. 1920 pp., diagrs., charts, tables, 8 x 5½ in., cloth, $7.00.

This standard handbook is a comprehensive reference volume for all who require ready access to chemical and physical data used in laboratory work and manufacturing. In this seventh edition, 24 tables are extended or completely rewritten, and 14 new tables on such varied topics as abundance of the elements, properties of hormones, dipole moments, and viscosity of ethyl alcohol solutions are included. A portion of the mathematical data which appeared as an appendix is omitted. As before, Beilstein references are given in the extensive table of physical constants of organic compounds.

HEATING, VENTILATING, AND AIR-CONDITIONING FUNDAMENTALS:

W. H. Severns and J. R. Fellows. 2 ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1949. 666 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.50.

Intended for engineers, architects and heating contractors, this book is also of interest to students of architectural and mechanical engineering. This second edition is revised to include the new methods of application and the equipment available. Along with applicable theory, examples of typical calculations are included. New material is presented on warm-air furnace heating, hot-water heating, panel heating, refrigeration, air purification, estimation of cooling loads, and air conditioning.

MANUFACTURING ANALYSIS:

R. F. Kipers. Sponsored by American Society of Tool Engineers, published by McGraw-Hill Book Co., New York, Toronto, London, 1949. 452 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.50 (in Canada).

This text is designed to familiarize the student with various processes, machinery, tooling and techniques for the production of consumer goods. It covers assembly methods, devices, and materials handling equipment. It also presents a study of inspection procedure and quality control. Recent advances in surface finish analysis, tolerance balancing, and tool estimating are included, as well as case studies, numerous illustrations and charts, and problems.

MUNICIPAL ENGINEER:

L. B. Escritt. Macmillan, New York; George Allen & Unwin, London; Thomas Nelson, Toronto, 1949. 252 pp., illus., maps, tables, 7½ x 4¾ in., cloth, 7s 6d.

Intended for those now in or desiring to enter a municipal engineering department, this book, written from the British point of view, describes in detail the working of the department. It outlines the scientific processes involved in road construction, water supply and sewerage, and discusses the relations of these environmental services to town planning.

PRE-STRESSED CONCRETE, Proceedings of the Conference held at the Institution, February, 1949.

Institution of Civil Engineers, Great George St., Wesminster, London, S.W.1, England, 1949. 132 pp., illus., diagrs., charts, tables, 8½ x 5½ in., paper, 7s.6d.

This long paper reviews the present position of pre-stressed concrete construction, sets out in general terms the methods of design and construction used, and gives examples of actual structures built in Great Britain and elsewhere. A brief history of the early development of pre-stressed concrete is included.

PRINCIPLES OF A NEW ENERGY MECHANICS:

J. Mandelker. Philosophical Library, 15 East 40th St., New York, 1949. 73 pp., diagrs., charts, 9½ x 6 in., fabrikoid, $3.75.

This book explains this new branch of physical science which represents the next step of an evolution, leading from Newton's classical mechanics through Einstein's relativity theory as an intermediate stage. Part one is devoted to a development and statement of principles, and Part two shows how the principles explain physical phenomena.

RADIANT HEATING.

T. N. Adlam. 2nd ed., rev. & enl. Industrial Press, 148 Lafayette St., New York, 1949. 504 pp., illus., diagrs., charts, tables, 9¼ x 6¼ in., fabrikoid, $6.00 U.S.; elsewhere $6.45.

Of interest to engineers concerned with the design and installation of this equipment, this book stresses applications of radiant heating to actual problems. Both American and European design practice are considered. Step-by-step procedures are included, and typical problems are solved by the application of simplified working data, charts and tables. In this second edition, material is added to the section on panel heating, and new coil dimensioning charts are included.

S.A.E. HANDBOOK 1949 Edition.

Society of Automotive Engineers, 29 West 39th St., New York. 933 pp., illus., diagrs., charts, tables, 8¼ x 6 in., fabrikoid, $10.00 to non-members; $5.00 to members.

This 1949 edition contains the current S.A.E. Standards and Recommended Practices except those specifically for aeronautical use. Thirty new specifications, numerous revised specifications and corrections are included, and those specifications which have been cancelled are noted. The more than 900 pages contain a wide variety as well as a considerable amount of data on materials, equipments, tests and ratings.

SPECIFICATIONS AND TESTS FOR ELECTRODEPOSITED METALLIC COATINGS:

Sponsored by American Society for Testing Materials and American Electroplaters' Society, October 1949. American Society for Testing Materials, 1916 Race St., Philadelphia. 62 pp., diagrs., charts, tables, 9 x 6 in., paper, $1.25.

In this compilation are specifications for various types of electrodeposited coatings on steel, copper and copper-based alloys, and zinc and zinc-based alloys. Two test methods — one for local thickness of electrodeposited coatings, the other for salt spray (fog) testing — are included. There are also three items presenting recommended practices.

STATICALLY INDETERMINATE FRAMEWORKS:

T. F. Hickerson. 3 ed. University of North Carolina Press, Chapel Hill, N.C., 1949. 202 pp., diagrs., tables, 11 x 8½ in., cloth, $5.00.

A textbook dealing primarily with the analysis of the bending stresses in bridge and building frames, in which is utilized the procedure of applying the actual degree-of-fixation at the ends of the loaded members of the structure. The chapter on arches has been omitted, but new material has been added covering special analytical methods and simplifications of certain cases such as the determination of wind moments. Tables of continuous-frame properties are included for use in applying the methods discussed.

TELEVISION FOR RADIOMEN:

E. M. Noll. Macmillan Company, New York, Toronto, 1949. 595 pp., illus., diagrs., charts, tables, 9½ x 6¼ in., cloth, $8.00 (in Canada).

Written to serve as a television text for practical radiomen and television students, this text explains in practical terms the principles and essential mathematics of the subject. It describes each part of modern television equipment, showing the particular application of theory in the construction and operation of each. Two chapters deal with installation, adjustment, alignment and trouble shooting. A rather thorough knowledge of radio circuits is assumed.

TROLLEY CONVEYORS:

S. Reibel. McGraw-Hill Book Company, New York, Toronto, London, 1949. 265 pp., illus., diagrs., tables, 9¼ x 6 in., cloth, $5.20 (in Canada).

This book is written for those who study, design, manufacture, operate, or purchase trolley conveyors. It shows what trolley conveyors will do, where they can be used, and how to lay out and use them. Standards of construction, original tables, data, and methods are included. New types of conveyors are described. There are many pictures, drawings and charts. The tables are grouped in a section at the middle of the text, thus allowing the book to lie flat while the tables are in use.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

GUIDED MISSILES:

A. R. Weyl, Temple Press Limited, London, E.C.1, 1949. 139 pp., illus., diagrs., tables, 8¼ x 5½ in., paper, 7s. 6d.

This book provides a history of the evolution and principles of guided and directed missiles for military and peaceful purposes. Following chapters on principles, constituents and origins of guided missiles, the development of operational long-range rockets and smaller types of guided missiles is discussed. The appendices contain data on design characteristics, code names for rocket propellents, and a classification of the belligerent use of guided missiles.

INTRODUCTION TO THE GAS TURBINE:

D. G. Shepherd. D. Van Nostrand Co., New York, 1949. 387 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $5.00.

Filling the gap between non-technical descriptive matter and very specialized reports, this book provides an introduction to gas turbine theory and design. Following initial chapters on the basic physical and engineering concepts, the various components are described, and an outline of some design methods given. The remaining chapters discuss auxiliary equipment and control methods and provide illustrations of the practical use which is made of the constant-pressure gas turbine. Specialized calculations are dealt with in appendices. Chapter bibliographies are included.

PATENT TACTICS AND LAW:

R. S. Hoar. 3 ed. Ronald Press Company, New York, 1950. 352 pp., 9¼ x 6 in., cloth, $7.00.

Of interest to the engineer, independent inventor, and business executive, this book constitutes a translation into plain English of essential patent law. Particularly noteworthy in this third edition are the changes in the handling of appeals within the Patent Office and new practices based on recent changes in the "Rules by Practice" and "Manual of Patent Examining Procedure" published by the Patent Office. A considerable number of case citations have been added, as footnotes, as well as a glossary of terms relating to patent law.

SATURATING CORE DEVICES, Operating Principles and Applications:

L. R. Crow. Scientific Book Publishing Co., 530 So. 4th St., Vincennes, Indiana, 1949. 373 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, $4.20.

Of interest to electrical engineering students as well as design and practising engineers, this books is a collection of simplified descriptions of saturable core devices and applications. It is not intended as a source of specific design and performance data. It is rather a means to acquaint students with electric phenomena not to be found collected elsewhere. Descriptive and graphical methods are used rather than advanced mathematics. There is a bibliography including related subjects.

Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

Gas Turbine Automobile.—Motoring history was made in Britain recently, when a gas turbine car was demonstrated for the first time. The demonstrator was an open two-seater with the engine placed behind the seats. The engine, which starts readily by ordinary electric starter, uses either gasoline, diesel oil or paraffin as a fuel. During the tests the car, made by the Rover Company, reached 85 m.p.h. and accelerated from a standstill to 60 m.p.h. in 14 seconds.

•

Floatation Process.—Hardinge Co., 240 Arch St., York, Pa., announce that a new device known as the "Heavy-Media Separator", which they manufacture, has been used with great success on the Mesabi Iron Range, Minnesota. The purpose of the machine is to improve the grade of ore.

The separator is a slowly-revolving, inclined, cylindrical drum with spiral flights attached to the inner surface of the cylinder. The material to be separated, accompanied by heavy media, is fed in at the lower end. As the drum rotates, the "sink" is carried by the spiral flights to the high end. The "float" overflows a circular weir at the lower end. There are no internal moving parts to grind against each other. The Separator will handle large pieces of ore up to 4 inches.

•

Mechanical Engineering Congress.—The British Engineers' Association, 32, Victoria St., London, S.W.I., has announced that the Third International Mechanical Engineering Congress will be held at Brussels, Belgium, from Sept. 18th to 23rd, 1950. Organized by Trade Associations representative of engineering manufacturers in the Scandinavian and Western European countries, this Congress provides an international meeting place for engineers for the purpose of discussing papers prepared by men with day-to-day industrial experience rather than a bias towards the purely scientific approach.

•

Imports from Britain.—Canada's imports from Great Britain during January 1950 are estimated to be worth 8.4 million dollars as compared with 6.6 million dollars in January 1949. There was a tremendous upswing in the number of British cars purchased.

•

Wood Sealer—The Monsanto Chemical Company, has announced the development of a new, economical, water-impervious sealer for wood. The new product was developed at Monsanto's Merrimac Division Laboratories in Everett, Mass. It is designed as a penetrating, non-sanding, moisture-resistant undercoat for all types of lacquers, enamels and paints. It is recommended for all types of wood, including plywood, which may be subject to water immersion or weathering. The product is expected to find a major market in brush handles, wooden bobbins for textile mills, doors and mill work.

•

Rock Drills.—Independent Pneumatic Tool Co., has announced the release of three new "power fed" mountings for drifter rock drills. The three new units are all designed for use with Thor Model 82 and 92 drifter rock drills, and are equipped with sliding cones, automatically doubling the length of feed. Largest size in the new line provides a total extension of 96 inches, 48 by means of the power feed and 48 by means of the sliding cone. Two smaller models the RF-48 and RF-60 are also equipped with the sliding cone, and provide feeds of 48 and 60 inches. All three models are powered with an air motor which provides power feed operation.

•

Western Oil Pipe Line.—Although main construction of a crude oil pipe line between Edmonton and the Great Lakes will not start until May, 1950, more than 2,000 Western Canadian farm land owners have felt a peculiarly personal interest in the project for several months. They are the men and women who hold title to lands through which the pipe line will pass in bridging the transportation gap between Alberta crude oil producers and the refineries in Eastern Canada. Since last fall they have been completing contracts without which the pipe line would not be possible.

The Interprovincial Pipe Line Company has announced that the process of obtaining the necessary legal authority for construction through farm lands is now entering its final stage. More than 2,100 tracts of land will be affected by the pipe line, and in most cases the tracts are quarter-section farms. As many of the owners of the land do not reside on their property, a great deal of work has been necessary to locate owners and their title deeds.

•

Bricklayers' Hoist.—A builder's hoist which will collect bricks within a 30-ft. range and elevate them to a two-storey building at the rate of 1,000 per hour, will be shown at the forthcoming British Industries Fair. The hoist can be moved around a building site like a wheelbarrow by one man and can keep a number of bricklayers supplied with tiles, bricks, mortar and cement. The hoist can be taken down, moved and re-erected in about two minutes.

•

Draughting Equipment. — Cal-Pan Corporation, Alhambra, California, announce triangular and flat draughtsman's scales of all-metal construction. Many special features are claimed for this new line of lightweight scales. A descriptive folder is available from the manufacturers.

•

Belt Conveyor.—An aluminum power belt conveyor has been announced by the Rapids-Standard Co. of Grand Rapids, Mich. Averaging less than 350 pounds in weight, the new 2-wheel power booster and stacker can be rolled into position almost as easily as a wheelbarrow.

The new conveyor is furnished in 10 and 16 inch belt widths and five standard lengths from 11 to 21 feet. Its box channel slider bed is formed of heat-treated aluminum alloy ⅛ inch thick, with steel trussing for added rigidity on the larger models. The unit operates horizontally, or at any angle up to 40 deg. Two-way belt travel permits use both in loading and unloading operations.

•

Miniature Temperature Transmitter.—A special small-size radiation pyrometer, for use in applications where space limitations make it impossible to

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Don't cut down on windows to save money. It works the other way!

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REGINA • SASKATOON • CALGARY • EDMONTON • VANCOUVER use a standard size radiamatic unit, has been developed by the Brown Instruments Division of Minneapolis-Honeywell.

The miniature unit may be used with any Brown Electronik Potentiometer, and is available in standard ranges from 200° to 1800° F. and at special ranges above that point. Overall dimensions, including terminals are 2⅜ in. x 2 11/16 in.

The chief application for this new small unit is temperature measurement in the heat treatment of small parts where space is limited, and in places where small targets must be observed at short distances. Temperature measurements of targets as small as ½ inch in diameter at six inches may be measured. For complete information write to Minneapolis-Honeywell, Brown Instrument Division, Leaside, Toronto 17.

●

Power Station Design.—The Ottawa Street Station of the Board of Water and Electric Light Commissioners of Lansing, Michigan, is a noteworthy example of modern industrial architecture.

The building which is located in the centre of the City of Lansing has no visible smoke stack and in outward appearance it resembles an office structure. The elimination of the visible stacks was accomplished by the use of specially designed stub stacks which are recessed in the parapet of the tower of the power plant building.

●

Earth Moving Equipment.—A completely new 24.5 cubic yard, cable operated scraper has been announced by the Findlay Division of Gar Wood Industries. It is known as the Model 625 4-wheel cable operated scraper. This new open bowl scraper has been designed for use with the Allis-Chalmers HD-19 Tractor. Complete information may be obtained from the manufacturer.

●

Corrosion Resistant Enamel.—Spielman Agencies Limited, 420 Lagauchetiere Street West, Montreal, agents for Griffiths Bros. & Co. Limited, paint enamel and varnish specialists, announce that they have on hand ample supplies of Driorol, a protective finish recommended for protection against rust and corrosion and damage by fumes. One of the principal features of this product is its quick drying properties.

●

Nickel Annual Report.—In a statement to the shareholders, President John F. Thompson of the International Nickel Company of Canada Ltd., said, when reporting on operations during the year 1949, "Our mines are in good condition and operated throughout the year without interruption. Ore mined was 9,984,891 short tons, compared with 10,866,862 in 1948 and 10,406,644 in 1947. Proven ore reserves at the year-end stood at 251,805,000 short tons, compared with 246,177,000 at the end of 1948 and 221,843,000 at the end of 1947. The nickel-copper content at the year-end stood at 7,630,000 short tons, compared with 7,503,000 at the end of 1948 and 7,171,000 at the end of 1947. Underground development in the operating mines totalled 84,654 feet, compared with 84,152 in 1948 and 54,790 in 1947. This brings the total footage of underground development in these mines to 1,408,314 or over 266 miles.

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Star PRODUCTION BOOSTER and PROFIT-EARNER OF ALL
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In the conclusion of the report the following statement was made "The year under review started with a pattern of good commercial activity, followed by a recession of several months duration and a recovery during the latter part of the year which has continued into 1950. Our company's business is so dependent on general industrial activity and political developments in the various countries which we serve that to forecast the company's future for this year, 1950, would imply an attempt to predict the trend of world affairs. As we change from a seller's market to a buyer's market, it is a satisfaction to know that we are well prepared to meet this great difference in our metal business."

●

British Diesel Engines.—Four new diesel engines will be on show at the Birmingham section of the British Industries Fair. They are the Meadows 970; the Petter-Fielding DH; the Mirrlees J6 and the Petter AVA. The Meadows and Petter-Fielding engines are on exhibition for the first time.

The Meadows 970, the latest high-speed diesel engine is a six-cylinder supercharged diesel with a traction rating of 250 b.h.p. at 1650 r.p.m. It has been designed primarily for traction purposes—extra heavy road vehicles, rail-cars, earth-movers, excavators, dumpers, bulldozers, etc. The Petter-Fielding horizontal DH engine is a single-cylinder totally-enclosed four cycle direct-injection oil engine developing 13 b.h.p. at 650 r.p.m. and 16 b.h.p. at 800 r.p.m.

Who says I'm throwing gravel away?

Chloride Cal. says:

This picture says so — that is, *if your gravel surfaces look like this, you're losing gravel for sure,* in the form of dust. New gravel and the cost of labour multiply maintenance costs without achieving more than a temporary improvement in the road surface.

But— hard, smooth, dustless roads like *this* actually cost no more than normal maintenance, if you use Calcium Chloride for consolidation. The Calcium anchors the gravel, holds it in place so it can't be scattered and ground into dust by traffic. Savings in material and labour and less frequent maintenance pay for the cost of the Calcium Chloride. Hundreds of case histories prove it. It will pay you to discuss with our Sales Engineers Calcium Chloride consolidation of your gravel road mileage.

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Quickly, Easily
Consolidate Roads With
CALCIUM CHLORIDE
-at No Extra Cost

It is designed to operate many kinds of light industrial machinery, lighting sets, and pumping units.

●

Instruments and Valves. — Minneapolis-Honeywell will show, at the Canadian International Trade Fair a number of instruments and valves which will be new to the Canadian market. Among the new instrument equipment will be a Brown Force Balance, displacement-type, Liquid Level Transmitter. The unit consists essentially of a sealed, ball-type float mechanism which transmits level variations through linkage to a pneumatic pilot valve. The pilot valve may be used to operate a pneumatic recording, controlling, or indicating instrument.

●

Fire Fighting Equipment. — Ansul Chemical Company, Marinette, Wisconsin, has developed a "jeep" fire truck which carries 340 lb. of dry chemical. It is claimed that, properly used, the fire fighting chemicals in the truck are capable of extinguishing large-area flammable liquid, gas, and electrical fires.

Named the Ansul Model 340-J, the "Jeep" fire truck will be available to manufacturing and chemical plants, the petroleum industry, airports, electric and gas utilities and other installations where fire hazards are dispersed over wide areas. It is also recommended for use by building contractors, small municipalities, and forest rangers. Complete information may be obtained from the manufacturer.

●

Canadian Trade Fair.—The Canadian International Trade Fair will be much larger this year than in 1949. A reflection of the current trade promotion trend is the preponderance of overseas exhibitors, who will account for more than 70 per cent of the total space. In their drive to earn more dollars to pay for their purchases of Canadian goods, many countries have sharply increased the scope and variety of their exhibits.

Although Canada may yield to the United Kingdom in the amount of total space this year, there will be a better balanced display of Canadian wares, with many new exhibitors from all parts of the country showing regional products for the first time. Chiefly responsible for this trend are the new Provincial Trade Fair Committees, which have been very active in encouraging participation of both exhibitors and visitors from their respective areas.

Two things stand out from the point of view of the Canadian businessman. First is the opportunity to save dollars by establishing new sources of supply for necessary imports, and second is the advisability for attendance at the Trade Fair of company personnel in addition to the obvious top executives, department heads, and buyers. Merchandise men and designers can develop profitable sales ideas there.

●

Bosun's Chair.—Safway Steel Products, Inc., 6234 W. State St., Milwaukee 13, Wis. announce a new "Bosun's Chair" of rigid tubular steel which can be moved by means of an efficient winch. The seat height is adjustable to fit the operator's size. It is also possible to work from a standing position. The worker operates standard bicycle pedals to raise or lower the hoist. Power is transmitted from the pedal crank to the winch drum by means of a roller chain, running on sprocket wheels which are arranged in a ratio that permits operation with minimum effort. Movement of the hoist in either direction may be as fast as 25 ft. per min., under the complete control of the operator. Use of foot power leaves the worker's hands free for other duties.

●

New Marion Machine.—Marion Power Shovel Company of Marion, Ohio, announces the introduction of a new one cubic yard machine, type 43-M.

With various front-end combinations, this machine serves as a shovel, dragline, clamshell, crane, backhoe and pile driver.

The machine is described in the company's bulletin No. 400 copies of which may be obtained from the nearest Marion sales representative or by application to the Company's head offices.

●

High Vacuum Equipment. — W. Edwards & Co. (London) Ltd., Worsley Bridge Road, Sydenham, London, S.E. 26, have announced that they will be showing an extensive range of high

Corrosive-abrasive sulphur-acid mixtures destroyed brass seats on gate valves in 3 weeks . . . corroded steel facings in less than a year . . . Stellited seats were in perfect condition after 3 years' use. Similar results are found with pump sleeves.

"Deloro Stellite" is a hard non-ferrous alloy of Cobalt, Chromium and Tungsten; ends maintenance problems created by corrosion, abrasion or high temperature. Stop wear, increase efficiency with "Deloro Stellite". Supplied as hard-facing rod or castings; parts reclaimed or custom hard-faced. Write for technical assistance in reducing your costs or for prices.

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"DELORO STELLITE"

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Outwears steel up to 25 times

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- HARDFACING RODS AND ELECTRODES
- CASTING UP TO 100 POUNDS
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- PRECISION INVESTMENT CASTING IN MANY ALLOYS

vacuum equipment of the Canadian International Trade Fair.

The company has established showroom service facilities in Toronto and brochures of their products are expected to be available at the Fair.

•

Cadmium-Nickel Battery.—The White Metal News Letter of the International Nickel Company, Inc. states that a new type long life battery has been introduced in the United States. The new battery which according to its producers will last from 20 to 25 years, features accumulator elements of cadmium and nickel in an alkaline solution. It is said to operate equally well in hot or cold temperatures.

The new battery is designed to replace lead-acid batteries in such fields as railway car lighting and air-conditioning, diesel and gasoline engine starting, stand-by and auxiliary power supplies for industrial plant laboratories, public utility plants and telephone exchanges.

•

Ignitron Rectifier.—Canadian Westinghouse Co. Ltd., Hamilton, Ont., states in a recent release that the ignitron rectifier developed by Westinghouse engineers in 1932 is contributing greatly to the development of electric traction for railways. It is claimed that two locomotives being built by Westinghouse for the Pennsylvania Railroad will have 47 per cent more pulling power at low speeds than locomotives with alternating current driving motors, and will be comparable with a-c drives at high speeds. This performance is due to the use of the ignitron.

Westinghouse is also building a 3,200 hp. gas turbine and electric transmission for a free-piston locomotive under construction by the Lima-Hamilton Corporation. In addition a 4,000 horsepower gas turbine locomotive is nearing completion at the Westinghouse East Pittsburgh plant.

Electric drive equipment for diesel-electric locomotives has been so improved that the tonnage ratings of freight locomotives are no longer controlled by the capacity of the electrical equipment, but by the slipping point of the wheels.

•

Weatherproof Column Light. — Stone Manufacturing Company, Elizabeth, N.J., has developed a new weatherproof column light for use in the gasoline stations, parking places, playgrounds, and other installations where uniformly high lighting intensities are required. Catalogue material can be obtained directly from the Company or from their Canadian distributors, Great Lakes Electric Specialties Ltd., 21 King Street E., Toronto, Ont.

•

New Northern Electric Building. — Northern Electric Co. Ltd., have called tenders for a proposed new office and warehouse building in Toronto. It will front on Fleet Street, facing north, will have a total floor area of 110,000 square feet.

•

(*Continued on page 343*)

THE SIMPLE TECHNIQUE OF EFFECTIVE WATERPROOFING

'PUDLO' Brand Waterproofer initiated a new technique in structural waterproofing when it was introduced over forty years ago. But this has now become standard practice. Well proved specifications based upon specialized experience are available for the asking.

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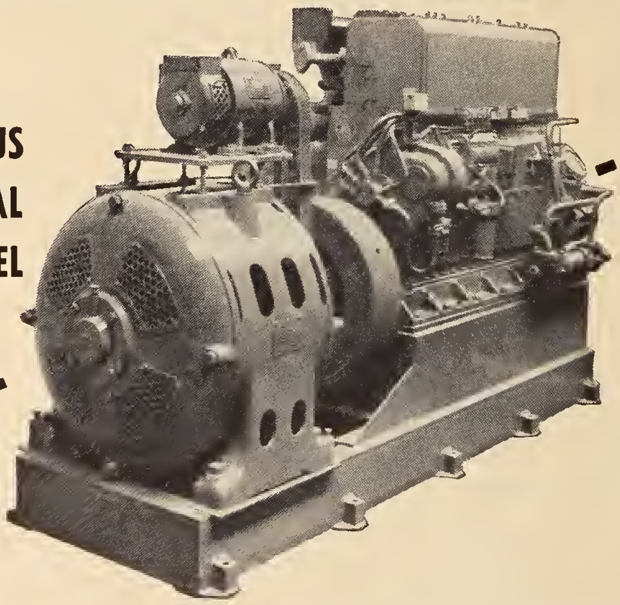
WORLD FAMOUS VERTICAL DIESEL



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CANADIAN DISTRIBUTORS

A. R. Williams Machinery (Western Limited), Vancouver, B.C.; Mumford-Medland Limited, Winnipeg, Man.; Saskatoon, Sask.; Laurie & Lamb, Engineers, Toronto, Ont. and Montreal, Que.

RUSTON & HORNSBY LTD.
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CANADIAN BRANCH OFFICE AND SPARES SERVICE DEPOT, MALTON, ONT.

Details from distributors on request.

RUSTON & HORNSBY LIMITED

(*Continued from page 338*)

Grader - Maintainer. — The Dominion Road Machinery Co. Ltd., Goderich, Ont., has introduced a new 47-hp. Four Wheel Drive Grader-Maintainer known as the CHAMPION 507. Attachments include Snow Plow and Wing, Front End Loader, Bulldozer, Scarifier and Power Sweeper. A heated cab enclosure is available.

Complete specifications may be obtained from the manufacturer.

Fluid Pressure Boosters.—Miller Motor Company, 4027 N. Kedzie Ave., Chicago 18, Illinois is offering fluid pressure boosters that develop working hydraulic output pressures up to 10,000 p.s.i. from ordinary plant air or hydraulic input pressures.

These booster units are recommended by the Company for supplying the fluid power for driving the working cylinders in clamping, shearing, crimping, riveting, welding, pressing and similar applications.

The manufacturer claims that this is the first time boosters of this type have ever been offered in a complete standard line of standard models at standard prices on a normal delivery schedule. Complete information may be obtained from the company.

C.P.R. Report.—In the annual report which he will present at the sixty-seventh annual meeting of the C.P.R. in Montreal on May 3rd, W. A. Mather, president of the Canadian Pacific Railway Co. will point out that the Company's dollar was earned in 1949 on the following basis:

"20 cents from hauling products of the farms, including livestock; 19 cents from transportation of products of mines and forests; 42 cents by transporting manufactures and miscellaneous; 14 cents by carrying passengers, and five per cent from other (unclassified) traffic.

The dollar was spent for: payrolls, 51 cents; materials and supplies, 32 cents; taxes and other expenses, 11 cents; fixed charges 4 cents; dividends, improvements, etc., 2 cents."

Synthetic Resin.—Monsanto Chemical Co., St. Louis 4, Missouri, announces development of a synthetic thermosetting resin especially designed for use as a core sand binder.

Use of Resinox 4846 is claimed to result in superior castings and lower core sand costs.

A wide range of core properties are claimed to be obtainable by varying core composition with the new synthetic resin. Among them are high tensile strength, high baked permeability, resistance to abrasion, rapid baking without green center, excellent detail and dimensional stability and unique collapsibility and shake-out.

Electronic Control For Presses.—Canadian General Electric Co. Ltd., announces that the presses of the Halifax Herald Chronicle are now being equipped with an electronic amplidyne control system, the first of its type in Canada.

By means of this control, operators will have push-button control of five 40-hp. motors coupled directly in the main press, from slow speeds used in threading the web of paper through the press, up to maximum speed.

Airport Fueling System. — Planes using Chicago's O'Hare Airport will be fueled with gasoline pumped through big wrought iron pipe lines laid underground. One portion of the underground line project required 15,980 feet of pipe ranging in sizes from two to 12 inches with a total weight of 328 tons. The 12-inch pipe leads to gates from which the planes are fueled. In another phase of the underground project, an additional 172,500 feet of wrought iron pipe weighing a total of 2,966 tons have been specified. This construction is proposed for the next five years.

Inspection Chart.—The Ansul Chemical Company, Marinette, Wisconsin, will supply on request copies of a periodic inspection chart which they have developed for recording fire extinguisher inspections.

COGHLIN SPRINGS

for Quality and Satisfaction

We manufacture all kinds of Springs, large and small, for every purpose.

Our eighty-one years' experience is your guarantee of superior quality and workmanship.

B.J. COGHLIN CO. Limited

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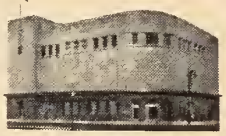
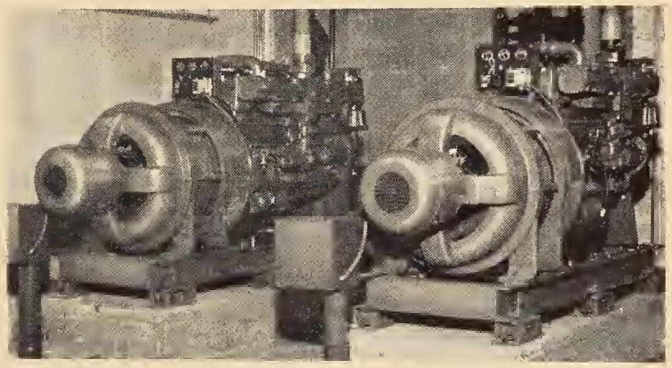
Another modern telephone exchange is *sure* of continuous power with



"U.S." Stand-by Electric Plants



"U. S." Electric Plants are noted for dependability . . . that's why "U. S." was selected by the Indiana Associated Telephone Corp. for this beautiful new building in Elkhart. In *any* business, wherever stand-by power is needed, it will pay you to get the facts about "U. S." units. Complete line from 300 watts to 175 kw. Contact distributor nearest you, or write the factory.

UNITED STATES MOTORS CORP.

212 E. WASHINGTON AVE., MADISON 3, WISCONSIN, U.S.A. Factory at Oshkosh, Wisconsin, U.S.A.

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Dietrich-Collins Equip., Ltd. Vancouver, British Columbia

Construction Equip. Co., Ltd. Toronto West, Ontario

Gorman's Limited Edmonton, Alberta

Construction Equip. Co., Ltd. Montreal, Quebec

Schumacher-Mackenzie & Co., Ltd. Winnipeg, Manitoba

Electric Crafts Ltd. Calgary, Alberta

Coslett Equipment Co. Fort William, Ontario

E. S. Stephenson & Co. St. John, New Brunswick

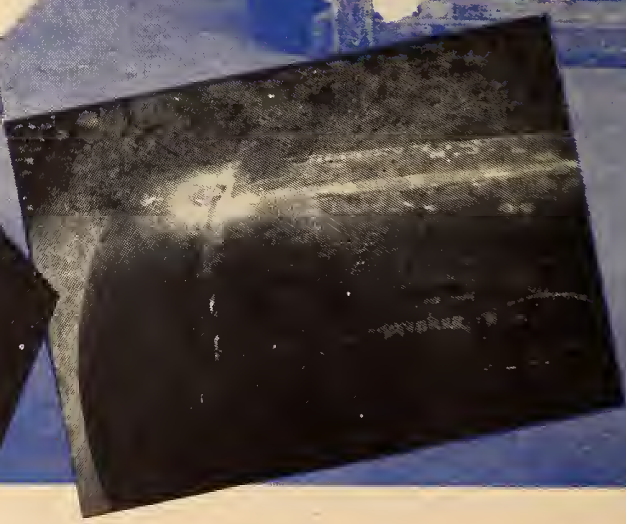
N. N. Campbell, Chester, Nova Scotia

Nickel Steel withstands impact at 320° below zero...

Identical test pressure vessels made of carbon steel and 8½% nickel steel (AISI 2800) were subjected to severe low temperature impact tests at the Air Reduction Company Apparatus Research Laboratory, Murray Hill, N.J. Temperatures were maintained at −320°F. by means of liquid nitrogen. Heavy weights were dropped from a height of five feet on both vessels. The carbon steel vessel shattered on the first blow. The 8½% nickel steel vessel withstood repeated heavy blows on all sections. Complete test details and data sheets "Properties of Nickel Alloy Steels at Low Temperatures" are available on request.

CARBON STEEL SHATTERED

NICKEL STEEL INTACT



EMBLEM OF INCO SERVICE
TRADE MARK

HE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED • 25 KING STREET W. TORON

Appointments and Transfers

F. H. Hedley has been appointed apparatus sales engineer at the Trail, B.C. office of Canadian Westinghouse Co. Limited. Mr. Hedley succeeds B. James who has retired.

•

Resignation of **Douglas A. Jones,** Steel Controller, coincident with the termination of Steel Control on March 31st was announced by the Rt. Hon. C. D. Howe, minister of Trade and Commerce on March 15th. Mr. Jones is returning to private industry.

Mr. Howe paid high tribute to the work of Mr. Jones in maintaining supplies of steel to Canadian industry through a difficult period. He said, "It is largely through his efforts that the Canadian steel situation has been brought to a position which no longer requires government control".

•

Trane Company of Canada Limited announced the following appointment. **Louis J. Austin** has been appointed jobber sales manager. This position has been created to enable the company to maintain closer relations and give better service to jobbers of heating equipment. Mr. Austin has been serving the company as its purchasing agent. The former assistant purchasing agent of the company, **J. Harry O'Neill,** has been appointed purchasing agent.

•

Minneapolis-Honeywell Regulator Co. Ltd., Leaside, Ont., has announced that the Company's general manager **Mr. W. H. Evans** is appointed vice-president and director.

Mr. Evans joined the company in 1931 as accountant and office manager. In 1938 he was appointed assistant general manager and he became general manager three years later.

•

G. D. Peters & Company of Canada Limited, a wholly owned subsidiary of Air Reduction Company, Inc. of New York, has changed its name to **Air Reduction Canada Limited.** Hugh Chambers, who has headed the Canadian company for nearly 30 years, will continue as president and general manager, and

M. A. Buell, general sales manager and R. M. Calhoun, general manager of the Ontario division, have been appointed directors of the Roofers Supply Company.

R. M. Calhoun

M. A. Buell

B. C. FIR WOOD STAVE PIPE

48-INCH DIAMETER

•

FOR SUBMERGED INTAKE APPROXIMATELY 2,000 FEET LONG . . .

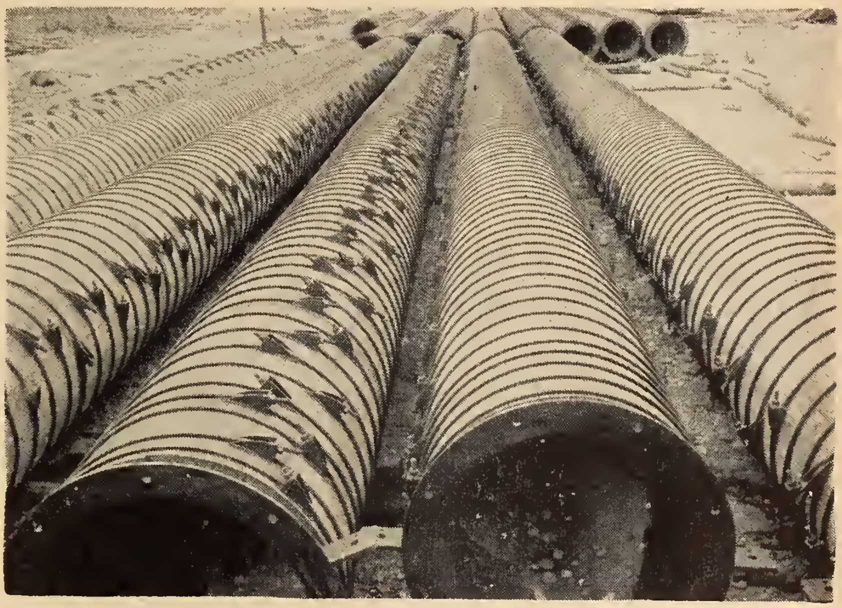


ILLUSTRATION SHOWS PIPE ASSEMBLED ASHORE IN LONG LENGTHS WITH SPECIAL FLANGES ATTACHED PRIOR TO LAUNCHING FOR UNDERWATER CONNECTION

Pacific Coast Pipe Co. Ltd.

1551 GRANVILLE ST. ESTABLISHED 1904 VANCOUVER, CANADA

STANDARD OIL COMPANY OF CALIFORNIA

adds new wing

THOMSEN & WILSON, ARCHITECTS, SAN FRANCIS
SWINERTON & WALBERG, GENERAL CONTRACTO

integrates unusual traffic flow with OTIS AUTOTRONIC ELEVATORING

An extremely versatile electronically supervised system will provide the fastest, most efficient elevator service ever devised, for the new wing of the Standard Oil Company of California Home Office Building in San Francisco. Otis AUTOTRONIC Traffic-Timed ELEVATORING will provide 5-car local service between the main and 17th floors; call service to the basement garage; call service from the 17th to 22nd floors; and heavy noontime service to the 20th floor cafeteria. At the same time, it will maintain normal service to all other floors in the new wing and closely integrated service with the newly modernized 8-car installation that serves the main section of the building. 2,600 tenants will be served by these two installations. Complex as this traffic flow may seem, it can still be handled with maximum efficiency by the 6 traffic programs that form the basis of Otis AUTOTRONIC ELEVATORING. This versatility of operation —which has been applied to a wide range of traffic patterns in 43 new and modernized office buildings, hotels, banks and department stores—is explained in Otis Booklet B-721-D. Otis Elevator Company Limited, Head Offices and Works: Hamilton, Ontario.

Otis

AUTOTRONIC
traffic-timed
ELEVATORING

APPOINTMENTS AND TRANSFERS *(Continued)*

all other personnel will remain unchanged.

●

Northern Electric Co. Ltd., announces that **Thomas J. Kingston,** manager of mining sales since 1948 has been appointed manager of mining and paper industries.

Mr. Kingston's headquarters will be in Toronto and he will act for and with all districts with regard to sales to the mining and pulp and paper industries.

●

Atlas Steels Ltd., Welland, Ont., have announced the appointment of **A. D. Earl,** as district manager for the eastern mining regions of Ontario and the Province of Quebec.

Mr. Earl's headquarters will be in Sudbury, Ont.

●

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.

Fan and Blower Lubricants.—The Canadian Fan Manufacturers' Association, Post Office Box 275, Windsor, Ont., has just issued its bulletin No. 101-C entitled "Schedule of Lubricants for Ball and Roller Bearings as Applied to Fans and Blowers."

The bulletin, compiled in co-operation with technical departments of oil companies and ball and roller bearing manufacturers, covers such topics as application of lubricants, cleaning ball and roller bearings, and schedules of lubricants, under changing speed and temperature conditions for various sizes of bearings. Copies of the bulletin will be forwarded on request.

●

Interior Painting. — The Tremco Manufacturing Co. (Canada) Ltd., 57 Bloor Street, Toronto, Ontario, has published a new booklet "Your Next Paint Job". Its sixteen pages are profusely illustrated and contain a complete discussion of the latest methods of interior and exterior painting. It was written for the executive, the factory superintendent the maintenance man, and all others who are interested in getting a better paint job in the most economical and efficient way.

●

Flame Conditioning. — Technical Bulletin D.E. 748 of Canadian Liquid Air Co. Ltd., is "Oxyacetylene Flame Conditioning".

The brochure is attractively produced in two colours. Commencing with the study of the factors affecting atmospheric corrosion of steel, it considers the theory of flame conditioning, the equipment required, recommended operating procedures, applications, gas consumption and cost factors, and other important aspects of the process.

Copies can be obtained from the Company's offices in the major cities of Canada.

●

Non-Metallic Gears.—Hamilton Gear and Machine Co. Ltd., 950-990 Dupont Street, Toronto, have issued a new technical Data Sheet "Non-Metallic Pinions: Rawhide or Bakelite".

Copies of this and subsequent bulletins may be obtained on application to the company.

●

Heating Equipment.—Following recent design changes in their Force-Flo Heater, Trane Company of Canada, Limited, have published a bulletin which describes and illustrates these heating units and gives complete information on their capacities, dimensions, and applications.

This newly improved unit fills a gap in the heating requirements of present day buildings. The unit is especially adaptable for such spaces as lobbies, showrooms, bowling alleys, and a wide variety of other commercial establishments. Copy of the bulletin may be obtained from the Trane Company of Canada, Limited, 4 Mowat Avenue, Toronto.

●

Jetliner Film.—A. V. Roe Canada Ltd., Malton, Ont., has contracted with Crawley Films Ltd., Ottawa, to complete a film on the company's jetliner plane. The title of the movie will be "Jetliner" and the picture will show the jet in action at its normal cruising speed of 427 miles per hour. To book the film for showing please communicate with the company.

●

Brown Boveri Publications. — Brown, Boveri (Canada) Ltd., 1111 Beaver Hall Hill, Montreal 1, has issued three new publications as follows:

(a) 2119E — Overload and Selective Short Circuit Protection of Industrial Installations.

(b) 2126E — Industrial Plants with Velox Boilers.

(c) 2127E—Industrial Application of Electric Boilers.

Copies of these pamphlets may be obtained from the Company.

●

Pressure Pipe Installation Guide. — Canadian Johns-Manville Co. Ltd., 199 Bay Street, Toronto, Ont., have announced a new publication "Installation Guide—Transite Pressure Pipe".

This guide is a convenient pocket size, four and a half inches by eight inches. There are 115 pages of information divided into fifteen sections. These cover the whole job of installation from receiving and handling the pipe to pressure and leakage tests of the finished line. The subjects range from excavating the trench, through various steps of pipe-assembly to backfilling and tamping.

Copies will be supplied on request.

●

Carboloy Manual.—A 200-page Carboloy Tool Manual is now available from the Carboloy Section of the Canadian General Electric Company. Operators of machine shops may receive the manual without charge by writing to their nearest C.G.E. office.

The manual is a complete reference book for all phases of Carboloy application, from design to trouble shooting and inspection. It has hundreds of excellent photographs and an 8-page index for ready reference. Requests for the manual should refer to it by number GT191.

●

Films Available. — Canadian Allis Chalmers Ltd., P.O. Box 37, Montreal, offer the following 16 mm. sound films. "Magic of Steam"—part 1:—explains the theory and operation of the Steam Turbine. "Magic of Steam"—part 2:—describes in detail the theory and operation of the surface condenser. "Tornado in a Box"—28 minutes covering the construction, principle, advantages, and limitations of the gas turbine—recommended especially for engineers and engineering students. "The Case of the Barking Logs":—ten minutes, full colour, showing the economy of removing the bark from logs by water jets. "The Story of the Hi-Density Feeder":—a 12 minute, full colour, film which shows the hi-density feeder in operation pumping paper pulp of an 8% consistency. "Precision Casting":—a 10 minute, full colour, film covering precision casting of intricate shapes by use of wax patterns and casting under pressure. "A Hidden World", a 26 minute, full colour, film which tells of the part played by industrial engineers in providing the things we use and enjoy in our daily living. It is a non-commercial salute to the engineering profession.

These films will be made available to branches and members of the Institute on request. Early booking is advised.

●

Stainless Steel Handbook. — Atlas Steels Limited, Welland, Ont., have produced a stainless steel handbook under the title "Corrosion Resistance of Atlas Stainless Steels". It will be forwarded to executives, fabricators, metallurgists, chemists, engineers, and others on application. To insure prompt delivery, requests should be made on company letterhead stating name, position, and address.

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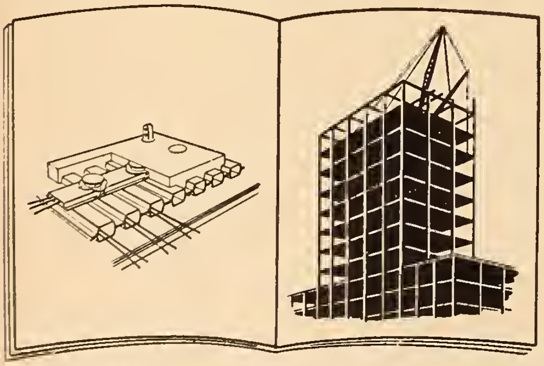

Q-Floor comes pre-cut ready to weld to the steel skeleton. Two men can lay 32 sq. ft. in 30 seconds. Construction is dry, non-combustible, clean, free from forms, falsework and fire hazard, Q-Floors so speed construction that building time is often shortened by 20 to 30 per cent. As for steel delivery dates — you always have to allow for demolition and by that time, the steel is ready.

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ALLOWANCES FOR DEPRECIATION

WITH SPECIAL REFERENCE TO TAXATION

by

L. A. Wilmot, M.E.I.C.

Hull, Que.

A paper specially prepared for publication in The Engineering Journal

There are many definitions of depreciation, varying to the extent they express the point of view of the particular expert concerned. The definitions agree, however, that depreciation applies to property that eventually loses its usefulness to its owner, and that, for such property, it is the difference between first cost and the proceeds to the owner on disposal. Land will support vegetation for centuries and as a foundation for construction it does not decay or deteriorate. Land, therefore, is not considered as depreciable property, although classed in accounting as a *fixed asset.*

Thus depreciation is the valuation of the decline in economic usefulness. This decline is the combined effect of a lowering in physical condition or productivity of the property and of its inferiority in output or service compared to the best available alternative. These two elements are known respectively as *deterioration* and *obsolescence.*

Wear and tear, decay and decomposition, in addition to requiring repairs and renewals for maintenance, cause *deterioration. Obsolescence* is caused by technological advances, or by a change required by buyers of the goods or services sold. For example, obsolescence in machinery may be due to the greater efficiency of improved equipment in terms of power input, space occupied, or labour. New materials may reduce maintenance costs. If some plant acts as a bottleneck, restricting the output from related plant, the lost output is the cost of obsolescence.

Whatever the causes, excess of first cost over proceeds on retirement or disposal, or salvage, is the depreciation cost to the owner. Most enterprises desire to know the progress of this cost over the period of use of property; it is in estimating its rate of growth that the differences in its calculation appear. These differences reflect the use to be made by, and the limitations that may be imposed on, the estimator.

There are three steps in scheduling rates. First, there is the choice of the period, which may be daily, monthly or yearly. An example of the daily rate is the capitation charge generally used in international settlements for military aid. The service life of some equipment is so short, e.g., three months for tanks, and other changes are so rapid that long periods are unfair. If long periods are taken, large payments that are obviously inequitable accrue. For income tax purposes, the period is twelve months, since returns of income must be submitted by individuals at the end of each calendar year and by corporations at the end of each fiscal year period of not more than twelve months.

Second, there is a choice between scheduling property individually and rating each item separately, or grouping the properties in such a way that it is reasonably accurate to apply a single rate to the group. Apart from convenience and saving in time and cost, reduction in the number of calculations and hence in the chances for error, gives grouped calculations an overall accuracy equal to that of individual scheduling. If grouping is desirable, a choice is made of the grouping system to be followed. For example:

(a) There may be a single group for each industry. Based on past experience, a single continuing rate, known as a *composite rate* for the industry, may be applied to the first cost of all depreciable property in use at the time the balance sheet is drawn up. No other accounting is necessary.

For industries which have a fairly uniform ratio between long-term and short-term depreciable property, the composite rate gives a fair lump-sum depreciation. Because it is obtained by considering all members of the industry, it includes the effects of new construction not yet in use, low rates of depreciation taken in years of low profit or of loss, depreciation of property disposed of during the year, removal from use of partly depreciated property, continued use of fully depreciated property and other factors that affect depreciation allowed for income tax purposes. The saving over other methods, both in calculation by the taxpayer and in checking by the income tax authorities, is real and a boon to financial management.

(b) Depreciable property may be grouped according to service life e.g., 40 years, 20 years, 15 years, 10 years, 5 years, 4 years, etc.

(c) Depreciable property may be grouped according to function or type. Examples are:

(i) Fixed construction: buildings, roadways, railway spurs, dams, trestles, wells, sidings, culverts, pipelines, wharves, fences, etc.

(ii) Machinery and equipment.

(iii) Furniture and fittings. The more commonly used expression "furniture and fixtures" is inappropriate, as fixtures are normally included in the structure of which they are components.

(iv) Vessels, including boats, scows and floating equipment.

(v) Vehicles and self-propelled overland equipment, including contractors' material moving equipment, tractors, trucks, wagons and logging equipment.

(vi) Power generating and distributing plant.

(vii) Railway rolling stock.

(d) Depreciable property may be grouped by a combination of methods (b) and (c), e.g., buildings may be divided between cement and stone with a service life of 50 years, brick with a service life of 40 years, and wood with a service life of 20 years.

(e) Depreciable property may be grouped according to units of production from the section of the enterprise that they serve.

This method is appropriate for short-term enterprises. For example, for an oil or gas well, mine or timber limit the life of the enterprise will probably be shorter than the normal service life of the depreciable property used to exploit it. It is, therefore, appropriate to depreciate such equipment with no salvage value at the rate of exhaustion of the property that it serves. This group should not include machinery and equipment that can be moved for further use or salvage.

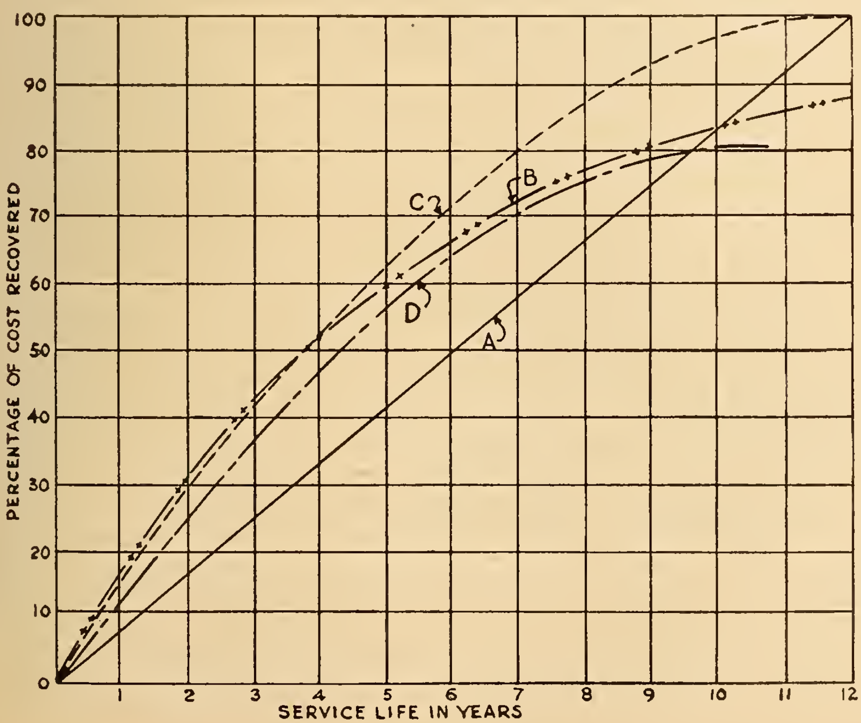
Third, there is the striking of a rate appropriate to the grouping adopted. With this is coupled accounting for the proceeds of disposals, since the amount of depreciation to be spread over the useful life of the property is the remainder after deducting salvage from first cost. Because they are peculiar to the respective groupings used, composite rates for all the depreciable property of an industry and for salvageless property used in exploiting natural resources have already been derived.

This leaves to be determined rates for groupings according to functional use or expected service life. Three basic methods, with many variations, have been adopted. They are:

(a) The most widely used and simplest is to divide the first cost of the property by the number of years of use expected, and to take the result as the annual depreciation. This rate is correct, if the combined effect of depreciation and of obsolescence is uniform over the period of service.

Depreciation calculated in equal yearly amounts is called *straight*

Fig. 1. Cumulative Recovery of Cost Through Depreciation.



ALLOWANCE BASED ON TWELVE YEARS' SERVICE

Curve A—Straight line, 8.3% on cost.

Curve B—Diminishing balance, 16.6% on residual value.

Curve C—Present worth, obsolescence 2% on cost, replacement financing, 8% per annum.

Curve D—Similar to C, but adjusted for expected terminal salvage.

Reduction in Salvage Value

Age	*Per cent of cost*
1	16.0
2	14.0
3	12.0
4	10.0
5	8.0
6	6.0
7	6.0
8	4.0
9	4.0
10	4.0
11	4.0
12	2.0

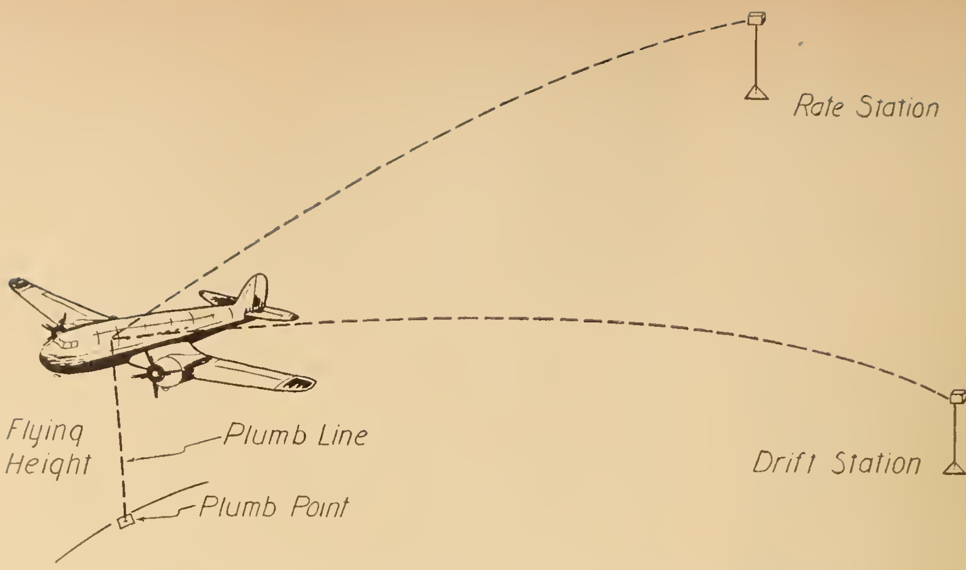


Fig. 9. Using Shoran stations for remote control of aerial photography.

1100 miles, and the longest line to be measured is 310 miles. In contrast with visual triangulation methods, more lines are required to secure accuracy of fixation, since the mathematical conditions to be satisfied are fewer.

The selection of lines to be measured has been made to give many right-angle intersections at each station, and two azimuth controls have been introduced, one at God's Lake and one at MacLean. In 1949 the lines inclusive and south of Moose-Meridian-God's Lake were measured, and the remainder of the net is expected to be completed in 1950. The intention is to make an assessment of the value of Shoran in the expansion of control over large areas, when it is forced to stand on its own feet. The positions of Beatty and Vermilion will be derived from the Shoran work alone, before the net is finally adjusted to fit the present geodetic co-ordinates. The discrepancy between Shoran and geodetic values of these stations will be a definite answer as to the degree of accuracy which may be expected in Shoran control. It is possible to make several adjustments giving misclosures at Beatty-Vermilion, two of which could be for the net with and without azimuth controls.

External line-crossings and azimuth controls are introduced in this net with the hope that short line measurement will be possible, with corresponding accuracy to long lines, and that the azimuth controls will correct any tendency to deviate from true direction. Both are innovations, and the answer as to their effectiveness should be available when this net is completed. From the work already completed we are sure that Shoran will give superior control to astronomic fixation. Hence, even before the test net has been completed in 1950, an extension is to be laid out northwesterly towards the Arctic.

The interest that has been expressed in this experiment on Shoran is extensive, well meaning, and productive of thought and co-operation. The result of the closure upon the line Vermilion to Beatty

Fig. 10. Beaverhill Shoran station in Northern Manitoba.

is awaited, not with anxiety, by the Shoran personnel, but with hopeful anticipation that Shoran will prove successful as a means towards accurate control in our northern regions.

For elevations of Shoran stations a method has been used which, where checks have been available, indicates that elevations within 25 feet of the truth have been secured: such an error is not serious in Shoran observations. Aneroids, frequently standardized, are read every three hours at the times meteorological data for weather maps are secured. These readings are continued for two weeks or so, and are then reduced by the Meteorological Service with reference to their weather charts. Naturally best results are secured where there is the greatest density of meteorological stations, and the results in the northern areas may be expected to be less accurate where these stations are sparsely located.

One may hope that radar altimetry may eventually be developed to a stage where it may provide

TABLE I

CORRECTIONS TO SHORAN MEASUREMENTS

Minimum Shoran distance (uncorrected)			215.2826 miles
Minimum Rate station reading			108.2390 miles
Minimum Drift station reading			107.0436 miles
		Rate	Drift
Corrected altitude of plane	(H)	18330 feet	18330 feet
Antenna altitude	(K)	769 feet	1227 feet
Slope distance, R and D		108.2390	107.0436 miles
Delay		— .1866	— .1853 miles
Correction to assumed velocity		+ .0056	+ .0056 miles
Frequency correction		— .0004	— .0004 miles
Curvature correction		+ .0030	+ .0030 miles
Slope correction		— .0512	— .0491 miles
Sea level correction		— .0493	— .0499 miles
		107.9601	106.7675 miles
Reduced Shoran distance			214.7276 miles

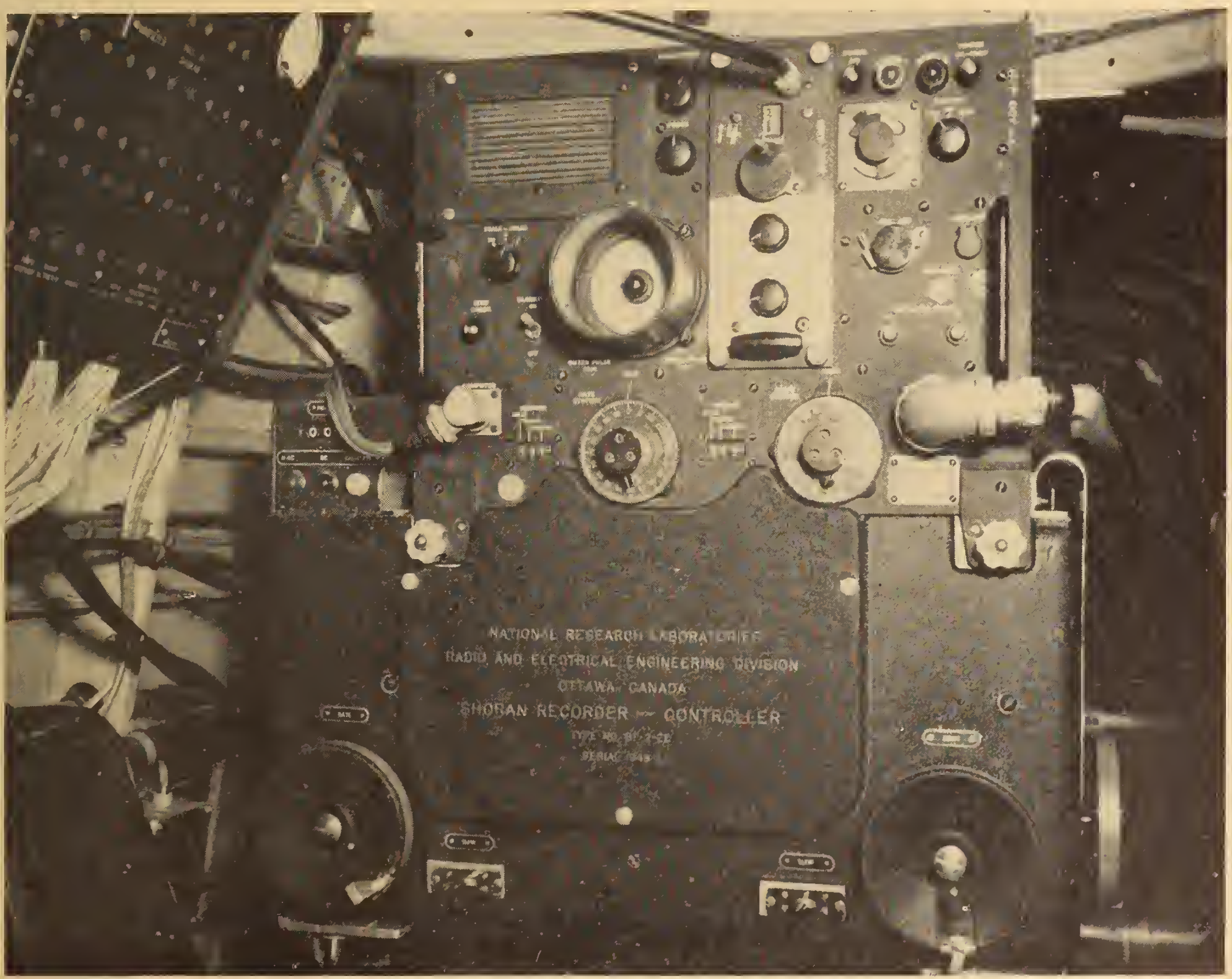
TABLE II

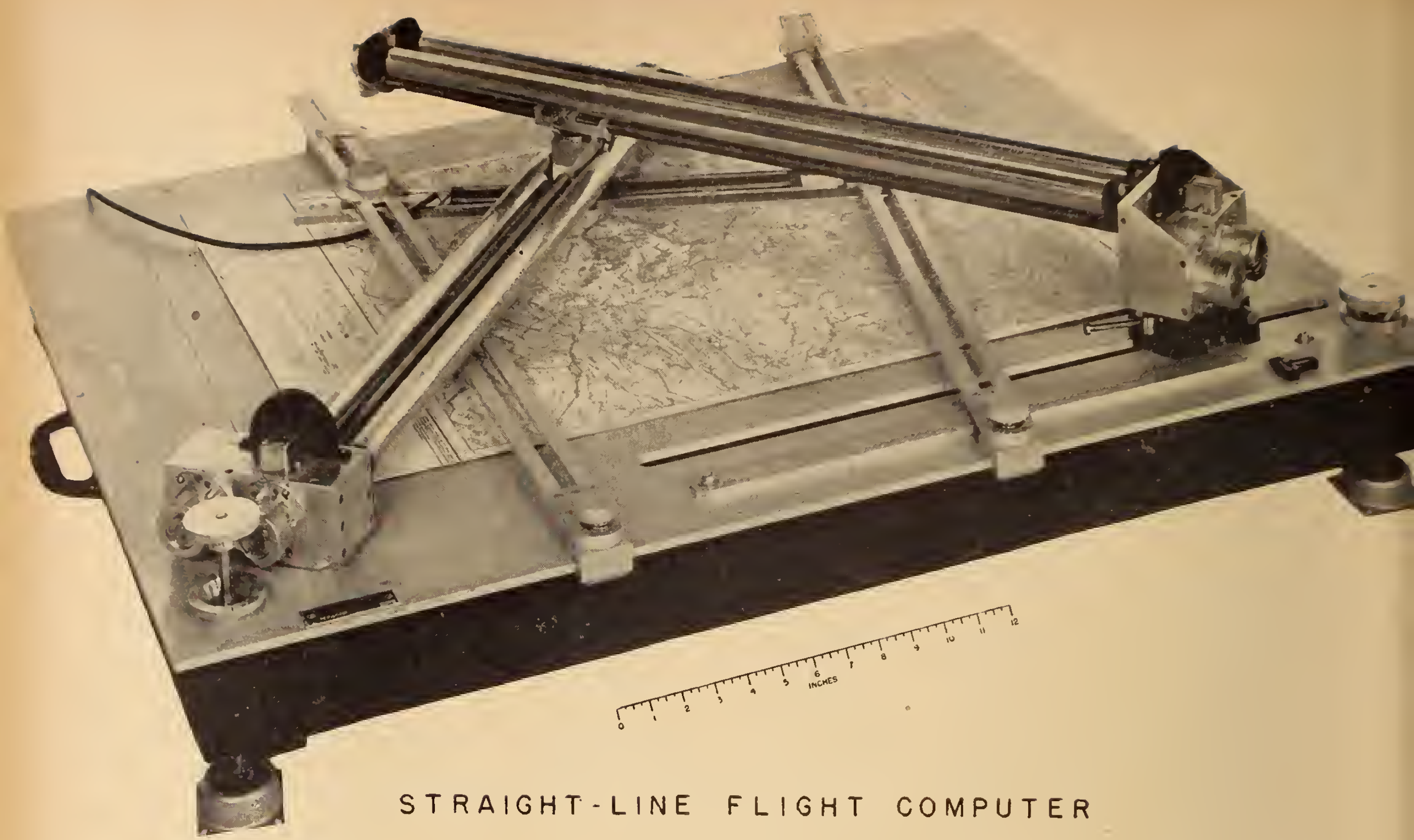
REDUCED LENGHTS OF LINE: HECLA TO NORTH SPIRIT

July 19/49 Flying elevation 18000 ft.		July 20/49 Flying elevation 18000 ft.	
186.2494 miles	186.2512 miles	186.2562 miles	186.2580 miles
.2512 miles	.2503 miles	.2580 miles	.2575 miles
.2520 miles	.2523 miles	.2579 miles	.2564 miles
.2498 miles	.2513 miles	.2559 miles	.2583 miles
186.2506 miles	186.2513 miles	186.2570 miles	186.2575 miles

Grand Mean 186.2541 miles

Fig. 11. Shoran airborne assembly.





STRAIGHT-LINE FLIGHT COMPUTER

for

Shoran-controlled topographic survey

Fig. 12. Straight line flight computer.

suitable elevation data, not only for Shoran purposes but also for topographical mapping. Its successful use will require traverse and loop closures to the larger lake surfaces previous to its use in a Shoran area.

Another development which is in its testing stage is radio sonde equipment, with parachute which would be released from the plane while on line-crossings. This would provide the needed meteorological data secured at present by the plane before and after the line-crossings.

Mapping with Remote Shoran Control

Where a Shoran net has been laid down it can be used without change for the control of aerial photography over an area devoid of control. As shown in Figure 9, ground beacons are set up at two Shoran stations; Shoran equipment is installed in the photographic plane, and radio pulses are sent out continuously from the plane, and at the instant of each camera exposure. The Shoran equipment on the plane records the distances to each of the two ground beacons, thus each photograph can be placed in its correct position in latitude and longitude. Tests made in Canada to date have supplied confidence that Shoran-controlled mapping will play an important role in mapping northern Canada.

The operator of airborne Shoran radar equipment is required to make continuous adjustments to two controls to maintain proper alignment of the "pips" on a cathode ray tube. When this alignment is achieved, then dials indicate the two distances. The record is obtained photographically by means of triggered flash, operating with a single exposure camera incorporated in the same device as the "aided-laying" control systems, through which the operator makes the adjustments. This unit is called the Shoran Recorder (Fig. 11) and is used for both line-crossing and mapping operations.

The aircraft may be directed on the lines required during mapping flights through use of the straight-line flight-computer (Fig. 12). An adjustment is made for the distance between the two ground stations. As long as the Shoran operator maintains pip alignment, the computer is so driven that the position of the aircraft is located as a point on the map on which the flight lines are drawn. The deviation of this point from a required flight line is detected electrically, and displayed to the pilot on a meter as track error, enabling the correct track to be made good.

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⑤Calibration of Shoran Ground Sets, by F/Lt. L. C. Card*,

⑥Shoran Operational Ground Procedure, Ground and Air, by F/Sgt. S. L. V. Paulson*

⑦Reduction of Shoran Results, by W. J. MacLean*,

**Canadian Surveyor*, Vol. 10, No. 5, July, 1950, and following issues.

LEVELLING by RADAR ALTIMETER

by

S. Jowitt

Department of Mines and Technical Surveys
Ottawa, Ont.

A paper presented before the Sixty-Fourth Annual General and Professional Meeting of The Engineering Institute of Canada, Toronto, July, 1950.

Conventional methods of contouring are unsuitable today for topographical surveys of large areas of outlying territory. This paper deals with the development of a new technique for securing ground surface elevations by pressure and radar altimeter readings from aircraft.

The Radar Altimeter, height corrector, pressure gradient, and operation of profiles are discussed in turn. Results obtained in the 1949 season by this method are described. Hoped for results from the 1950 research programme are outlined.

In preparing aeronautical charts of Canada, the Aeronautical Chart Section of the Department of Mines and Technical Surveys was faced with the problem of securing terrain elevations to control the contouring of more than 2½ million square miles of outlying territory. Conventional methods could not be used because of the high cost and time factor, so, with the co-operation of the National Research Council of Canada, the Royal Canadian Air Force and the Department of Transport, a new technique was developed.

It consists of flying an aircraft at a constant pressure altimeter reading, while measuring the distance to the terrain directly below by a radar altimeter. It provides for deviations of the aircraft, changes in the true height of the constant pressure reading, and the necessary co-relation. As a result, when referring to mean sea level there is a general condition that is represented in Fig. 1.

Radar Altimeter

The first requirement was a radar altimeter that would measure the "a" distances in the figure to the needed accuracy. Since the contour interval on the eight mile to one inch aeronautical charts is 500 feet, the maximum tolerance in the radar altimeter measurements was tentatively set at 100 feet.

In 1943 experiments were made with an AN-APN-1 frequency modulated radio altimeter which was in production. Numerous flight tests were undertaken, and the results were carefully tabulated and analysed. Over water surfaces they were very encouraging, but over land surfaces they were erratic and unsatisfactory. Because of security and other reasons connected with the war, the radar equipment needed was not available and the development was delayed.

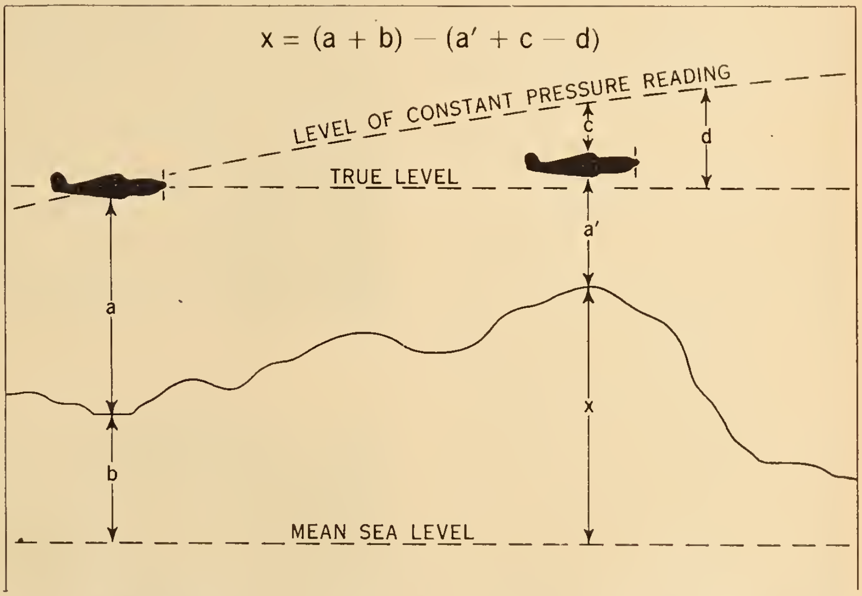

Fig. 1. General conditions for levelling by radar altimeter. *b* is known. *x* (the height above sea level of any other point directly below the aircraft) is required. *a*, *a′c* and *d* are to be measured.

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Figures 2, 3, 5 and 6 published by permission of the Electrical Engineering and Radio Branch, National Research Council, Ottawa, Ont.

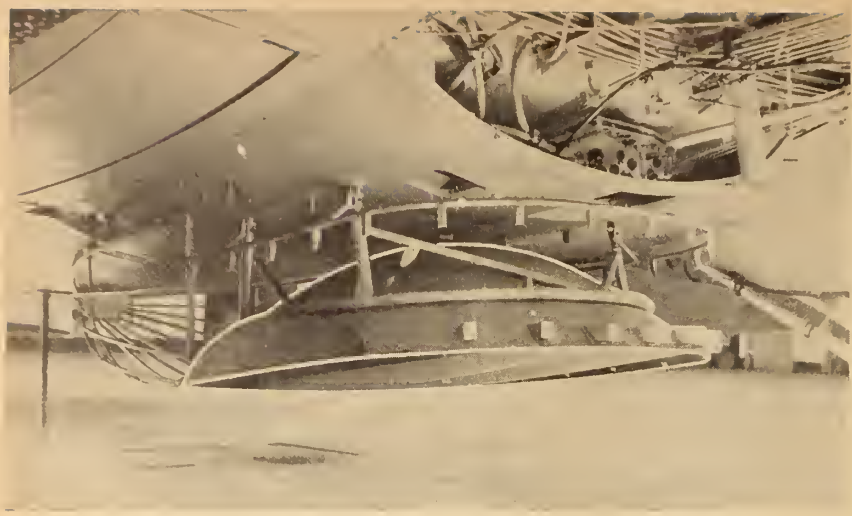


Fig. 2. Parabolic reflector attached to Anson aircraft.

After the war the problem was referred to the National Research Council by the Associate Committee on Survey Research. It was conceded that Canada's aeronautical chart requirements warranted the development of a radar altimeter suitable for the operations proposed. The Electrical Engineering and Radio Branch of N.R.C. designed and constructed a narrow beam continuous recording radar altimeter. It is fully described in their report E.R.A. 138/1, and only a few features of it will be mentioned in this paper.

The instrument includes a pulse transmitter using a 3.2 cm. wave length. Radiation is reflected vertically downward in a beam whose effective width is confined to about a 1.6 degree cone by a four foot parabolic reflector, inset into the bottom of the plane's fuselage. A 1.6 degree cone angle illuminates a circle of about 112 feet in diameter at an altitude of 4000 feet. The cone angle is proportional to the wave length and, although a smaller illuminated area was desirable, the 3.2 cm. wave length was chosen for the experimental model because parts were readily available. In the new models the wave length is 1.25 cm.

Fig. 2 shows the four foot parabolic reflector in position on the Anson aircraft used in the experiment. The fuselage of the aircraft controlled the size of the reflector. The antenna is mounted at a fixed angle, so that the beam is vertical for the attitude of the plane at normal cruising speed.

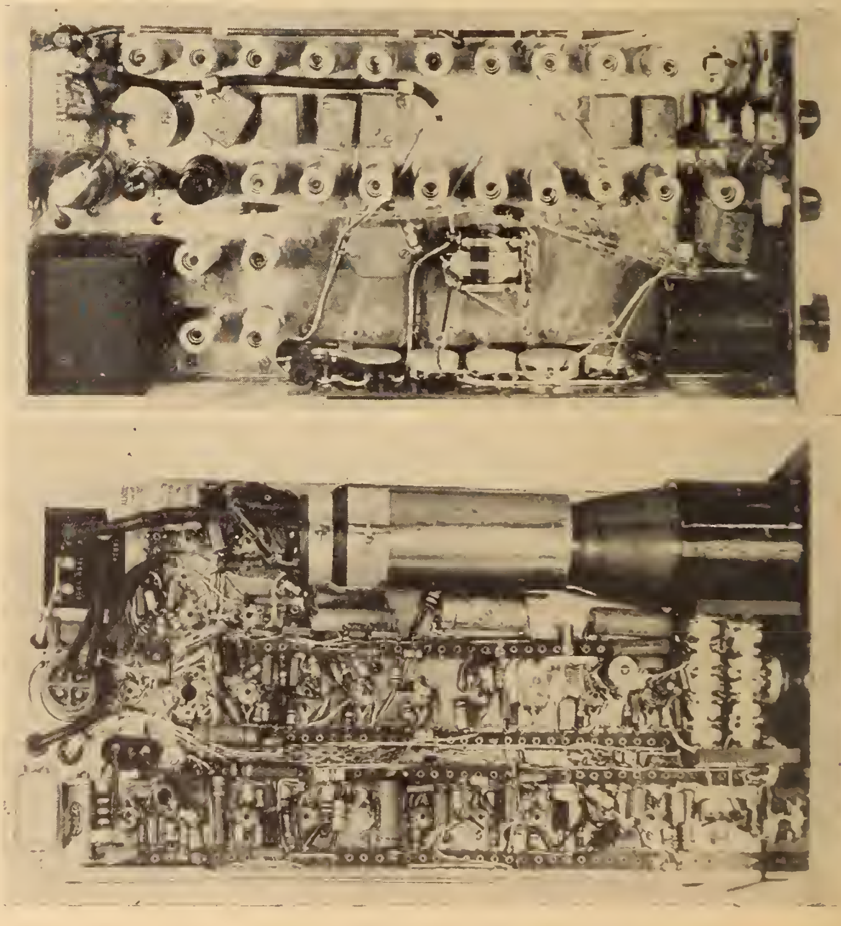
The height of the aircraft above the ground is a function of the time required for the energy radiated from the antenna to be reflected back to the aircraft from the ground. To accomplish the measurement of the time with as much accuracy as possible, a complicated timing unit as shown in Fig. 3 was designed. The time interval is converted directly into feet, and indicated graphically on an Esterline-Angus recorder as a profile of the ground directly beneath the plane's track. In order to magnify the recordings and at the same time retain a range of 30,000 feet in measurements, the Esterline-Angus graph is limited to 2500 feet and the base to which the measurements refer is controllable by step switches of exactly 1000 foot intervals. Laboratory calibration tests of the radar altimeter showed an instability of ± 10 feet, due to indefinable causes.

In flight tests over a target located on flat clear ground at heights ranging from 2200 feet to 11,900 feet, the altimeter showed discrepancies from -35 feet to -70 feet, as compared to the same heights measured by a camera of known focal length. Since the discrepancies were all in one direction it was assumed that there was a 50 foot error in the zero setting, and that the actual altimeter errors ranged from ± 15 feet to -20 feet.

From the results of numerous flight tests over ground of which profiles could be constructed from topographic maps or spirit levelled lines it was concluded that:

1. Errors in establishing heights

Fig. 3. Timing unit for radar altimeter.



over water surfaces averaged about 20 feet.

2. Errors in establishing heights over land of all varieties averaged less than 50 feet and occasionally reached 100 feet.
3. The altimeter met the requirements for aeronautical charting.

One of the most interesting test profiles was obtained in a 100 mile flight along the 45th parallel, where is forms the international boundary south of Quebec province. This it shown in Fig. 4.

Height Corrector

The next consideration was to obtain a measurement of the c's as illustrated in Fig. 1, that is, the amount the plane deviates from a constant pressure altitude while in flight. With fairly good flying conditions this may amount to ± 50 feet, so it must be taken into consideration.

At first this was done by photographing the dials of three pressure altimeters with a movie camera, and co-relating the mean result with the radar altimeter graph on a time basis; a slow and tedious process. To simplify the work the National Research Council developed a height corrector, which is fully described in their bulletin E.R.A. 160. Briefly, it is an electrical device actuated by the movement of an aneroid barometer capsule, the correction in height being automatically applied to the radar altimeter graph. The range of the height corrector is about ± 150 feet, and the "zero setting" can be adjusted to any pressure reading.

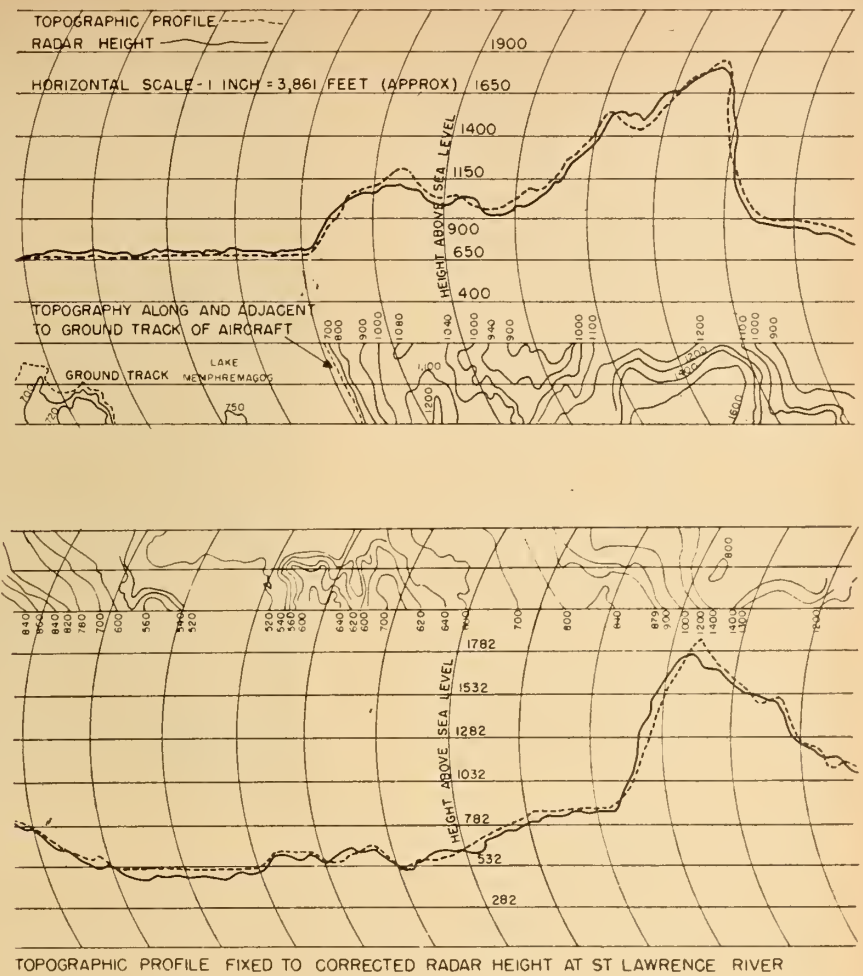
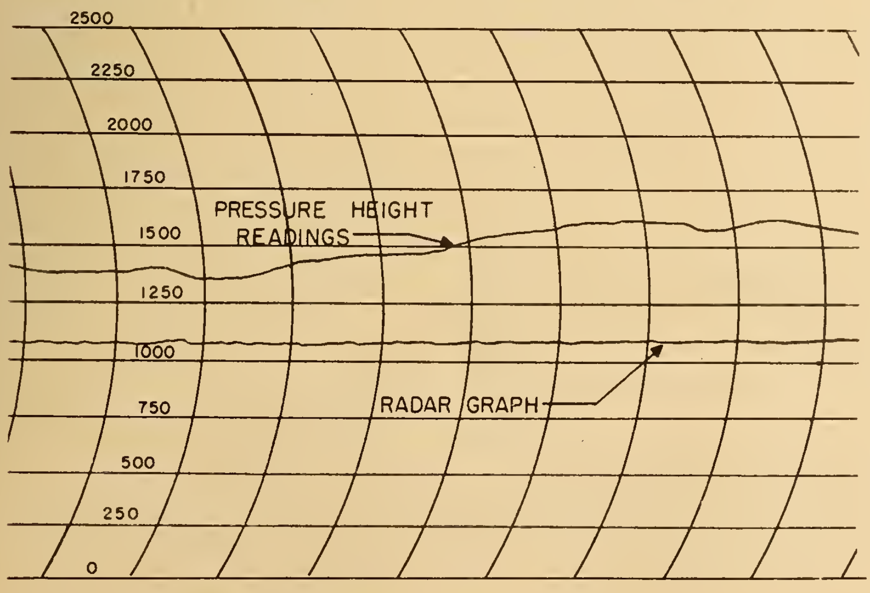


Fig. 4. Comparison profiles along the 45th Parallel.

The graphs shown in Fig. 5 resulted from a one hour test flight over lake Ontario in which the aircraft's height as indicated by a pressure altimeter was varied ± 160 feet. The radar graph, corrected by the height corrector, is practically a straight line.

Fig. 5. Effect of the height corrector on the radar altimeter graph.



Pressure Gradient

Referring again to Fig. 1, the measurement of "a", or the deviation of the constant pressure line from true level, presents greater difficulties. If the flight under consideration is short, and is between two known elevations, "d" need not be measured, and any error of closure may be adjusted by interpolation along a straight line. However, cases occur of long flights between points of known elevation in which the wind varies, and other cases occur in which the flight does not terminate at a point of known elevation. In such cases "d" must be calculated.

The Meteorological Branch of the Department of Transport furnished the following equation for the calculation:

$d = .035 \times$ Air Speed in miles per hour $\times$ Sin of Drift Angle $\times$

×distance in miles×Sin Lat. (approx)

There are three other terms to the equation, but from experience the accuracy of the measurements did not warrant their use. Corrections as great as 50 feet in a 100 mile flight have been applied from the equation. The equation applies only to levels above the influence of surface friction, i.e., 2000 ft. above flat terrain.

The drift angle is measured by a drift recorder, and also by the crab angle of overlapping vertical photographs of the ground, the camera being aligned with the fore and aft axis of the aeroplane. Table I shows the calculation made for the deviation of the pressure gradient from true level on a flight of 306 miles, composed of five different courses.

In Table I the corrections from the drift angles were calculated only at the end of each course, and were interpolated over the whole course. Calculated corrections are underlined.

The effectiveness of the equation is not yet fully known. From experience it has been found that where the measurements of the drift angles were consistent throughout a flight, the heights of water surfaces were established within the expected tolerance ±20 feet. Consistent drift angle measurements were associated with flights at right angles to the wind. Inconsistent values were obtained on flights parallel to the wind, where the pressure gradient is usually small.

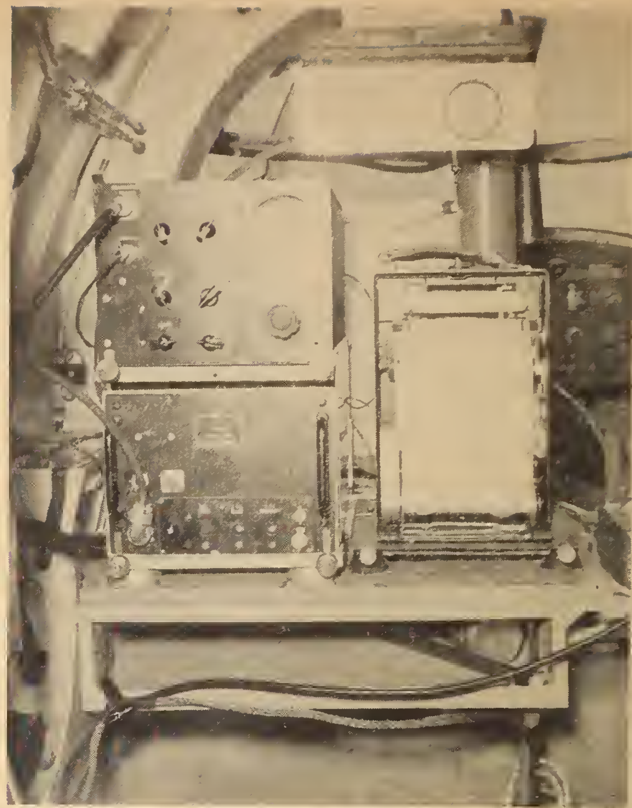


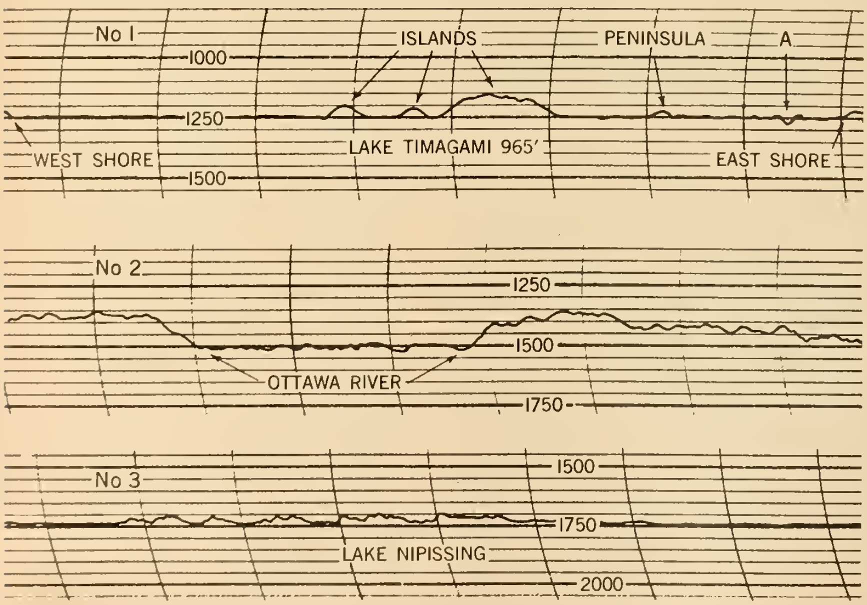
Fig. 6. Arrangement of operator's table.

Orientation of Profiles

There still remains the task of orienting the ground profile to the planimetric map. The operations to date have been limited to areas of which reasonably good planimetric maps are available. The flight lines for the operation are laid down on the maps, and the pilot follows them. At reasonable intervals, vertical exposures of identifiable topographical features are made, and a margin pen on the profile recorder is operated electrically at each exposure. The distances measured on the map between exposures provides the horizontal scale of the graph.

In unmapped areas it is proposed that the photographic planes carry the radar altimeter, and the ground profile will then be directly corelated to the photographs.

Fig. 7. Examples of profiles in operation Radalt.



Operation "Radalt", 1948

Radalt was an experimental operation and the first application of the technique to mapping. The work was carried out with the same co-operation as in the past. The proto-type equipment installed in a Mark 5 Anson aircraft (Fig. 6) was used to profile the ground along about 10,000 miles of flight lines, arranged to include an area of 77,500 square miles of territory to the north and east of Lake Huron and Georgian Bay. The lines were spaced at 16 miles intervals across the general direction of the drainage, and included many reference points of known elevation.

During the four months in the field the equipment was operated for 140 hours, and its performance was satisfactory. Except for adjust-

TABLE I

Observation	Direction of Flight	Distance flown (Miles)	Uncorrected Elevation from Profile Record	Correction from Drift Angles	Corrected Elevation	True Elevation	Correction
1		0				664	
2	NE	49	599	−21	578	587	+ 9
3	NE	53	864	−23	841	855	+14
4	W	57	584	−20	564	587	+23
5	W	83	944	19	944	941	− 3
6	W	94	894	+ 9	903	900	− 3
7	W	121	794	+30	824	836	+12
8	W	134	839	+40	879	876	− 3
9	SW	169	764	+63	827	810	+17
10	E	214	719	+28	747	738	− 9
11	E	219	774	+24	798	800	+ 2
12	E	264	549	−11	538	520	−18
13	SW	306	624	+14	638	645	+ 7

ments at the beginning of each flight the radar altimeter required attention for only five unserviceabilities; three required the replacement of tubes, and two were caused by circuit failures. The unserviceabilities usually necessitated recalibration by a bench test. The pressure height corrector needed more attention than was anticipated because the periods of drift of the zero setting were longer than expected.

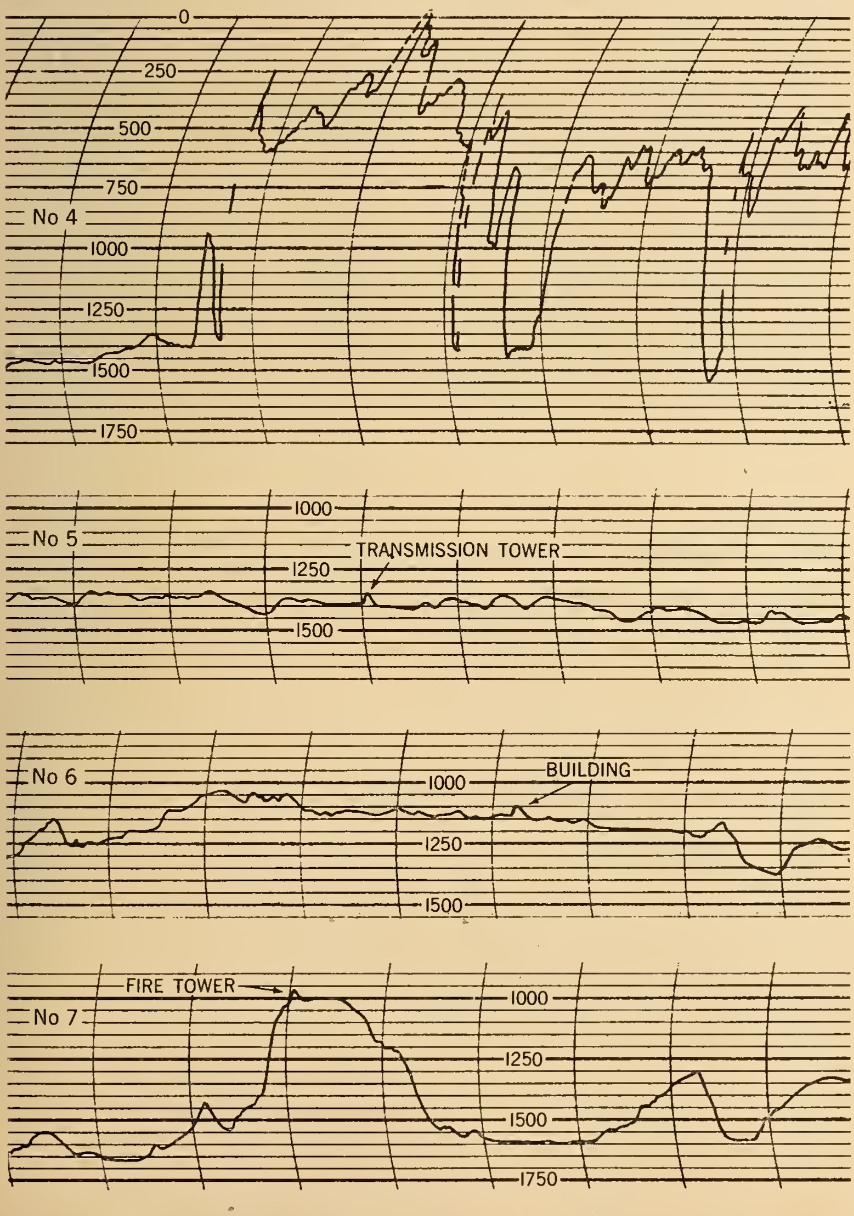
Unfavourable weather caused considerable delay. Unstable atmospheric conditions, generally associated with cumulus cloud formations, caused errors in recordings from below cloud level. On most occasions the clouds were too dense to permit adequate identification photography from the calm atmosphere above the clouds.

Figure 7 shows some examples of profiles from the operation. Number 1 shows the accurate delineation of the level water of Lake Timagami under calm atmosphere conditions, except that at "A" an erratic occurred which was possibly caused by an isolated area of unstable air. Number 2 is representative of recordings over water surfaces during unstable atmospheric conditions, and number three shows the effects of excessive vibration caused by tapping the height corrector during a flight over water.

Figure 8 includes some further interesting profiles. Number 4 shows the effect of rain; No. 5 a steel tower of a power transmission line; No. 6 a building on an airport and No. 7 a fire tower. Numbers 5, 6 and 7 are oddities, since no similar effects were obtained from other records of the same nature. No explanation is apparent.

The choice of the area for the Radalt operation was influenced by the fact that numerous lake elevations were already available in the district for tieing down the profiles to mean sea level. Adjustment between points of known elevation was made by straight interpolation between lake surface elevations. Drift angles were recorded on all flights and the meteorological cor-

Fig. 8. Effects of rain and landscape features on radar altimeter profiles.



rections calculated for comparison purposes.

An assessment of the total operation showed that the elevations of identifiable ground features were rarely in error more than 50 feet, when compared to the elevations of the same points as established by ground methods. It showed also that the average of 80 per cent of the elevations of interim water surfaces were correct within 10 feet. (Table I).

Operation "Radalt" proved that the new technique could be successfully applied to the contouring of aeronautical charts. By using the heights from the profile records preliminary contours have been drawn. These may be drawn in more detail by photogrammetric measurements at a later date.

Operation North Shore

In the summer of 1949 an operation involving 8,300 miles of flight lines, to cover an area of 125,000 square miles, was accomplished in the area north of the St. Lawrence River and Gulf. The operation was done by contract with a private company.

The altimeter equipment, installed in a Lockheed Hudson aircraft, was essentially the same as the prototype N.R.C. set, except that the pressure height corrector had a more "temperature stable" circuit. The performance of the equipment was generally satisfactory, the height corrector giving less trouble than in the 1948 operation. Besides the normal crew of a pilot, navigator, and camera operator, a radar technician and an observer from the Department were carried on all recording flights.

The results were processed and the resulting contours drawn during the winter of 1949-50. All heights were referred to sea level by using term 1 of the meteorological formula, and where previous altitudes had been established by ground levels the information was used for further adjustment. The method seemed to be quite satisfactory, and few appreciable discrepancies were in evidence.

Only limited information of ground elevations in the area covered was available previous to the operation, and some of the information appearing on maps was considerably in error. In several cases the previous elevations of lakes were corrected as much as 100 feet. In one area ground elevations were corrected by about 2000 feet. Water elevations obtained indicated anomalies in drainage which were corrected by a further study of air photographs.

Research Programme for 1950

Although the objective of developing a practical tool for the contouring of aeronautical charts has been reached, this new technique in mapping shows such promise and appears to be subject to such refinements in accuracy that, with this object in view, a further experimentation has been decided upon to be carried out this summer.

The equipment to be used is one of a set of 7 radar altimeters and pressure height correctors, recently constructed for the R.C.A.F. In the new altimeter the wave length is 1.25 cm., and the reflector is approximately 2 ft. in diameter. From the results of an acceptance flight the prototype seems to be capable of greater accuracy than the 3.2 cm. model.

The other uses to which the technique may be put will of course depend upon the success of the experiment, and upon the accuracies achieved. Of major importance to the Surveys and Mapping Branch is its use to Shoran in triangulation, and in establishing ground heights to control contouring on larger scale maps. The object of the experiments is to determine. if possible, the causes of the larger errors so far encountered, and to eliminate or reduce them.

The possibility of using radar altimeter measurements in conjunction with vertical air photographs to extend horizontal control into unmapped areas is also to be investigated. The National Research Council, the Royal Canadian Air Force, and the Meteorological Branch of the Department of Transport are co-operating with the Department of Mines and Technical Surveys in these experiments, which are under the control of a subcommittee of the Associate Committee on Survey Research.

Erratum

J. B. Candlish, M.E.I.C., author of the paper "Alternative Engine Fuels" (May issue of *The Journal*, page 361) has brought to our attention the fact that since February, 1950, he has been manager of the mechanical division of Taylor & Gaskin, Inc., Detroit. His connection with Palmer Bee Company, Detroit, was terminated in September, 1949.

AIR PHOTOGRAPHY

in

IRRIGATION & WATER DEVELOPMENT WORK

by

J. D. Mollard, M.E.I.C.

Air Surveys Engineer,
Prairie Farm Rehabilitation Administration
Department of Agriculture, Canada,
Regina, Saskatchewan

A paper presented before the Sixty-fourth Annual General and Professional Meeting of The Engineering Institute of Canada, July 12-14, at Toronto.

A large assemblage of distinctive land forms are recorded in air photographs. With an understanding of geologic processes and of soil principles, soil conditions may be interpreted from the photos. Engineering problems can then in turn be predicted and their significance evaluated.

Mosaics, contact prints, and stereopairs are used as illustrations. How the interpretation of features observed in these photos can simplify and facilitate preliminary irrigation and water development surveys is also given. Selected examples show unstable valley slopes, alkali-salt soils, heavy clay lakebed soils, gravel deposits, irrigable areas, and valley sections.

The peoples in many sections of Western Canada seem constantly faced with the threat of recurring cycles of flood and drought. To remedy this unhappy situation, many irrigation and water conservation projects have been put into operation in the past two decades. Others are in the planning stage. It is during the planning period of such projects that a need to organize and detail field surveys frequently emerges. Such surveys include topographic, geologic, and hydrologic studies; engineering and agricultural soil investigations; drainage and alkali studies; and land evaluation surveys. For any one of these the aerial photograph affords a comprehensive perspective of physical ground conditions.

Photo-Interpretation

Usually in the region where a particular engineering project is being investigated, one major geologic process has been predominant—for example, glaciation. Yet there may be local variations in soils and topography within the individual land forms that are important to the engineer. Not uncommonly, these too can be identified and evaluated. Sandy lakebed deposits along heavy clay glacial lakebed shorelines are a typical example. A transition zone may also be indicated on the photos.

Viewed stereoscopically, soil-landscape patterns in aerial photographs show a variety of colour tones and drainage and erosion patterns; different topographic expressions and vegetative types; and several man-made features. These indicators, jointly considered, reflect the mode of origin and environmental history of soil deposits (Fig. 1). Each indicator of soil conditions, moreover, has a particular airphoto aspect which results from forces that caused it to appear.

As an illustration, very light tones in the photos from Western Canada may be produced by high lime or high saline soils, by soil erosion or by sandy and gravelly soils. Or, perhaps, the light tones may result from any combination of these factors which are conditioned by the physical and chemical nature of the soil profile. Similarly, changes in the cross-sectional form and directional trend of streams and gullies; changes in vegetative types and in farming practices can often be readily related to the soil conditions that are being interpreted. A discriminating analysis of all details recorded in the photograph may at times be necessary.

When describing deposits at any locality, the dominant soil texture should be stated along with the geologic term; as, for example, gravel outwash plain, or clay lakebed. A characteristic group of engineering problems are thus immediately associated with the area outlined.

Reservoir Studies

The location and elevation of irrigable lands, and the size and shape of the valley, usually determine the reach of the river where site selection might prove most fruitful. This reach may be a matter of 20 miles or more. Thus, as a first step in locating a suitable damsite, an aerial mosaic should be assembled of the entire section of river valley where a dam appears feasible.

Spot elevations plotted on photos along section lines and road allowances may occasionally be used to compute initial flooded area and

Fig. 1. An airphoto soil-landscape pattern. Uniform heavy clay lakebed soils at A are depicted in the photo by uniform colour tones and level topography. Area B is glacial moraine, revealed by a mottled colour pattern and hilly topography. Because of the wide variation in soil texture and topography between A and B, engineering and agricultural practices differ in these areas. Knoll tops in B (light, island areas) have shallow top soils, are dry and high in lime carbonate. Soils in the low areas surrounding the knolls (darker tones) have deeper top soils and higher moisture, nitrogen, and organic matter contents than the light areas.

storage capacity figures for a proposed reservoir. This will facilitate a speedy preliminary comparison of the alternative sites, with a minimum of field data required. With the reservoir outlined on the aerial mosaic, its damaging effect on existing highway and railway lines can be seen. Alternative highway and railway routes may then be planned with the aid of the photographs.

Appreciable widening and narrowing of valley sections can have important geologic implications. For instance, narrow valley sites frequently owe their existence to the differential resistance that unlike rocks or soil materials offer to weathering and erosion. It may be inferred that narrow valley sections are places where the rocks are most durable (Fig. 2).

Steepness of Valley Sides.

An observer with some experience in reading air photos will be able to estimate the steepness of valley slopes, which, in turn, can be related to their suitability for construction purposes. In some instances it has been found more economical to place a greater quantity of fill in a valley with easily worked side slopes than to place a much smaller fill quantity where the slopes are comparatively steep.

Stability of Valley Slopes.

Observed in the airphoto, landslides and similar phenomena can be classified as to extent, whether ancient or recent, and whether they appear stable or are obviously active. But the immediate purpose is recognition of unstable slope conditions. In consequence, field investigations can at once be directed to locations where slope stability appears critical.

In-Valley Deposits (gravel terraces, alluvial cones and fans, deltas, recent flood plains, natural levees, etc.)

Ordinarily, stream valleys in Western Canada do not contain large, deep gravel terraces. Still,

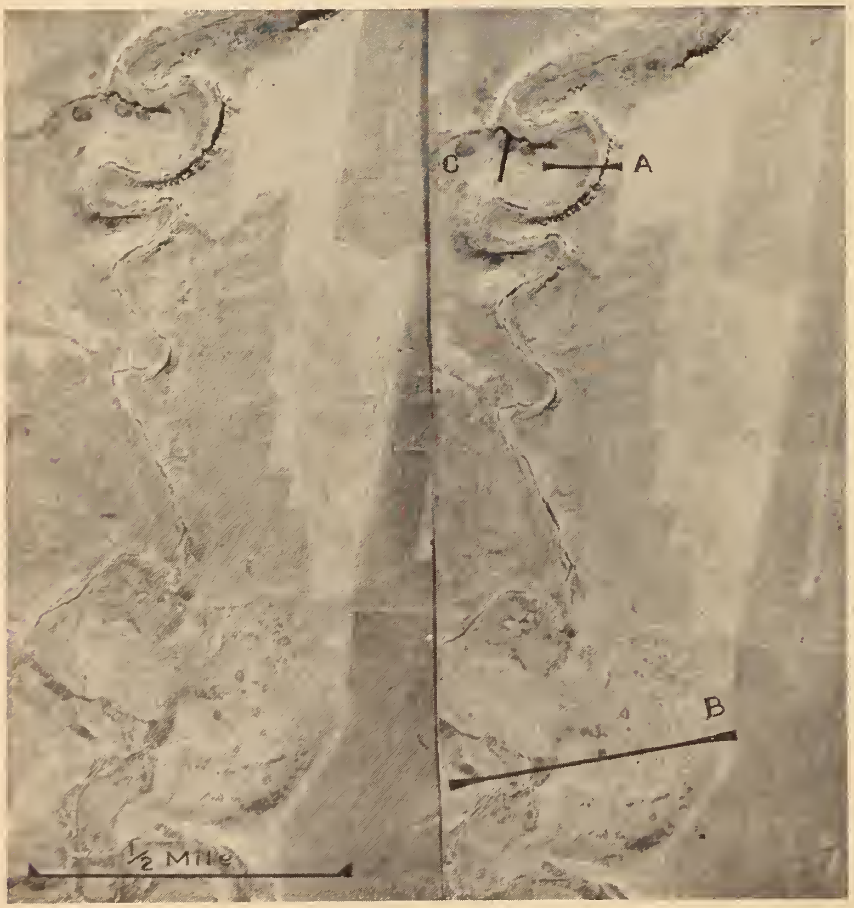


Fig. 2. Stereopair of Valley Shape and Valley Side Slopes. Comparing valley sections at A and B, useful geologic and engineering information may be readily inferred. The following is inferred at site A: (1) rock outcrops in valley sides (see minute projections); (2) near-vertical valley sides; (3) deep, narrow, gorge-like valley cross-section; (4) strong, resistant bed rock along abutments; (5) bed rock near ground surface in the valley floor; and (6) a favourable location for diversion tunnels or spillway at location C. At B: (1) no rock outcrops; (2) much gentler, easier-worked, side slopes than at A; (3) much greater storage capacities per unit of valley length than at A; and (4) deep alluvial deposits in the valley bottom.

the recognition of these deposits, when present, is important, owing to their widespread use for granular earth-fill borrow and concrete aggregate. On the other hand, indications of deep gravel beds in valley bottoms will forewarn of potential seepage trouble if earth dams are located there. The other in-valley depositional forms referred to above may also be identified and their engineering implications assessed.

Damsite Selection

Rock Outcrops and Strike and Dip of Sedimentary Rock.

Sound bed rock abutments along valley sides are frequently sought to carry the weight of high dams. A search for bed rock outcrops at ground surface may be made in the photos. The presence of rock can be inferred where the underlying rock structure influences native vegetation or surface topography. For example, bands of scant vegetation follow shale-sandstone contacts, even though these rocks cannot be seen to outcrop.

Often in noticeably stratified, sedimentary rocks, traceable bands along valley sides allow the strike and dip of strata to be readily determined. Drainage is frequently adjusted to rock resistance, faulting and folding, and, therefore, can be relied upon to reflect the underlying structure.

Dam Height and Fill Quantities.

Sites requiring comparatively small fill volumes are often investigated first and noted on the photos. Where a large storage capacity is necessary to the economic development of a reservoir, high valley bank locations may be sought out in the photos. This factor is especially significant if hydroelectric power is required to raise irrigation water to lands situated above the reservoir. An increase in height of the dam will increase the available power head and, correspondingly, decrease the pumping lift to irrigable lands.

Earth-fill Materials and Aggregates.

Several types of sand and gravel deposits, each depicting distinctive airphoto patterns, may be found in the vicinity of rivers, small streams, and old, abandoned glacial channels. Less commonly, they occur in the irrigable land areas. These deposits reveal a characteristic appearance in the photo that is usually easily recognized.

Extensive gravel beds normally

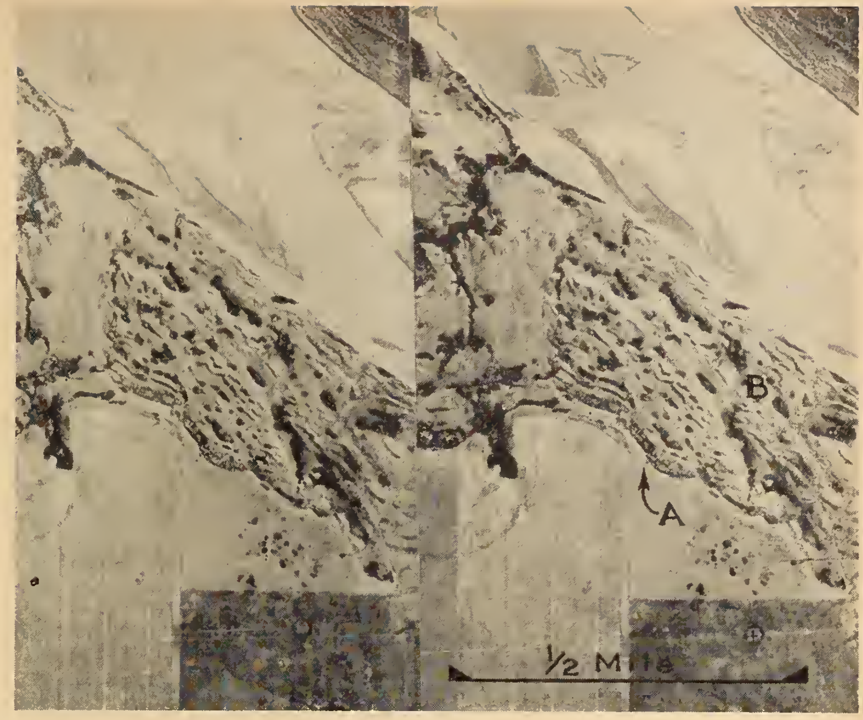
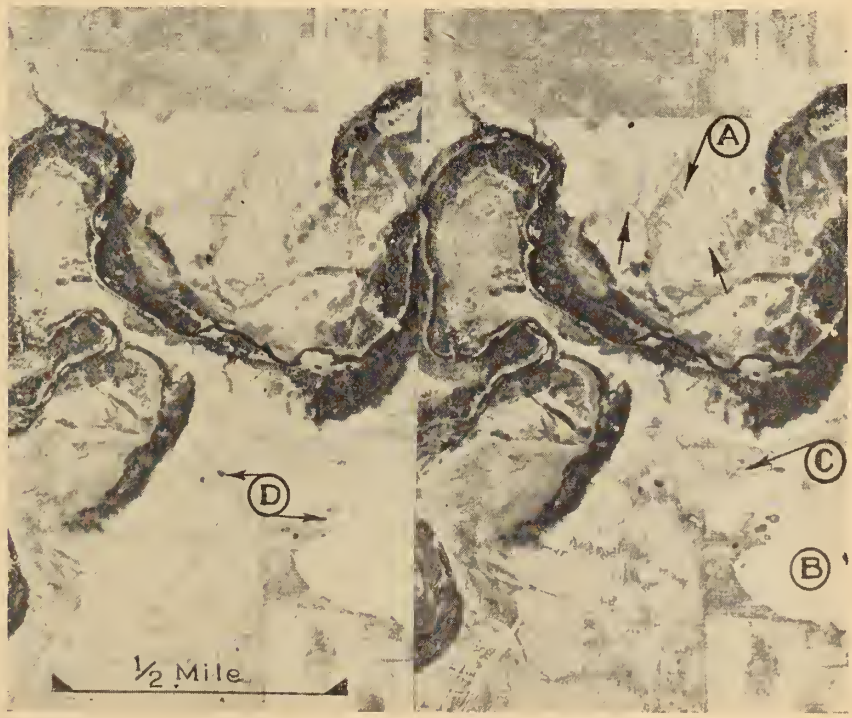


Fig. 3. Unstable valley side slopes. A stereopair of an active slide area, B. Deep, open fissures are now forming at location A (fine, parallel lines in the airphoto). Thus, shortly, another section of the upland will be released to slide down the steep valley side. Land slides and lesser earth movements are revealed by roughly parallel ridges and bands of vegetation. Note, also, the abrupt change in slope and the arc form of the slides near the top of the slide area.

Fig. 4. A stereopair of a Valley Section and Adjacent Upland Soil Conditions. Small, closely spaced, notch-like gullies at A indicate deep, clean sands and gravels. The solid white area, B, indicates local soil drifting. Surface soils on the upland are sandy (inferred from light colour tones and the ease with which soils drift). The sandy soils are only a thin mantle, and overly relatively impervious soil materials (inferred from water in small depressions, D). C points to small, eroded, "burn-out pits," associated with alkali conditions. Note, also, the many changes in valley side slopes shown in this stereopair.



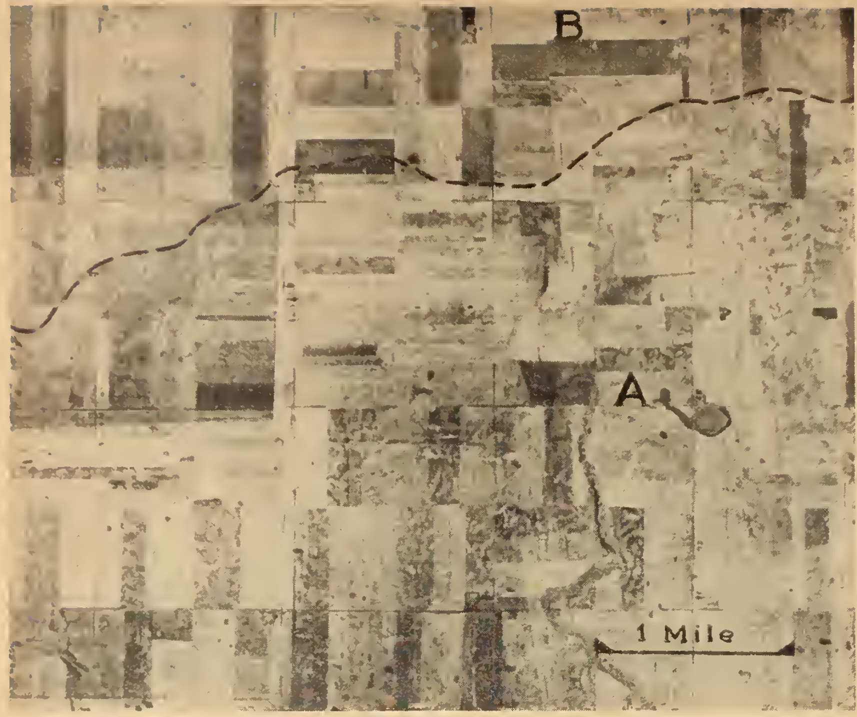


Fig. 5. Outlining irrigable lands for future agricultural soil surveys. The mottled soil pattern at A occurs on undulating to rolling glacial till topography. B is a level to gently undulating lakebed airphoto pattern. Area B represents suitable soils for irrigation; area A, on the other hand, cannot be economically irrigated. The junction of the two patterns, shown by the dashed line, is the ancient shoreline of a glacial lake, and therefore marks a possible location for a high level canal to serve area B.

Fig. 6. Canal Location. The aerial mosaic shown here has been used to assist the planning of alternative gravity canal locations. Aerial photos immediately suggest an alternative, A, to a route traversing the side hill, B. In alternative A, the large ravines would have to be dammed, creating several small ponds, but resulting in a shortening of the canal length, a reduction in quantity of excavation, a much desired saving in grade, and a complete by-passing of the landslide at location C.

show faint current markings, associated with the sorting action of former fast-moving streams. Both topographic position and gully shape are also reliable indicators of deep gravel deposits. Very little surface drainage is found on gravels owing to the permeability of their subsoils.

Locotion of Structures.

When earth-fill dams involve a few million yards of fill, much thought and planning is required for the location of structures around the damsite. Topographic features and soil conditions may be better suited for the layout of structures at one valley location than at another. Favourably situated tributaries entering a main valley will often permit an appreciable saving in the excavation of spillway pilot channels. Re-entrants and recesses, and projecting rock or earth spurs, along valley sides, offer certain advantages for the location of diversion tunnels or spillways (Fig. 2).

Adjustment of Dam Centreline.

Though the approximate location of alternative damsites may be chosen for field investigation, still further refinements in the actual location of the dam centreline may be possible. Features regularly identifiable that deserve mention are springs along abutment slopes, intermittent creeks which might possibly enter the valley on the downstream side of the dam, apparent local instabilities along valley slopes, bed rock and topographic features, and high alkali soils where concrete structures might be located. With a view to the best economic utilization of both pervious and impervious borrow, a more refined adjustment of the centreline may be possible.

Airphoto Studies in Irrigable Areas

Aerial photographs have been employed to delimit potential irrigable lands for future soil surveys. Soil areas can first be outlined on the photo according to mode of origin. As an example, water-laid deposits on the floors of large, ancient, dried-up glacial lakes are ordinarily level, in contrast to glacial till landscapes[1] (Fig. 5). The mode of deposition of the soil materials will, morever, usually indicate the dominant soil textural type, and the tendency for the soils to drift.

[1] Glacial till, as used here, includes all unsorted, unstratified soil materials, transported and dumped by glaciers.

When mapping irrigable soil boundaries on the airphoto, clay soils may be separated from those soils that are lighter, more sandy, in texture. The latter may show excellent response to irrigation, yet produce little under ordinary dry land conditions. A good impression is therefore gained about the comparative economic desirability of the land under irrigation compared to dry land operation. By separating areas of distinctly different topography, it is possible to approximate the percentage of land that can be irrigated by gravity and/or sprinkler systems. Information obtained in this way can be used in making preliminary water studies.

When boundaries are placed on these areas, and the best available contour maps are consulted, the shape and location of the lands will often suggest distribution and drainage problems. Information may also be obtained about the number and approximate size of irrigation structures, such as canal crossings at highways, railways, stream channels, and small gullies (Fig. 6). Possible sites for service or balancing reservoirs, as well as waste water reservoirs, may also be located on the photos.

Fig. 7. Alkali-salt pattern. The speckled light and dark pattern at A indicates a high concentration of alkali-salts in the surface soils. Many variations of this pattern are readily identifiable (Fig. 4). Right-angle bends in the river suggest a fracture or jointed system in the bed rock that is near ground surface.

Drainage and Alkali Problems

Drainage.

Irrigation projects now in operation clearly illustrate the need for an early recognition of lands that might develop bad drainage situations. One might begin a study of the drainage aspects of a proposed irrigation scheme by plotting all surface drainage features on the photos, including areas where the drainage is local into undrained depressions.

In Western Canada frequently fairly large areas of medium-textured soils, with level or nearly level topography, are underlain by compact glacial till soils. Irrigation waters percolate through the surface soils and gather in undrained depressions in the undulating glacial till. These circumstances are particularly conducive to the accumulation of alkali-salts in the surface soils.

Usually these are areas where shallow wind or water-laid deposits veneer the old glacial till surface. These patterns are generally identifiable in the air photos. Boundaries can be placed on areas where canals cross sand and gravel plains or dune areas. Plans may then be projected for field permeability and soil investigational studies.

Alkali.

In many areas of the Prairie Provinces, alkali is a totally limiting factor of soil productivity. Saline soils commonly occur in large sloughs; the dried-up beds of small lakes; on dry, flat valley bottoms; and on upland areas where the unconsolidated soil mantle is shallow, overlying marine shales. These are areas where soluble salts rise from the subsoil through the u p w a r d capillary movement of ground water.

Alkali-salt soils are reflected in the airphoto by a variety of associated patterns, the difference in pattern being primarily dependent on the vegetative species and type and concentration of salts in the surface soils.

Hydrology and Flood Control

Air photos are currently being used to study the character of watersheds. Pertinent information taken from air photos may show the size and shape of the watershed; the range and character of the predominant slopes; the type and amount of vegetative cover; and geologic conditions. This information is valuable in planning the solution to watershed problems. Furthermore, it provides a means of comparing a watershed in which stream flows are gauged with one in which no runoff records are available, for the purpose of estimating flows in the latter area.

Information relative to the solution of flood problems along stream channels is also readily derived from air photos. For example, locations along meandering streams where channel straightening would be most economical and beneficial, can be selected from the photos for more detailed field studies.

Conclusion

Only a few illustrations have been given to show the application of photo-analysis to irrigation and water development work. Therefore, they do not begin to cover the variations in the land forms and soil conditions which can be interpreted. Though the reader may have received the impression from the text that photo-interpretation techniques are carried out without field checking, this, of course, is not true. The amount of checking will vary with the complexity of geologic conditions in the area being studied.

All available sources of information that will assist and confirm photo-interpretation, or help in any way to implement these studies, should be consulted. These may include existing agricultural soil maps, geologic maps, topographic maps, and hydrologic data. Needless to say, the amount and type of information that can be interpreted from the photos depends in no small measure upon the quality of the aerial photographs, and upon the experience and skill of the interpreter.

Sixty-fourth Annual General Meeting

Convened at Headquarters, Montreal, on January 12th, 1950, and adjourned to the Royal York Hotel, Toronto, Ont., July 12th, 1950

THE BUSINESS MEETING

The Sixty-fourth Annual General Meeting of The Engineering Institute of Canada was convened at Headquarters on Thursday, January 12th, 1950, at eight fifteen p.m., with President John E. Armstrong in the chair.

The general secretary having read the notice convening the meeting, the minutes of the Sixty-Third Annual General Meeting were submitted, and on the motion of J. T. Farmer, seconded by Henri Gaudefroy, were taken as read and confirmed.

Appointment of Scrutineers

On the motion of B. A. Evans, seconded by G. B. Moxon, Messrs. R. N. Coke, J. F. Harris and J. M. MacBride were appointed scrutineers to canvass the officers' ballot and report the results.

There being no other formal business, on the motion of E. B. Jubien seconded by H. F. Finnemore, it was resolved that the meeting do adjourn to reconvene at the Royal York Hotel, Toronto, Ontario, on the twelfth day of July, nineteen hundred and fifty.

The adjourned meeting convened at ten o'clock a.m. on Wednesday, July 12th, 1950, with President John E. Armstrong in the chair.

Retiring President's Address

The text of the address of the retiring president, John E. Armstrong, appears on page 707 of this number of the Journal.

Invitation from A.S.C.E.

The president introduced to the meeting Mr. L. D. Snow, a member of the American Society of Civil Engineers. Mr. Snow explained that his mission to this meeting was to carry an invitation from the members of the A.S.C.E. in Texas to the members of The Engineering Institute of Canada to attend the forthcoming spring meeting of the A.S.C.E. which is to take place in Houston, Texas, on February 21st, 22nd and 23rd, 1951.

Mr. Snow referred to the fine relationships established between Canadians and Texans during the world war and hoped that enough Canadians would come to the meeting to permit the Texans to return in some measure the hospitality which their boys had received while training in Canada.

Mr. Armstrong thanked Mr. Snow for his invitation and promised that it would be brought to the attention of all members of the Institute from coast to coast.

Nominating Committee - 1950

The general secretary announced the membership of the Nominat-

Eighteen of the thirty-two branches were represented at the Branch Officers Conference on Tuesday, July 11th.

The Hon. Lester B. Pearson, Secretary of State for External Affairs, is pictured here as he spoke on the Korean situation at the annual banquet.

ing Committee of the Institute for the year 1950 as follows:

Chairman: T. E. Storey, Winnipeg

Branch	*Representative*
Border Cities	J. M. Wyllie
Calgary	W. E. Robinson
Cape Breton	J. R. Morrison
Central British Columbia	M. L. Wade
Cornwall	C. I. Bacon
Edmonton	F. R. Burfield
Halifax	L. E. Mitchell
Hamilton	I. Macdonald
Kingston	S. D. Lash
Kitchener	A. J. Girdwood
Kootenay	A. C. Ridgers
Lakehead	H. M. Olsson
Lethbridge	J. Haimes
London	A. L. Furanna
Moncton	V. A. Ainsworth
Montreal	R. S. Eadie
Newfoundland	H. Forbes-Roberts
Niagara Peninsula	C. G. Cline
Ottawa	Norman Marr
Peterborough	A. L. Killaly
Quebec	C. H. Boisvert
Saguenay	H. R. Fee
Saint John	A. R. Bonnell
Saint Maurice Valley	H. O. Keay
Sarnia	E. W. Dill
Saskatchewan	Stewart Young
Sault Ste. Marie	R. A. Campbell
Toronto	A. E. Berry
Vancouver	G. W. Allan
Victoria	Kenneth Reid
Winnipeg	H. W. McLeod

Honorary Memberships

The general secretary reported that the following had been elected to honorary membership in the Institute and that certificates would be presented at the annual dinner:

John Bow Challies, C.E., D.Eng., vice-president and executive engineer and a director, Shawinigan Water and Power Company, Montreal.

Lillian Moller Gilbreth, Ph.D., Sc.D., LL.D., etc., consulting engineer, Montclair, N.J.

Sir Frank Whittle, K.B.E., C.B., F.R.S., etc., honorary adviser, B.O.A.C., on development and operations of gas turbine engined aircraft.

Clarence Richard Young, C.E., D.Eng., former dean of the Faculty of Applied Science and Engineering, University of Toronto, Toronto.

Award of Medals and Prizes

The general secretary announced the various awards of the Institute for the year as follows, stating that the formal presentation of these distinctions would be made at the annual dinner of the Institute on July 14th:

Julian C. Smith Medal—"For achievement in the Development of Canada," to G. A. Gaherty, M.E.I.C., Montreal, Que., and J. A. McCrory, M.E.I.C., Montreal, Que.

Gzowski Medal—to C. H. Pimenoff, M.E.I.C., for his paper "The Arvida Bridge-Design of the Aluminum Superstructure".

Duggan Medal—to H. H. Minshall, M.E.I.C., for his paper "Emergency Railway Bridging".

Leonard Medal—to Owen Matthews for his paper "Fluo-Solids Roasting of Arsenopyrite Concentrates at Cochenour Willans", and to: P. E. Cavanagh for his paper "Economics of Ferrous Smelting in Canada".

Plummer Medal—to C. V. Trites, M.E.I.C., and J. D. Shannon for their paper "Mining Process Applied to Runway Construction".

Keefer Medal—to W. L. Pugh, M.E.I.C., for his paper "The New Powell Wharf of Saguenay Terminals, Limited, Port Alfred, Quebec".

Students' and Juniors' Prizes

H. N. Ruttan Prize (Western Provinces) — to J. W. McPhail, S.E.I.C., for his paper "The Design and Control of Asphalt Paving Mixtures".

John Galbraith Prize (Province of Ontario)—to J. C. Buchanan, Jr.E.I.C., for his paper "The Cast Out-of-Round Piston Ring".

Phelps Johnson Prize (Province of Quebec, English)—to Walter M. McLeish, S.E.I.C., for his paper "Norsemen 'V' Propeller Performance".

Ernest Marceau Prize (Province of Quebec, French)—to Fernand Desrochers, Jr.E.I.C., for his paper "Etude d'un moteur turbo-reacteur pour la propulsion d'un avion".

Martin-Murphy Prize (Maritime Provinces) — to R. Otsuki, S.E.I.C., for his paper "The Van De Graaf Electro-static Generator".

Report of Council, Report of Finance Committee, Financial Statement and Treasurer's Report

On the motion of W. R. Manock, seconded by Neil Metcalf, it was resolved that the report of Council, the report of the Finance Committee, the Financial Statement and the Treasurer's Report be accepted and approved.

Reports of Committees

On the motion of F. J. Ryder, seconded by S. E. Williams, it was resolved that the reports of the following committees be taken as read and accepted: Admissions, Legislation, Library and House, Papers, Publication, Board of Examiners, Conservation of Natural Resources, Employment Conditions, Prairie Water Problems, Professional Interests, The Young Engineer, Employment Service, Canadian Chamber of Commerce, Canadian Radio Technical Planning Board, Canadian Standards Association, National Construction Council.

Branch Reports and Ontario Division Report

On the motion of J. T. Rose, seconded by A. H. Hull, it was resolved that the reports of the various branches and of the Ontario Division be taken as read and approved.

Centennial Celebration A.S.C.E.

The president introduced Mr. Carlton Proctor, a vice-president of the American Society of Civil Engineers, who told the meeting of the preliminary plans of the A.S.C.E. to celebrate their one hundredth anniversary and to invite the Institute to be one of the "co-ordinating societies" which would participate in the celebration. Mr. Proctor stated that it was the society's intention to make this meeting not only the greatest engineering meeting that had taken place in the one hundred years of the society's activities, but also an outstanding demonstration of the value of the free enterprise system which is so firmly fixed in these two countries.

Mr. Armstrong thanked Mr. Proctor for the invitation and stated that it would be considered in detail at the first meeting of the new Council of the Institute.

Amendments to the By-Laws

The president explained that by the by-laws of the Institute it was necessary to have proposed changes authorized at the annual meeting so they might go forward to the membership in ballot form. The general secretary outlined the several proposals which had been approved by the executive of every branch of the Institute and by the Council.

The president called for a motion with regard to the proposals and it was moved by Louis Trudel, and seconded by D. Ross-Ross that the proposals to amend the by-laws be approved by this meeting and sent out to ballot. There was no discussion and on being put to the meeting the motion was approved without any dissenting votes. (A copy of the proposals was mailed to every corporate member in December and a further copy will be included with the ballot which will be mailed shortly.)

New Business

The general secretary read a telegram which had been received from the group of Canadian engineering teachers then on a tour of inspection of British industries. This telegram wished the meeting every success and also sent congratulations to the new president.

A further telegram was presented from the secretary of the World Power Conference then in session in London. This, too, expressed good wishes to the meeting.

A third telegram was received from Past-President J. N. Finlayson in which he expressed regret at being unable to attend and conveyed his greetings to the members of both societies and in particular to the outgoing and incoming presidents of the Institute.

Election of Officers

Mr. R. N. Coke read the report of the scrutineers appointed to canvass the officers' ballot for the year 1950 as follows:

President:

James A. Vance, Woodstock, Ontario.

Vice-Presidents:

Province of Ontario — Drummond Giles, Cornwall, Ont.

Province of Quebec—J. F. Wickenden, Three Rivers, Que.

Maritime Provinces — E. O. Turner, Fredericton, N.B.

Councillors:

Victoria Branch—F. W. Gray
Central British Columbia — H. L. Hayne
Lethbridge Branch—A. G. Donaldson
Calgary Branch—R. T. Hollies
Winnipeg Branch—T. H. Kirby
Sault Ste. Marie Branch—L. R. Brown
Sarnia Branch—F. F. Dyer
Kitchener Branch—F. H. Midgley
Hamilton Branch—W. E. Brown
Niagara Peninsula Branch—P. E. Buss
Toronto Branch—J. F. MacLaren
Peterborough Branch—F. R. Pope
Ottawa Branch—A. A. Swinnerton
Cornwall Branch—D. Ross-Ross
Montreal Branch—J. P. Carriere, L. A. Duchastel, I. R. Tait
Quebec Branch—J. O. Martineau
Moncton Branch—R. L. Parsons
Halifax Branch—W. C. Risley
Cape Breton Branch—C. M. Smyth

On the motion of J. L. Shearer, seconded by J. K. Sexton, 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.

Vote of Thanks to Toronto Branch

On the motion of Past-President L. F. Grant, seconded by E. R. Eaton, it was unanimously resolved that a hearty vote of thanks be extended to the Toronto Branch in recognition of their hospitality and activity in connection with the Sixty-Fourth Annual General Meeting.

Vote of Thanks to Retiring Officers

On the motion of Past-President Beaubien, seconded by P. E. Buss, it was unanimously resolved that a hearty vote of thanks be extended to the retiring president, vice-presidents and councillors for the very effective and arduous work they have done on behalf of the Institute during the past year.

The meeting adjourned at eleven twenty-five a.m.

THE PROFESSIONAL MEETING

As the Institute, largely through the activities of The Engineers' Council for Professional Development, has come to more and more complete co-operation with the founder societies of the United States, Council has sought opportunities to join with those societies in professional meetings. Co-operation with our great southern neighbour has been beneficial and profitable in many other fields of endeavour and the field of engineering should be no exception.

Joint regional professional meetings had been held previously but this year's meeting was the first time the Institute has combined its Annual Meeting with a meeting of any other professional society. Opinions expressed during and since the meeting by those fortunate enough to have attended seem to indicate that the combination was a success.

Registration

Registration totalled 1,005 of which 645 were members and juniors of the two societies, 340 were ladies and guests and 20 were students.

Above, the head table on Wednesday night included Col. W. N. Carey, executive secretary of A.S.C.E.; Dr. A. P. Haacke, consulting economist to General Motors Corporation, who was the principal speaker; Ernest E. Howard, president of A.S.C.E.; President John E. Armstrong of the E.I.C.; Col. C. E. Davies, secretary of A.S.M.E.; and the general secretary of the Institute, Dr. L. Austin Wright.

Above, a group of delegates from various points in Quebec.

Technical Programme

The technical divisional organization of A.S.C.E. provided the impetus for a particularly comprehensive technical programme. There were eleven full technical sessions jointly sponsored by the two societies and comprising thirty-four papers approximately equally divided between American and Canadian authorship. In addition there were two sessions comprising five papers arranged by A.S.C.E. and nine sessions comprising 8 papers and 2 panel discussions arranged by E.I.C. and covering fields of specialization other than

Below, the annual students' conference included, clockwise from left front: President James A. Vance, Paul Greenwood, Don Duguid, Gerry Strother, Harry Swinnard, Harry Filiatrault, John Lindsay, Andre Ringuette, Dr. G. R. Langley, Col. L. F. Grant, Robert Wheelan, W. W. Walker, H. B. Davis, Victor LeGuerrier, Abe Mohammed, J. F. Harris.

civil engineering. In all there were fifty papers presented, which is an all-time record as far as the Institute is concerned. The Royal York is probably one of the few hotels in the world where such an extensive programme of meetings could be held so conveniently. Although at times as many as six large meetings were in progress, together with committees and other smaller groups there was no occasion when accommodation was overtaxed. Attendance at the technical discussions was most satisfactory and there has been ample evidence that papers were well received. Many will be published in forthcoming issues of the *Journal*.

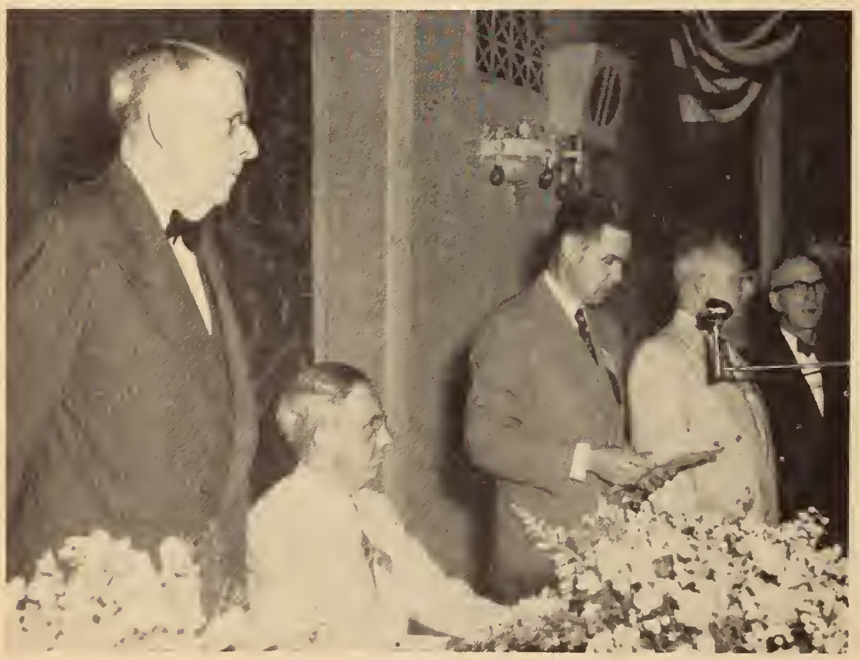
An added feature of the technical programme was a special session on hydraulic model studies held at the new hydraulics laboratory of the University of Toronto. This joint session comprised 9 papers and an inspection of the new laboratory.

Ernest E. Howard, president of A.S.C.E., delivers the presidential address at the business meeting of that Society.

Monday

The Board of Direction of A.S.C.E. and the Council of the Institute held separate meetings on Monday, July 10th. Eighteen of the Institute's 32 branches were represented and the total attendance was 49 councillors and guests. In the evening the officers of both societies with their ladies dined in the Roof Garden. The A.S.C.E. board continued its deliberations on Tuesday while the Institute held its annual branch officers' conference and students' conference. The agenda for the students this year was shorter and included only subjects of paramount interest and importance. In addition to Dr. G. R. Langley who has been so keenly interested in the conference each year. R. F. Shaw, vice-president of the Foundation Company of Canada took a most valuable interest and contributed much to the value of the deliberations.

Guests at the head table for the opening luncheon were, from left to right: President Armstrong; Wesley W. Horner, past-president of A.S.C.E., and principal speaker for the luncheon; E. Ross Graydon, chairman of the Toronto Branch of the Institute; president Howard of A.S.C.E.; and David A. Balfour, controller of the city of Toronto.



Tuesday

The branch officers conference gained much this year by being held before the official opening of the general and professional meeting. There were no conflicting meetings and the branch representatives were enabled to give their undivided attention to their agenda. On both these conferences more will be reported in later issues of the *Journal* as the minutes become available.

Wednesday

The general business meetings of the two societies were held on Wednesday morning and Mr. Armstrong's retiring address may be found on page 707. For the opening luncheon and the dinner on Wednesday, speakers were arranged by A.S.C.E. At luncheon. Wesley W. Horner, past-president of A.S.C.E. outlined the activities and recommendations of the Water Resources Committee of the Engineers Joint Council. Although primarily of interest to the American delegates, the administration of water resources in the United States can provide valuable lessons for Canadians, and Mr. Horner's remarks were well received.

In the evening, Dr. A. P. Haake, consulting economist to General Motors Corporation, spoke of the achievements and values of the free enterprise system. His address was followed by a delightful half-hour concert by the Harvey Perrin all-girl choir of Toronto. The forty-odd attractive and most colourfully-gowned young ladies with their personable conductor captivated the audience and provided a memorable climax to the functions of the first day.

Thursday

On Thursday there were technical sessions in the morning, a meeting of the incoming Council of the Institute, and an informal luncheon. A wide variety of recreation had been arranged by the Toronto branch committee for the afternoon and evening, including a trip to Niagara Falls, sightseeing, plant visits, a symphony concert and an outdoor presentation of Shakespeare. An inspection trip through the Toronto subway, presently under construction, was arranged on Wednesday afternoon and again on Thursday afternoon.

Friday

The panel discussion on "Education for Management" on Friday morning attracted an audience of over three hundred which was not surprising in view of the eminently qualified persons who comprised the panel. From Britain came Lieut.-Col. Lyndal Urwick, probably the top authority in scientific managment affairs in that country; from the United States came Dr. Lillian Gilbreth whose qualifications are so well-known as to need no elaboration, and Rear Admiral Carl H. Cotter, U.S.N. (Ret.) president of Merrit, Chapman, and Scott Corp., New York City. Canadians were S. G. Hennessey of the Dept. of Political Economy, University of Toronto, E. W. McBride, assistant manager of mills, Abitibi Power & Paper Co., and F. G. Ferrabee, vice-president and general manager, Canadian Ingersoll-Rand Co., Ltd. C. A. Peachey, chairman of the Canadian Management Council, was in charge of arrangements for the panel and directed the discussion in the capacity of moderator.

The joint committee of the Institute and the American Society of Mechanical Engineers held a meeting on Friday morning.

Col. Urwick followed his effective contribution to the panel with

This picture was taken as the new president, James A. Vance of Woodstock, Ont., assumed office at the conclusion of the annual banquet. Retiring President Armstrong is on the left, and the Hon. Lester B. Pearson is seated in the foreground.

Three of the four recipients of honorary memberships were present at the annual banquet to receive their certificates from President Armstrong. The pictures below, left to right, show the presentations to Dr. J. B. Challies, Dr. Lillian Gilbreth, and Dr. C. R. Young.

an address at luncheon on "Management Developments in Britain", which left with his audience an impression that Britain is certainly not lagging in the affairs of scientific management.

The panel discussion in the afternoon on "Engineering Education and the Employer" also attracted much interest. It is expected that both these discussions will be published in early issues of the *Journal*.

The Honourable Lester B. Pearson, Secretary of State for External Affairs had accepted the Institute's invitation several weeks before the meeting to speak at the Annual Banquet. The development of the Korean situation apparently made a pronouncement of national policy desirable and Mr. Pearson's address "Canada and the Korean Situation" was broadcast over the coast-to-coast network of the C.B.C. It seemed particularly appropriate that the joint meeting should have brought so many United States citizens to Toronto to hear an address which must have been of profound interest to them.

Public Relations

Once again the annual meeting received wide coverage through the press and radio and once again this emphasized the contribution the Institute is able to make in bringing the profession and its achievements to the notice of the public. The value of effective public relations has been so thoroughly demonstrated as to be beyond question and, since the profession is nation-wide in Canada, its publicity must be nation-wide. The Annual Meeting of the Institute affords an unequalled opportunity for engineers to tell their story, and the expanding coverage obtained by these meetings in recent years testifies that the engineers' story is of real interest to the public.

In this regard the Institute is much indebted to the Public Relations department of the Canadian Pacific Railway and the representatives of the local press, the Canadian Press, and British United Press, whose co-operation was wholehearted and complete.

Muriel's Room was operated as usual during the meeting by Industry's Committee. This delightful feature was particularly valuable this year in enabling the Canadian and American delegates to mingle and come to know each other better. Once again the Institute wishes to record its sincere appreciation of the generosity of those organizations which have regularly supported the committee since its inception in 1941 and also to the many new firms which afforded their support this year.

Ontario Association Entertains

Another event which contributed greatly to the success of the meeting was a dinner tendered by the officers of the Association of Professional Engineers of Ontario to the officers of the A.S.C.E. and The Engineering Institute of Canada. It was held in the evening of Tuesday, July 11th, at the Royal Canadian Yacht Club with E. V. Buchanan, president of the Association, presiding. The practical demonstration of the Association's interest in the meeting was appreciated greatly by both societies.

The Toronto Committee

The account of the meeting would not be complete without an acknowledgement of the contribution of the Annual Meeting Committee of the Toronto Branch. Under the chairmanship of E. Ross Graydon, they worked for several months on preliminary arrangements and then were on hand for the full time of the meeting to help with all the operations which combine to make an effective and memorable meeting. Only the chairmen of committees are listed below but there were many other members of these committees who deserve in equal measure the appreciation which was voiced on every hand as the meeting progressed.

Joint Convention Committee

Chairman, E. Ross Graydon; *A.S.C.E. Representative,* Dr. Albert Haertlein; *Reception,* J. F. Maclaren; *Plant Visits,* R. G. Segsworth; *Hotel Arrangements,* C. D. Carruthers; *Exhibits,* MacK. McMurray; *Finance,* E. A. Cross; *Ladies,* Mrs. E. Ross Graydon, Mrs. Albert Haertlein; *Publicity,* D. C. Beam; *Papers,* J. G. Hall; *Entertainment,* W. H. Paterson, W. E. Bonn; *Registration,* E. G. Tallman; *Industry's Committee,* F. P. Flett, D. D. Whitson; *Management,* J. F. Harris; *Secretary,* Mrs. M. J. Wardle.

A part of the audience of over three hundred who heard the Friday morning panel discuss "Education for Management".

Address of the Retiring President

John E. Armstrong, M.E.I.C.

Delivered before the Sixty-fourth Annual General and Professional Meeting of The Engineering Institute of Canada, Toronto, Ont., July 14, 1950

Brevity has been said to be the soul of wit. Your President will attempt to be brief.

The fiscal year of the Institute does not coincide with your president's term of office. The former coincides with the calendar year. The latter extends from one annual meeting of the Institute to the next. They merit separate reporting.

The report of Council for the year 1949, together with Committee and Branch reports, was published in the February, 1950, issue of *The Engineering Journal*, and reprints are before you.

Membership increased in all classifications except that of Affiliate. In spite of the automatic transfer of 717 Students to Junior membership, a major increase occurred in the number of Students. This augurs well for the future of the Institute. Total membership on December 31, 1949, was 12,566, a net increase of 1,688 during the year. The membership is now over 13,000 and continues to increase.

For the first time, advertising revenue from *The Engineering Journal* exceeded expenditures on the *Journal*. Quite aside from membership subscriptions the *Journal* produced a small net income for the Institute. The outlook for the current year is promising.

As shown in the statement of Institute revenues and expenditures, total revenues exceeded total expenditures in 1949 by almost $10,000. Of this amount $8,000 was transferred to building reserve in anticipation of necessary enlargement of the headquarters building at some future time to meet the requirements of increasing membership. As shown on the financial statement of the branches, each of the branches ended the year with money in hand.

1949 was an excellent year for the Institute.

The presidential term of office, which ends at this annual meeting, commenced in May 1949, and has extended over a period of fourteen months. These have been exceedingly interesting months.

During that period twelve council meetings were held—six at Montreal and six elsewhere. The latter were held one each at Sydney, Nova Scotia; Quebec, P.Q.; Toronto, Kitchener, and Sudbury, Ontario; and Vancouver, British Columbia. All were well attended.

The two by-law changes authorized by the 1949 annual meeting for ballot by the membership—that having to do with the number of Honorary Members, and that having to do with the appointment of an alternate for a councillor unable to attend a specific meeting of Council—were approved by membership ballot, and became effective October 15, 1949.

The Institute suffered a serious loss in the death of its field secretary, Charles E. Sisson, on November 25th, 1949, something less than three months after he had officially initiated that position. For a time the loss seemed irreparable. On March 20th, 1950, however, Past-President L. F. Grant accepted appointment as field secretary and has been very busy doing an outstanding job ever since.

The Institute, together with certain other organizations, kept persistent pressure on the matter of the appointment of an engineer to the Canadian Section of the International Joint Commission. At the turn of the year the vacancy on that Section was filled by the appointment of General The Hon. A. G. L. McNaughton, M.E.I.C. The Institute officially expressed to the Government its appreciation of such an outstandingly acceptable appointment.

Recently, a membership directory, the first since 1946, has been completed and issued. This was a monumental task. Due to the migratory habits of engineers, it is perhaps already somewhat out of date. It is much more up to date, however, than a directory four years old. It is hoped that until such a directory can be issued each year it will be found possible to issue it at least in alternate years.

Progress in the preparation of a catalogue of consulting engineers in Canada has been too slow. Most, if not all, consulting engineers are in favour of the preparation of such a catalogue, but too many of them have failed to provide the necessary information in regard to themselves and their work. This is an undertaking vitally important to the engineers and the employers of engineers in Canada, which should not be delayed further. The catalogue can be made available as soon as the essential information to be included in it has been supplied by the consulting engineers.

Your general secretary and your president-elect attended last April the Conference of Commonwealth Engineering Societies in Johannesburg, South Africa. The invitation to attend was issued to your general secretary and to your president, but because of the conference being scheduled near the close of the latter's term of office it was considered that greater good would accrue to the Institute if the incoming rather than the retiring president were to attend. The fact that your president-elect was overseas some seven weeks in connection with this conference and other Institute matters is but one instance among many indicative of his willingness and ability to serve the Institute in an outstanding manner.

In May, 1949, there were twenty-nine branches of the Institute. Today there are thirty-two branches. Your president has had the privilege of inaugurating each of these three new branches—one in St. John's, Newfoundland, in September, 1949, one in Kitchener, Ontario, in October, 1949, and one in Sudbury, Ontario, in April, 1950,—and, in each case, of personally presenting the branch charter at a charter night dinner. These were happy occasions. It is believed that the inauguration of three new branches during one presidential term of office has created a new record.

This record should be surpassed in the future. Canada is developing industrially, the Institute membership is increasing, and in more and more places larger groups of engineers are gathering where only smaller groups existed before. The individuals composing them are now classed as non-resident members of branches, in some cases hundreds of miles distant. Some of these groups are of such size as to warrant being organized as branches. Until this is done the Institute cannot serve its members as it should. Additional branches are under consideration at several places, and it is expected that new records will be made by future presidents in the inauguration of new branches. Such additions will not be made because of pride of numbers, but rather for the purpose of having the Institute so organized that it can best serve its members and Canada.

Each year your president is invited to visit each branch of the Institute, each of the Canadian universities which grants engineering degrees, and each of the Canadian schools which gives two or more years of engineering courses. During the past fourteen months your president has had the privilege of accepting all of these invitations.

At the beginning of his term of office your president thought he knew much about the Institute and about the engineers of Canada. He knows a great deal more now. Meeting with the branch executive committees, with the members of thirty-two branches, usually accompanied by their ladies, and with the undergraduates of eleven universities and seven other schools, so broadens one's knowledge of Institute affairs, of the engineers of Canada who are the Institute, and of the engineering undergraduates of Canada who are the future of the Institute, as to make one's previous knowledge of the kind seem infinitesimal. Your president, in most cases accompanied by his wife, who he freely admits is by far the better half of the presidential couple, gratefully acknowledges the education given him at these meetings, and particularly the many outstanding courtesies extended both to his wife and to himself at all times, in all places and in all ways.

Perhaps few future presidents of the Institute will have such a privilege. It is not at all difficult to foresee an Institute with a membership of 25,000 organized in fifty or more branches, to foresee some increase in the number of Canadian universities granting engineering degrees, and to foresee perhaps a substantial increase in the number of engineering schools. It is much more difficult to foresee how a future president can visit all of these during a single term of office unless perhaps your choice of presidents is restricted to retired millionaires.

In anticipation of such a future development your president considered the past year an opportune time to commence sharing these privileges with your six vice-presidents. He asked each of them to visit the branches in his zone at some time during the year other than that of the president's visit. Your vice-presidents have responded admirably to this request. During the past year they have visited most of their branches and much benefit has accrued from these visits. Certain of them have voluntarily gone beyond your President's request and have called upon some or all of the universities and schools in their respective zones. They have been unusually active during the past year. May their good work continue.

As the branches, universities and schools increase in number your vice-presidents may have to take over entirely, certain presidential privileges to the end that your choice of future presidents need not be restricted to retired millionaires. If and when this change occurs, your president's privileges will be curtailed. No president will voluntarily relinquish these privileges, but such relinquishment will be made necessary by limitations of time and distance, and by a growth in the number of privileges beyond the ability of any one man to accept. This will be one of the penalties of increasing size.

Gentlemen, your Institute is in a thriving condition. It is a vital thing, not only in the life of the engineering profession, but in the life of Canada itself. Bear in mind continuously the responsibilities which this places upon us who are the Institute. May these responsibilities increase and may we be ever willing and able to bear them to the increasing credit of the engineering profession.

Locally, the results you secure are an attribute of the branches. Nationally and internationally, they are an attribute of the Institute. The past year has been outstandingly successful because of the activities of the individual members, of the branches, of the Council of the Institute, and of the general secretary of the Institute and his staff. To all of these your president is deeply grateful for making the past presidential year one upon which both you and he may look back with pride.

These remarks include no wit. If they are not ended soon they will lack the merit of brevity. They do record the major highlights of the past year and some forecast of things to come. May your future presidents review their presidential terms with equal pride in and gratitude for the things you have accomplished, and with equal confidence in your future and that of The Engineering Institute of Canada.

From Month To Month

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

International Joint Commission

It will be a matter of general satisfaction throughout the profession to learn of the promotion of General The Honourable A. G. L. McNaughton to the chairmanship of the Canadian section of the International Joint Commission, and the appointment of another engineer to the vacancy caused by the death of the former chairman. The new member is Jean A. L. Dansereau, a consulting engineer practising in Montreal. Mr. Dansereau has been a member of the Institute since 1909.

The provincial professional associations and the Institute have urged for over two years that engineers should be appointed to the Canadian section as has been done by the United States on the American section. It will be a matter of much gratification to them to know that the recent appointments are in full conformity with their proposals.

The government is to be congratulated on the action that has been taken. It is comforting to find in the Cabinet, recognition of the fact that the work of the Commission is largely of an engineering nature and that to obtain the best results the engineers should be on the Commission and not just on technical advisory committees. At last it can be said that engineers are on "*top*" and not just on "*tap*".

The Canadian section is now composed of A. G. L. McNaughton, M.E.I.C., Chairman; George L. Spence, Affil.E.I.C.; and Jean A. L. Dansereau, M.E.I.C. This is a strong group, well able to take care of Canada's interests and in collaboration with the American section to develop international waterways and other matters along efficient and acceptable lines. Between them they have in their hands the distribution of great natural assets of inestimable value to both countries. It is comforting to know that the hands are so competent to deal with the problems.

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

Jean A. L. Dansereau, M.E.I.C.

In referring to the International Joint Commission, a writer in "The Ottawa Morning Citizen" said:

The commission's great responsibility is to maintain goodwill and friendliness between the two nations by handling any cause for friction arising along the international border. Elihu Root, the American secretary of state, negotiated on behalf of his country the treaty in 1909 that established the Joint Commission. A quarter of a century later he wrote that the work of the commission "is a signal illustration of the true way to preserve peace — by disposing of controversies at the beginning before they have ceased to be personal and nations have become excited and resentful about them."

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Britain made treaties for Canada in those days and Lord Bryce, British ambassador in Washington conducted the negotiations with Mr. Root. He viewed the commission as "one of the best things done in our time for peace and goodwill between the British Empire and the United States."

Two world figures were behind the negotiations—Theodore Roosevelt, then President and Sir Wilfrid Laurier, the Prime Minister of Canada. Sir Robert Borden had become Prime Minister when the commission began to function and years later wrote that the commission "gives service not only to two great neighbouring nations but to the world in exemplifying goodwill and friendly endeavour for the cause of public right and peace on earth."

In a recent magazine article entitled "3,000 Miles and Never a Quarrel," Mr. Stanley, veteran head of the American section wrote:

"Today friendliness and harmony between the two great North American neighbours are taken for granted. It is generally assumed to be a natural outgrowth of the similarity of language, customs and laws of the two countries.

"History disproves that assumption. Until 1912, when the International Joint Commission was formed, interminable disputes accompanied every effort to establish the approximately 3,000 miles of boundary extending from Passamaquoddy Bay to the Strait of Juan de Fuca. . . .

"For a century an atmosphere of suspicion pervaded our international relations and literally hung like a Sword of Damocles over our borderland."

With waterways forming so large a part of the border and with so many rivers flowing from one country to the other, during the 38 years the commission has been functioning, it has handled a great number of controversial problems but always with fairness. It has given much advice to the two governments, some of which was acted upon and some ignored.

In cases involving the use or diversion of boundary waters or streams crossing the boundary, the commission has final authority and its orders are binding on the parties concerned. In the case of references submitted to it by either of the national governments, all it can do is to offer advice.

One of the first references to the commission was an inquiry into the pollution of waters in the rivers and lakes of the Great Lakes system. After years of investigation the commission reported the waters of the system were contaminated by raw sewage being dumped into it, particularly in the Detroit and Niagara Rivers. It recommended changes to remedy these conditions and drafted a treaty, but neither the Canadian or American government has acted on it. It did however result in the larger municipalities installing filtration plants and sewage disposal facilities.

The same question in a somewhat different form is again before the commission to investigate water pollution in the St. Mary's, St. Clair, Detroit and Niagara Rivers. It has also been asked to report on atmospheric pollution in the Windsor-Detroit area. It handled a similar problem before the war when the sulphur fumes from the Trail smelter were injuring the lands in the state of Washington.

Civil Defence

Many members of the Institute will recall that in the early days of the Second World War the Institute took a prominent part in the work of civil defence.

This participation took the form of arranging for a series of lectures by Professor Fred Webster who was the foremost expert in that field, and the establishment of a committee under the chairmanship of J. E. Armstrong, which committee did a monumental piece of work for Canada.

The record of these matters indicates that the activities were of considerable value. Under these circumstances it is only natural that within recent times the coordinator of civil defence, Major-General F. F. Worthington, should again consult the Institute.

Some months ago Major-General Worthington held a meeting in his office at Ottawa which was attended by J. E. Armstrong, president of the Institute; Allan C. Ross, president of the Canadian Construction Association and chairman of the Ottawa branch of the Institute; Major-General Guy Turner; and the general secretary. The situation was discussed in a preliminary way and it was agreed that both the Canadian Construction Association and the Engineering Institute were prepared to assist the government in any way they could. From the discussion it became apparent that the first needs were to know where necessary equipment and supplies were located.

This brought the subject directly into the field of the Canadian Construction Association inasmuch as the equipment is almost wholly that used in the various phases of the construction industry as are also the materials.

Recently the C.C.A. has inaugurated plans for carrying out the preliminary part of the work assigned to it. The *Journal* is pleased to reproduce herewith the letter sent to the presidents of all Canadian builders' exchanges and local construction associations which has gone out over the signature of E. E. Crain, chairman of the Civil Defence Liaison Committee of the Association.

Cover Picture

The cover picture this month is composed of a group of photographs taken at the Sixty-Fourth Annual Meeting which was held jointly with the Annual Summer Convention of the American Society of Civil Engineers at the Royal York Hotel, Toronto, July 12 to 14.

For details of the meeting see page 700.

Correction

It has been brought to the editor's attention that the caption for last month's cover picture gave the interrupting capacity of the new Ontario Hydro circuit breakers as "5,000 k.v.a."

This was a typographical error and should have read "5,000,000 k.v.a.".

Dear Sir: July 13, 1950.

Re: Civil Defence

The question of Civil Defence in Canada is still largely in the planning stage. It is obvious, however, that the construction industry must play a leading role in reconstruction work following an attack. As examples, these activities would include debris clearance and demolition work, the restoration of public utilities and lines of communication, assisting in the rescue of victims trapped in basements, etc., and the erection of emergency shelters.

The Canadian Construction Association has long pledged its unrestricted co-operation to the Government on defence matters and the Civil Defence Co-Ordinator, Major-General F. F. Worthington, has appealed to the C.C.A. for assistance in alerting the construction industry for the part it may be called upon to play in the event of emergency.

As a consequence, following consultations with Major-General Worthington, the C.C.A. has established a Civil Defence Liaison Committee, whose members reside in or near Ottawa and whose purpose will be to act as a central advisory body and to continue consultations with the Co-Ordinator of Civil Defence. This central committee will also act as a Liaison between the Co-Ordinator's office and local construction committees to be formed throughout Canada. This will afford a quick channel of communication through which advice and assistance can be volunteered to the Office of Civil Defence, and through which that office in turn can quickly sound out the ability, qualifications and resources of the construction industry for contemplated tasks.

Through this procedure it is believed that the construction industry in each locality can determine, in consultation with civic officials in charge of public utilities, local branches of the Engineering Institute, Red Cross, St. John's Ambulance, etc., the role which the industry can best play in civil defence, the immediate sources of its resources of equipment, technical personnel and manpower, and its relation in the entire picture with the other groups mentioned, with whom it will have to co-operate as a team.

It is felt that local Builders' Exchanges and Construction Associations are the logical bodies to organize the construction phase of local civil defence. Generally speaking, it is recommended that committees be kept reasonably small. The suggested composition of a local construction committee would include a general contractor, two men familiar with the district's (a) power and (b) water services, one road repair man, and possibly one other such as a prominent engineer belonging to the local branch of the Engineering Institute. It is known that the Engineering Institute of

PROGRAMME

for the

MARITIME PROFESSIONAL MEETING

of

THE ENGINEERING INSTITUTE OF CANADA

and

THE ASSOCIATIONS of PROFESSIONAL ENGINEERS

of

NEW BRUNSWICK AND NOVA SCOTIA

The Pines, Digby, N.S., Sept. 6-9, 1950

Wednesday - 2.30 p.m. - 4.30 p.m. — **Registration**

Thursday, September 7th —

8.30 a.m. — **Early Birds Breakfast.**
9.00 a.m. — **Registration.**
10.00 a.m. — **Professional Sessions.**
1.00 p.m. — **Luncheon — Address of Welcome.**
2.45 p.m. — **Sports and Recreation.**
6.30 p.m. — **Cocktail Party.**
7.30 p.m. — **Dinner.**
9.30 p.m. — **Grand Opening Ball.**

Friday, September 8th —

10.00 a.m. — **Professional Sessions.**
1.00 p.m. — **Luncheon.**
2.45 p.m. — **Sports and Recreation.**
6.30 p.m. — **Cocktail Interlude.**
7.30 p.m. — **Engineers Banquet de Luxe.**
9.30 p.m. — **Entertainment.**
12.01 p.m. — **Moonlight Festivities.**

Saturday - 10.00 am. — **Regional Meeting of E.I.C. Council**

For further details please write to:—
M. F. DEAN, M.E.I.C.,
c/o Starr Manufacturing Works, Ltd.,
Dartmouth, N.S.

Canada is anxious to be of whatever assistance it can to the Co-Ordinator of Civil Defence.

It therefore would be greatly appreciated if your group could organize a local construction committee on civil defence in your area in keeping with the above proposals and supply us with the names and addresses of its chairman and members. These lists will in turn be handed over to General Worthington to form a major portion of his paper organization in the larger centres and strategic zones. In this way the industry should be geared to quickly answer any call that may be made upon it to deal with emergencies.

In civil defence matters, the old maxim "to hope for the best but prepare for the worst" is especially true. Recent developments in Korea suggest the urgency of the matter, and also that your local civic authorities may welcome your initiative in taking action to be prepared to co-operate in whatever local civil defence measures may be decided upon. I hope that the above suggestion will commend itself to you and your directors and I look forward to hearing from you in this regard.

News of Other Societies

The Canadian Chamber of Commerce (Board of Trade Buildings, Montreal 1) volunteers information about its annual meeting at Banff, Alta., the week of September 10, 1950.

G. H. Thompson, vice-president of Montreal Engineering Company, was elected president of the **Canadian Electrical Association** at the 60th annual meeting in June. C. I. Bacon, of Cornwall, was chosen vice-president.

The 38th national safety congress and exposition has been arranged by the **National Safety Council** (425 North Michigan Ave., Chicago, Ill.) to take place October 16 to 20, 1950, in Chicago.

Division conferences of the **American Society of Mechanical Engineers,** scheduled for September next, are as follows: Industrial instruments and regulators conference with the Instrument Society of America, Municipal Auditorium, Buffalo, N.Y., September 11-15; petroleum mechanical engineering, Hotel Roosevelt, New Orleans, La., September 25 to 27.

The fall meeting of A.S.M.E. will be at the Hotel Sheraton, Worcester, Mass., Sept. 19-21, 1950.

The 30th annual meeting of the Highway Research Board of the **National Research Council** (2101 Constitution Ave., N.W., Washington 25, D.C.) will be held in Washington, from January 8 to 12, 1951.

A meeting of District No. 2, of the **American Institute of Electrical Engineers** will take place in Baltimore, Md., October 3-5.

The **Societé Française de Microscopie Théorique et Appliquée** announces that an international congress on electronic microscopy will take place in Paris, September 14 to 22, 1950.

Secretariat is at the Laboratoire de Cryptogamie du Museum National d'Histoire Naturelle, 12, rue de Buffon, Paris.

A congress on building research is to be held in London, England, from September 11 to 20, 1951.

Sponsored by British professional institutions and by government departments, the Department of Scientific and Industrial Research is providing the central organization for the Congress.

Information can be obtained from the organizing secretary, Building Research Congress 1951, Building Research Station, Bucknalls Lane, Garston, Watford, Herts, England.

FOR SALE—Gurley transit, six-inch circle, leather covered box. Fine condition, $115.00.

Write H. M. Rowe, M.E.I.C., 114 Daly Bldg., or phone Pl. 9-3090, Ottawa.

Heat Transmission

Postwar heat transfer development will be the theme of an international discussion to be held in London, September 11th to 13th, 1951. Plans for participation by engineers in the Western Hemisphere are being arranged by the Joint Committee on North American Participation, which consists of representatives from The American Mathematical Society, American Institute of Chemical Engineers, the American Chemical Society, The American Society of Refrigerating Engineers, American Society of Heating and Ventilating Engineers, American Society of Mechanical Engineers, American Institute of Physics, American Institute of Mining and Metallurgical Engineers, The American Physical Society, The Society of Automotive Engineers, The Institute of the Aeronautical Sciences, and The Engineering Institute of Canada.

The American Society of Mechanical Engineers is co-ordinating administrative details. Prof. E. A. Allcut, head of the Department of Mechanical Engineering, University of Toronto, will represent the Institute on the joint committee.

Participation by British and European engineers is being co-ordinated by the Institution of Mechanical Engineers with the co-operation of 30 British societies and the engineering and technical societies of Australia, India, New Zealand, South Africa, Belgium, Denmark, France, Holland, Norway, Sweden and Switzerland.

Preliminary plans indicate that the following subjects will be among those discussed: recent information on physical properties of gases and gas mixtures pertinent to their heat transfer characteristics; measurement problems related to heat transfer; mass transfer and heat transfer; heat transfer by sweat and film cooling; condensation at high speed flow; heat transfer to liquid metals; the analogy method for the solution of conduction problems.

Members of the Institute wishing to attend and or participate in this discussion should address communications to the general secretary.

Personals

Notes of the Personal Activities of Members of the Institute

Gen. the Hon. A. G. L. McNaughton, M.E.I.C., has been elected chairman of the International Joint Commission, succeeding the late James A. Glen.

Gen. McNaughton has served on the Commission as a member since last December. He is the former Minister of National Defence of Canada and the former president of the National Research Council, and was a Canadian delegate to the United Nations.

J. Lucien Dansereau, M.E.I.C., Montreal consulting engineer has been appointed a member of the International Joint Commission, to serve with General the Hon. A. G. L. McNaughton and the Hon. George Spence.

Mr. Dansereau was for many years associated with the Federal Department of Public Works and was the district chief engineer at Montreal for the Department from 1915 to 1936. He then went into consulting work in Montreal. He was a member of the board of engineers of the International Joint Commission on the Champlain waterway project and the Montreal and Ship Channel Water Levels Board.

He is a director of several corporations, as well as of the Montreal French-language daily newspapers La Presse and La Patrie.

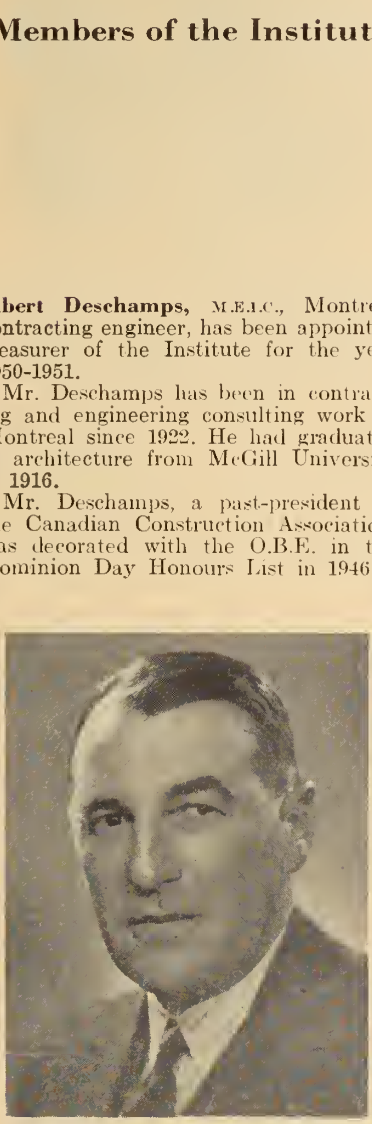
Brigadier J. Bishop, M.E.I.C., was recently promoted from the rank of colonel. He is vice adjutant general in the Department of National Defence at Ottawa.

Brigadier Bishop graduated from University of British Columbia, in 1929 and he was in civilian work until 1939, with Allis-Chalmers Co. Ltd. and with Canadian General Electric. He served overseas in the recent war with the rank of lieutenant-colonel in the 5th Canadian Armoured Division, and with the rank of colonel, as deputy director of mechanical engineering of the First Canadian Corps. In 1945 he was appointed director of mechanical engineering for R.C.E.M.E. at National Defence Headquarters, Ottawa.

Albert Deschamps, M.E.I.C., Montreal contracting engineer, has been appointed treasurer of the Institute for the year 1950-1951.

Mr. Deschamps has been in contracting and engineering consulting work in Montreal since 1922. He had graduated in architecture from McGill University in 1916.

Mr. Deschamps, a past-president of the Canadian Construction Association, was decorated with the O.B.E. in the Dominion Day Honours List in 1946.



Garcia Studio

Albert Deschamps, M.E.I.C.

Dr. Roger Brais, M.E.I.C., has been elected to fellowship in The Chemical Institute of Canada.

Dr. Brais is head of the department of chemical engineering and professor of chemistry at Ecole Polytechnique, Montreal

A. O. Wolff, M.E.I.C., of Toronto, engineer maintenance of way, Eastern Region, Canadian Pacific Railway Company, has retired from the Company, to be succeeded by Mr. G. W. Miller.

Mr. Wolff, joined C.P.R. in 1908 as an instrument man, and he has served the company in Ontario, Quebec and the Maritime Provinces.

When he was divisional engineer of C.P.R. at London, Ont., he served for a year as chairman of the London Branch of the E.I.C. Later, while serving at Saint John, N.B., as district engineer, he represented the Saint John Branch on the Council of the Institute, and he served also as chairman of that branch. He was transferred to Toronto in 1946 by C.P.R.

J. B. Carswell, M.E.I.C., formerly chairman of the Fraser Valley Dyking Board, is chairman of the dyking board recently formed to handle the construction of preventive dykes in the Winnipeg area. Associated with Mr. Carswell on the committee, are: **Victor Michie,** M.E.I.C., of the Department of Public Works, Ottawa, representing the Federal Government; **D. M. Stephens,** M.E.I.C., deputy minister of mines and natural resources, for the Manitoba Government.

The Board is proceeding with the appointment of staff and it will be the duty of the Board to place contracts immediately for the purpose of completing its work during the 1950 building season. The pattern will parallel the construction of the Fraser Valley dyke with Federal and Provincial Governments participating in the costs.

The project will be under the general supervision of the **Right Hon. C. D. Howe,** Hon. M.E.I.C., for the Federal government and of the **Honourable J. R. McDiarmid** for the Provincial Government.

James E. Neilson, M.E.I.C., has been appointed vice-president in charge of engineering for Foster Wheeler Limited.

He graduated from Queen's University in engineering in 1928. Upon graduation he was employed by the Swift Canadian Company, and he went to Riley Engineering and Supply Company later the same year.

In 1934, when Foster Wheeler became Canadian representatives for Riley Stoker Corporation, Mr. Neilson joined Foster Wheeler. He has served the company as sales engineer, district engineer, assistant chief engineer and he now holds the position of chief engineer, steam division.

C. D. Wight, M.E.I.C., recently accepted appointment as a member of the Ontario Municipal Board, of the government of Ontario, in Toronto.

Mr. Wight had been commissioner of works for the city of Ottawa since January 1949.

W. O. Richmond, M.E.I.C., has been appointed to head the mechanical engineering department of University of British Columbia.

Professor Richmond assumed his new duties this summer.

He is a graduate of University of British Columbia, and of the University of Pittsburgh, and has done research in laboratories of Westinghouse Ltd., Pittsburgh; Harvard Engineering School and the Massachusetts Institute of Technology.

In 1937 he came to the University of British Columbia as an associate professor and has combined his educational career with service to industry, working with the Powell River Co. Ltd., the engineering department of Boeing Aircraft Ltd., the War Metals Research Board, and the Consolidated Mining and Smelting Company.

Dr. N. A. D. Parlec, M.E.I.C., was elected councillor of the Chemical Institute of Canada at the Institute's annual meeting in June.

Dr. Parlee, director of research for Dominion Steel and Coal Corporation, Sydney, N.S., is the past-chairman of the Cape Breton Branch of the E.I.C.

D. D. Reeve, M.E.I.C., has resigned from the position of resident engineer with the Abitibi Power and Paper Company Limited, at Fort William, Ont., to join Mr. A. L. Swanson in partnership to conduct a general consulting engineering business in Vancouver. The name of the new organization is Swanson and Reeve, consulting engineers, Vancouver.

Mr. Reeve graduated from the University of British Columbia in 1933, and he worked first for the B.C. Pulp and Paper Co., Port Alice, B.C. He later worked as designer for Quebec North Shore Paper Co. Ltd., in Quebec, and for Bloedel Stewart and Welch, in B.C., as chief draughtsman at Arvida, Que., for Aluminum Co| of Canada, and as assistant chief draughtsman, for Aluminum Company at Montreal. He went to his position as resident engineer for Abitibi Power and Paper Company in 1946.

D. D. Reeve, M.E.I.C.

E. H. Wright, M.E.I.C.

E. H. Wright, M.E.I.C., has been elected chairman of the Edmonton Branch of the Institute.

Mr. Wright, is from the Province of Quebec, a graduate of Queen's University, class of 1935.

He went to Northwestern Utilities Ltd., Edmonton after graduating, working first as assistant combustion engineer and later as an assistant engineer in the engineering department. He is now the general superintendent for the Company, on construction and maintenance of gas pipe lines.

R. E. Kirkpatrick, M.E.I.C.

R. E. Kirkpatrick, M.E.I.C., of Consolidated Paper Corporation Limited, has been elected chairman of the St. Maurice Valley Branch of the Institute.

Mr. Kirkpatrick was born in Montreal and was educated there, graduating from McGill University in mechanical engineering in 1937. Upon graduation he joined Dominion Engineering Company in Lachine later transferring to the B. J. Coghlin Company. He joined the Royal Canadian Artillery and went overseas in 1940 where he served in the field and in various British Ministry of Supply posts, chiefly in connection with rocket design and development, until his discharge in 1946.

After the war, he moved to Grand'-Mère where he has taken an active interest in the St. Maurice Valley Branch, serving as secretary-treasurer in 1947-48 and vice-chairman in 1949-50.

N. B. Eagles, M.E.I.C., newly elected chairman of the Moncton Branch of the Institute, is the assistant city engineer and street commissioner for Moncton, N.B.

Born at Moncton, Mr. Eagles studied at University of New Brunswick, graduating in electrical engineering in 1935.

He received his appointment as assistant city electrical engineer in 1936. He went in 1941 to the Elementary Flying Training School at Chatham, N.B., as engineering instructor, and later to the R.A.F. school at Neepawa, Man., returning to the engineering staff of the City of Moncton in 1945 as assistant city engineer.

G. T. L. Andrews, M.E.I.C., has been elected chairman of the Kingston Branch of the Institute.

Mr. Andrews is a project engineer in the engineering dept., Nylon Plant of Canadian Industries Limited, Kingston.

He is from Winnipeg, a graduate of University of Manitoba, in electrical engineering, class of 1932. He worked in 1934 to 1939 on surveying and mapping for the Oban Salt Co. Ltd., at Oban, Sask., and for the East Crest Holding & Development Co. Ltd., at Calgary, on draughting and construction, and research on sodium sulphate plant operation. He was with Defence Industries Limited in 1941 to 1944 in Montreal and Valleyfield, Que. Engaged in agriculture for a time in 1945, in 1946 he joined C.I.L. at Kingston.

Bernard Beaupre, M.E.I.C., has been appointed head of the newly created smoke control division of the city of Montreal Public Works Department charged with the task of controlling and abating smoke and atmospheric pollution.

Mr. Beaupre is a graduate in engineering of Ecole Polytechnique, Montreal, and received an M.A.Sc. degree in 1943 from University of Toronto, after

E. R. Eaton, M.E.I.C., whose election as councillor for Sudbury Branch E.I.C. was announced in the June *Journ*

postgraduate work in health engineering. He then joined the Division of Industrial Hygiene of the Ministry of Health of Quebec. He joined the engineering division of Montreal in 1949.

G. A. Campbell, M.E.I.C., formerly of Atlas Construction Co. Limited, is now with the Pentagon Construction Co. Ltd., Montreal.

R. A. deVillers, M.E.I.C., who was, in February last, appointed division engineer, Levis Division, C.N.R., Levis, Que., graduated in civil engineering from Ecole Polytechnique, Montreal, in 1942.

After being with the Canadian Marconi Co., Montreal, as a mechanical engineer, he entered C.N.R. service in 1945, as assistant engineer of the Bureau of Research. In 1946 he was appointed assistant engineer, Quebec District, and in 1948, assistant district engineer at Quebec.

He was on military service as lieutenant, ordnance mechanical engineer, R.C.O.C., in 1941 and 1942.

C. I. Johnson, M.E.I.C., is with the Bird Construction Co. Ltd., at Edmonton, Alta.

He was previously with the Quebec North Shore Paper Company at Baie Comeau, Que.

R. W. Wright, M.E.I.C., recently was appointed manager of the Ontario district office in Toronto, for Canadian Allis-Chalmers Limited, to cover sales throughout Ontario. He is the former manager of eastern district sales in Montreal.

Mr. Wright is a graduate in science from Dalhousie University and is a graduate in mechanical engineering from McGill University. He served the company in Ontario, between 1944 and 1948, in sales and service work from Toronto.

James T. Howley, M.E.I.C., is employed by the National Research Council, Chalk River, Ont. He was previously with Canadian Industries Limited, in Montreal.

George Vincent Meagher, M.E.I.C., newly appointed division engineer, special appliances and laundry equipment division, Canadian General Electric Company, Montreal, was previously in general consulting engineering work in Vancouver.

He graduated from the University of Dalhousie in 1940, and from McGill in 1942.

F. C. Read, M.E.I.C., is with Hiram Walker and Sons Limited, Walkerville, Ont. He was previously a chemical engineer with the Atlantic Fisheries Experimental Station at Halifax.

J. D. Robertson, M.E.I.C., is now with the International Petroleum Company Limited, Talara, Peru, South America.

Prior to his recent appointment he was mill electrical engineer for Brown Corporation, La Tuque, Que.

V. M. Wallingford, M.E.I.C., is a project engineer with the Hydro Electric Power Commission of Ontario.

Mr. Wallingford was previously a field engineer for the Anglo-Canadian Pulp and Paper Mills Ltd., at Forestville, Que.

Stanley R. Price, JR.E.I.C., has been appointed assistant city engineer at Belleville, Ont. He was previously assistant engineer with the town of Weston, Ont.

After service in the R.C.A.F. in the recent war, he graduated in civil engineering from Queen's University in 1948.

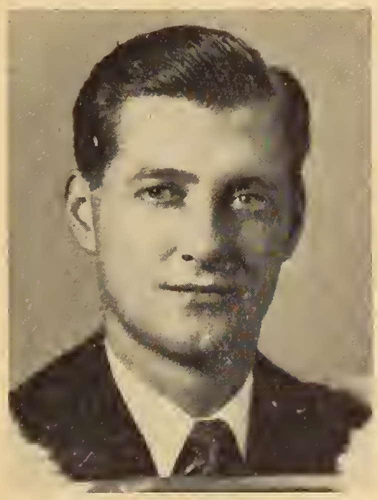
Eric J. Connor, JR.E.I.C., has recently been transferred to Imperial Oil Limited, Redwater, Alberta, in the capacity of drilling engineer. He recently returned to Canada after four years in Colombia, Ecuador, and Peru with the International Petroleum Company. While in South America he served in the positions of mud engineer, drilling engineer, reconditioning engineer, and acting district petroleum engineer. He graduated in chemical engineering from Queen's University in 1944.

Eric J. Connor, Jr.E.I.C.

D. M. McKim, JR.E.I.C., is the chairman of the Shawinigan Falls Junior Section of the St. Maurice Valley Branch of the Institute.

Mr. McKim is a chemical engineer on research for Shawinigan Chemicals Co. He graduated in chemical engineering from McGill University in 1947.

W. M. McLeish, S.E.I.C., was presented with the Phelps Johnson Prize of the Institute at the recent Annual Meeting in Toronto.



W. M. McLeish, S.E.I.C.

Mr. McLeish was born in Montreal. He attended Verdun High School, and graduated from Sir George Williams High School in 1936, enroling in the Evening Division of Sir George Williams College in the same year as a candidate for a B.Sc. degree. He was employed by Canadian Vickers Ltd. (Aircraft) as draughtsman and materials estimator in 1938-40; and joined the British Air Commission in 1940 as an aircraft inspector after passing the Aeronautical Inspection Directorate Course at Toronto. After serving with the R.C.A.F. as a pilot for four years, he was awarded the King's Commendation and was discharged with the rank of flight lieutenant. He entered McGill University in 1945, and graduated in 1950 with the degree of B.Eng. (applied mechanics option). He is a member of the Phi Epsilon Alpha Engineering Society.

Summers of 1946 and 1947 and 1950 have been spent with Canadian Car & Foundry Ltd. (Aircraft Division), as a pilot and in the engineering office; those of 1948 and 1949 with the R.C.A.F. as a technical officer. He has been awarded a fellowship by University of Michigan, Ann Arbor, and will commence studying this fall for a master's degree in aeronautical engineering.

R. W. Esplin, S.E.I.C., is the winner this year of Standard Oil Company's fellowship for research in petroleum engineering.

An honours graduate this year in chemical engineering, at University of British Columbia, this fellowship will enable him to complete his master's degree next year.

He has done summer work for Canadian White Pine, and for B.C. Distillers. For the latter company he is doing control work this summer.

Michael H. Walsh, S.E.I.C., one of this year's graduates from McGill University in civil engineering, has obtained a position with the Ontario Department of Highways, at Brockville.

Richard D. Gillett, S.E.I.C., a 1950 graduate from McGill University in electrical engineering, has joined the Sherbrooke Machineries Limited.

Robert Kovacs, S.E.I.C., has been appointed district sales manager of the new office of Bepco Canada Limited, in Winnipeg, Man.

Mr. Kovacs graduated from McGill University in 1949, after serving in the R.C.A.F. He goes to his new position from Bepco's head office sales and engineering departments in Montreal.

G. T. Christie, S.E.I.C., is with Alpha Manufacturing Company, Winnipeg. He graduated from University of Manitoba in mechanical engineering in 1949.

VISITORS TO HEADQUARTERS

E. G. Percy Weir, Ottawa, Ont.

A. Love, M.E.I.C., Hamilton, Ont., July 4.

W. S. Macnamara, M.E.I.C., Hamilton, Ont., July 4.

G. R. Henderson, M.E.I.C., Sarnia, Ont., July 4.

G. V. Logan, Toronto, July 7.

Hubert R. Crossley, M.E.I.C., Saint John, N.B., July 10.

A. S. Lowe, Ministry of Health, London, England, July 17.

S. Blumenthal, M.E.I.C., Montreal, July 24.

A. J Kerry, M.E.I.C., Woodstock, England, July 25.

Wm. Mitchell, Toronto, July 25.

Charles Camsell, M.E.I.C., Ottawa, Ont., July 28.

Obituaries

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

C. C. Worsfold, M.E.I.C., of New Westminster, B.C., died on May 10, 1950. He had been retired for several years from the Public Works Department of Canada.

Mr. Worsfold was born at Feltham, Middlesex, England, in 1866. He received his engineering education at the Crystal Palace Engineering School, graduating in 1884. He joined Thames Iron Works, Blackwall, England, in the drawing office of the girder department, remaining until 1888. Then, in Canada, he worked a few months in the pattern shop of the Victoria Machinery Depot at Victoria, B.C., after which he joined the Department of Public Works at Victoria. He remained with the Department in British Columbia being appointed in 1920 as district engineer at New Westminster.

Mr. Worsfold joined the Institute in 1893 as a Student, transferring to Associate Member in 1898 and to Member in 1901.

Henry S. Carpenter, M.E.I.C., of Regina, Sask., died on June 12, 1950, after a short illness.

Mr. Carpenter was deputy minister of highways for Saskatchewan for many years, until his retirement in 1939, and he had been in the government service since the formation of the Province in 1905.

He was born in Collingwood, Ont., in 1874, and received elementary and high school education there. He studied at University of Toronto, and graduated in 1898 with the degree of B.A.Sc.

Before joining the provincial service, Mr. Carpenter was employed by the federal Department of Railways and Canals from 1900 to 1905, in exploration work on the Yukon Railway and in construction of the Trent Canal.

Going to Regina that year as district land surveyor and engineer for the Saskatchewan Department of Public Works, he was appointed in 1907 director of surveys, and in 1910 superintendent of highways. He was acting deputy minister of public works and chief engineer in 1911 and 1912. When the highways department was organized in 1913 he returned as superintendent of highways and from 1915 to 1917 he was acting chairman of the board of highway commissioners. In 1917 he was appointed deputy minister of highways. Thus he was the guiding head of the Department from the time it was formed until his retirement.

He was a member of the Dominion Land Surveyors Association, and of the Saskatchewan Land Surveyors Association, of which he was a president. He became an Associate Member of the Engineering Institute in 1904, a Member in 1922, and a Life Member in 1934. He took an active interest in Institute affairs, and represented the Saskatchewan Branch on the Council during the year 1921-22 and 1923. He was elected a vice-president of the Institute in 1937.

H. S. Carpenter, M.E.I.C.

H. G. O'Leary, M.E.I.C.

H. G. O'Leary, M.E.I.C., of Fort William, Ont., and his wife, died in a level crossing accident on June 30, 1950. They had resided in that city for thirty-five years, where Mr. O'Leary was terminal superintendent for the Canadian National Railways until his retirement in 1944.

Mr. O'Leary was born at Lindsay, Ont., in 1881. Graduating from the Lindsay Collegiate Institute, he enrolled at Toronto University in 1900 and graduated in civil engineering with honours.

He worked first on the construction of the Transcontinental Railway, on location in the Gatineau area of Quebec. Then for the Grand Trunk Pacific Railway he was an instrumentman and a resident engineer of the Lake Superior Branch from 1907 to 1909. He returned to the Transcontinental Railway as a division engineer at Cochrane, Ont., for five years, and in 1915 he joined the Canadian Government Railroad at Fort William, in the engineering department. In 1922 the line came into the Canadian National Railway organization and he was successively division engineer at Fort William, and terminal superintendent there for C.N.R.

He was active in city welfare and was a sports enthusiast.

He was chairman and councillor of the Lakehead Branch of the Institute, which he joined in 1906 as a Student. He transferred to Associate Member in 1910 and to Member in 1940. He was a past-president of the Canadian Club, and held offices in several Fort William sporting associations.

John Middleton, M.E.I.C., of Ottawa, Ont., died on May 7th, 1950, following a lengthy illness.

Mr. Middleton was a naval architect with the Department of National Defence, a veteran of World Wars I and II, and former grand superintendent of Ottawa District Royal Arch Masons of Canada, an office which he vacated only a few days before his death.

Born in Bilboa, Spain, in 1891, he was educated in Hull, England, and at the Liverpool Technical College; and he studied naval architecture at the Technical College, Greenock, Scotland. He returned to the Greenock college after service during World War I in Italy, Egypt, France and India. He had received the rank of lieutenant.

While studying he had worked as an apprentice plater on cargo vessels, and as an apprentice draughtsman on battleships and submarines and on completion of his studies he joined Scotts & Co., shipbuilders in Greenock, as a draughtsman.

Coming to Canada, from 1923 to 1926 he was with Dominion Bridge Company, Montreal, as a draughtsman, after which he was chief draughtsman for Southern Shipyard, Newport News, U.S.A., for a year. He was in Montreal again from 1927 to 1936 as draughtsman and estimator for Robert Mitchell Company, and after further service as a draughtsman with Dominion Bridge Company, Canadian Vickers, and Lambert & German, Montreal, he went to Ottawa in 1939. There he joined the Department of National Defence as principal draughtsman in the naval service, and in 1941 was appointed assistant engineer. His work prior to his illness was naval architecture for the Department.

During the recent war he enlisted with the Canadian Navy and served as a constructor lieutenant until the end of hostilities.

Mr. Middleton joined the Institute in 1941 as a Member. He was also an associate member of the Institute of Naval Architects, of London, England.

Leonard H. Birkett, M.E.I.C., well known figure in railway and industrial fields throughout Canada, passed away at his home in Montreal on June 28, 1950.

Mr. Birkett was born in Kingston, Ont., in 1890, was educated in schools in that city, and attended Queen's University there.

He was employed by Canadian Locomotive Company, Limited, in Kingsston, and later joined the mechanical department of the Canadian Pacific Railway Company, to which Company's service he returned after World War I. During the first World War he served as captain in the Royal Canadian Engineers in England and France, and was awarded the Military Cross

In 1921, he entered the employ of the Superheater Company, Limited, Montreal, where up until the time of his death he was sales manager of the Industrial Division of that Company, as as well as general sales manager since 1933 of its associate company, Combustion Engineering Corporation, Limited.

L. H. Birkett, M.E.I.C.

He was a member of the United Services Club, Canadian Railway Club, and a life member of Karnak Temple and a Thirty-second Degree Mason of the Ancient and Accepted Scottish Rite. He joined the Engineering Institute as an Associate Member in 1927, transferring to Member in 1940.

John T. Dohan, Jr.E.I.C., of Westmount, Que., died accidentally on June 4, 1950.

He was born in Montreal in 1925, studied at Newman House School, and Bishops College School, and graduated in civil engineering from McGill University in 1948.

After entering McGill in 1942, he joined the Canadian Army. On his return to University he was appointed a member of the students' executive council, and of the Scarlet Key Society. He was president of the Red and White Society when it was formed in 1945. In addition he was a member of the Delta Kappa Epsilon Fraternity and Phi Epsilon Alpha Society. He was an assistant engineer for Atlas Construction Co. Ltd., Montreal.

He joined the Institute as a Student in 1944, transferring to Junior in 1950.

News of the Branches

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

Lethbridge

D. Cramer, M.E.I.C.
Secretary-Treasurer

J. T. Dokken, Jr.E.I.C.
Branch News Editor

On Saturday, May 27th, sixty members and guests of the Lethbridge Branch travelled to Hungry Horse, Montana to see the Hungry Horse Dam and power plant now under construction on the south fork of the Flathead River.

The dam, being constructed by the U.S. Bureau of Reclamation, will serve three purposes. Primarily, 285,000 kilowatts of generating capacity will be installed at the dam site, as well as increasing substantially the power outputs of dams on the Columbia River with the release in winter of summer run-off storage. The dam will also contribute materially toward controlling costly floods on the Columbia and its tributaries. Preliminary studies also indicate that it may be economically feasible to irrigate approximately 44,000 acres near the city of Kalispell.

The Hungry Horse Dam will be an arch gravity type structure. It will be 2,115 feet long at the crest, 564 feet high, and will be surmounted by a 30 foot wide road. About 2,900,000 cubic yards of concrete will be used in its construction. The structure will be the fourth largest concrete dam in the world.

During construction the river flow is being diverted through a tunnel, 1,180 feet long and 36 feet in diameter, drilled in the right abutment of the dam. The water is excluded from the river by two earth and rock fill cofferdams, constructed across the river upstream and downstream from the damsite.

When the dam is high enough to permit storage of the water, the diversion tunnel will be sealed permanently with a concrete plug. The lower 170 feet of the diversion tunnel will then be lined with concrete to form the outlet to a 45,000 c.f.s. "glory hole" spillway.

The dam will form a reservoir approximately 34 miles long and 3½ miles wide at its widest point. It will have a capacity of 3,500,000 acre feet. Before storage can begin, trees and underbrush must be removed from about 27,000 acres in the reservoir and 50 miles of Forest Service roads relocated.

The concrete is being produced in a 139 feet high concrete mixing plant erected on the canyon wall 300 feet above the river a short distance downstream from the dam. Maximum production capacity is 400 yards per hour. Electrically operated equipment automatically weighs and releases specific quantities of cement, water and aggregates into five 4 yard mixers. Concrete is transported from the mixing plant to the dam in 8 yard bottom dump buckets lowered by 4 steel cableways spanning the river canyon.

The reaction which takes place between water and cement in concrete produces enormous quantities of heat. To prevent structural weaknesses due to cracks resulting from heat expansion and subsequent shrinkage and to permit the final sealing of all joints between blocks before the dam is completed, about 1,000 miles of 1 inch steel tubing is being embedded to circulate cooling water. After cooling is completed and the concrete blocks have shrunk to their final dimensions, grout will be forced through a system of pipes into all the contraction joints, cementing the concrete blocks into a monolithic structure.

To seal joints and cracks in the bed rock, grout is being forced under pressures up to 1,000 p.s.i. into holes drilled into the foundations.

The staff of the U.S. Bureau of Reclamation very courteously and efficiently showed the visitors all the aspects of the construction and the members were very impressed with the hospitality shown by the Chamber of Commerce of the town of Whitefish. The tour was a tremendous success and was thoroughly enjoyed by all.

Members of the Lethbridge Branch gathered at a special dinner meeting on Friday, June 16th, at the Marquis Hotel, on the occasion of President Armstrong's visit to the branch. R. D. Livingstone, retiring chairman presided.

J. M. Campbell, district engineer for the C.P.R. at Lethbridge, capably introduced the president of the Institute, Mr. J. E. Armstrong. Mr. Armstrong thanked the members and officers of the branch for honoring him with the presidency and for their support throughout his term of office. He told of plans for creating greater co-operation between the Council of the Institute and the various branches.

Mr. Armstrong discussed the role of the Institute as a professional body set up to maintain high standards in the engineering profession, to encourage the attainment by its members of that professional consciousness that leads to professional status. The provincial professional organizations of Canada, on the other hand, act as licensing bodies set up to administer the engineering acts in their respective provinces and to assure the public that anyone professing to be an engineer is qualified to act in that capacity.

The president pointed out that the aims of the Institute are to work closely with the provincial organizations, to do all in its power to place young engineers in suitable employment in Canada and to advise Canadian employers of the availability in Canada of competent engineers thus attempting to offset the tendency for hiring foreign engineers for positions which Canadians can hold.

Mr. Armstrong stated that a great many engineers approach membership in the Institute from the viewpoint of "what is there in it for me?" The man of broader vision will see that he will receive in proportion to that which he gives. He also realizes that the engineers in Canada, organized in a single professional body, are a prominent and powerful body from which he cannot afford to remain isolated.

J. Haimes capably moved a vote of thanks to the president for his interesting and encouraging address.

The president met with the branch executive in the morning and discussed matters which would be coming up for the consideration of the membership in the near future. In the afternoon the president and his party visited the St. Mary Dam construction works, a part of the St. Mary-Milk River Irrigation Development, at Spring Coulee, Alberta.

Montreal

The Entertainment Committee is busy arranging a joint golf tournament with the Corporation of Professional Engineers. The tentative date is September 25th. Full particulars will be sent individually to all members.

The first meeting of the autumn season will take the form of a dinner to be held on September 28th. President J. A. Vance is to be the guest speaker. Tickets are available at headquarters or through H. A. Mullins of C-I-L, chairman of the Entertainment Committee, and other members of his Committee. Complete information will be sent by post card.

Next month, all members and juniors will receive a letter from the chairman, together with a memorandum and a questionnaire dealing with the expansion of branch activities. The problems of providing for the technical requirements of an increasing membership have occupied the executive and special committees for nearly two years. As an outcome, the Programme Committee has undertaken to sponsor and guide the formation of specialized sections within the Branch.

All members are urged to study the memorandum and to submit their comments by returning the questionnaire as soon as possible after receipt.

Ottawa

H. E. Treble, M.E.I.C.
Secretary-Treasurer

A. J. Bernard, M.E.I.C.
Branch News Editor

Mr. T. A. Haslett of Imperial Oil Limited was guest speaker at a luncheon meeting of the Ottawa Branch on April 27, 1950. The subject, **The Development of Pipe Line Transportation in Canada,** included an interesting general history of oil production from the discovery of oil in Pennsylvania 60 years ago to modern production methods. Storage and transportation methods have progressed tremendously from the original crude wells and oil storage tubs. As an example of this progress, there are at present 450,000 miles of pipe used to transport crude oils and gasoline in the United States alone.

The potentialities of Canadian oil fields were generally described by the speaker. One billion barrels proven reserve are known to exist in the Leduc oil fields and investigators are optimistic for a four or five billion barrel reserve.

Very satisfactory progress has been made on planning oil lines from the Western fields to the shipping ports and industrial centres on the Great Lakes. A particularly satisfactory phase of this planning has been the acquisition of property for right-of-way.

Mr. Haslett showed two films the first dealing with general construction of oil production equipment and pipe lines; the second, entitled "Mile Below the Wheat", portraying in technicolour, construction in the Leduc oil fields.

Mr. Haslett was introduced by A. A. Swinnerton, past chairman of the Branch, and was thanked by Harold McLeod, chairman of the Ottawa Branch of Canadian Institute of Mining and Metallurgy (C.I.M.M.)

Head table guests were as follows: Allan C. Ross; T. A. Haslett, member pipeline advisers staff, Imperial Oil; Harold McLeod; J. M. Harrison, vice chairman, C.I.M.M.; E. R. Rose, Sec. C.I.M.M.; Douglas Piper, government liaison officer for Imperial Oil; Capt. G. R. Smith, army adviser on petroleum products; C. S. Parsons, chief of the Mines Branch; G. C. Monture, chief, Mineral Resources Division, C.I.M.M.; J. L. Shearer, past chairman; A. A. Swinnerton; Max Narraway, Sec. Junior Section; J. A. Higgins, former chief engineer in Peru of Standard Oil Co.

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On May 13th members of the Ottawa Branches of the C.I.M.M., A.I.E.E., and the E.I.C., participated in a field trip to hydro power development sites.

The first site visited was the Chenaux power development on the Ottawa River. This 160,000-hp. development is well under way with two of eight units expected to be in operation in December, 1950. This is a low head (40-ft.) propeller type unit installation. The tour included the inspection of dams, spillways, coffer-dams and powerhouse units.

An excellent lunch was provided through the courtesy of the Ontario Hydro Electric Power Commission in the construction camp cafeteria.

The group next visited the Stewartville plant on the Madawaska River. Members were conducted in groups through this modern, recently completed

Golf Tournament

Members Corporation of Professional Engineers of Quebec and the Engineering Institute of Canada—Montreal Branch.

Place:	Islesmere Golf & Country Club Inc., St. Dorothee, Que.
Date:	Monday, 25th September—starting time 1 to 3 p.m.
Fees:	Golf game—$2.50 per person payable at starting tee.
	Dinner—7 p.m. $3.00 per person
	Tickets obtainable from the following: Mr. Leopold Nadeau, Corporation of Professional Engineers PL. 9486 Miss Kane, Engineering Institute of Canada PL. 5078 Mr. H. A. Mullins, BElair 1531—Local 274
	Dinner tickets must be purchased not later than 18th September.
Arrangements:	Persons planning to attend are requested to contact Mr. Nadeau or Mr. Mullins as soon as possible.

All members of the Corporation of Professional Engineers and the Engineering Institute of Canada are cordially invited.

development. The installation has three high head Francis type wheels.

A very complete and enjoyable day resulted from the excellent arrangements made by the Management Committee and by Mr. A. M. Pederson, eastern region representative of the H.E.P.C. Representatives of the Pentagon Construction Company, general contractors for the Chenaux plant, helped to make the tour both interesting and instructive.

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Ottawa members were fortunate in having Mr. S. W. Fairweather, vice-president, Research and Development, Canadian National Railways, as guest speaker at a regular luncheon meeting, on May 25.

The subject, **New Developments in Transportation** was presented in a very interesting manner. Mr. Fairweather is particularly well qualified to speak on the economics of railway transportation. While this talk covered principally developments in railway transportation, sufficient information was given to make comparison with other means of transportation.

The largest single item of railway expense is fuel for locomotives. This item alone for the Canadian National Railways amounts to about 70 million dollars per year or about 15 per cent of operating costs. This includes costs of handling and disposal of ash. With increased coal costs it has been necessary to carry on intensive research into the design of locomotives to increase efficiency. Both coal and oil burning types are being studied.

Comparative costs were discussed for conventional coal-fired steam locomotives, oil-fired steam, diesel electric, oil-fired gas turbine, coal-fired gas turbine and a hypothetical steam locomotive for main line traffic in Canada. On the surface, costs would indicate that the coal-fired gas turbine is far more economical than other types, but the speaker was emphatic in the warning that many factors enter into the economy of any radical changes from existing equipment.

Initial costs of new designs of locomotives are very high and a degree of uncertainty as regards the future, particularly as it effects fuel costs, depreciation, or obsolescence, indicates that caution is necessary.

Mr. Fairweather concluded by stating that pressure is now upon Canada to continue furnishing the lowest cost land transportation in the Western Hemisphere—the lowest, in fact, in comparison with any country which approximates our standard of living. This is important as Canada uses more transportation per capita than any other country in the world.

Mr. John Watt, chairman of the Junior Section of the Branch, thanked the speaker. Lt.-Col. M. C. Sutherland Brown who had presided over the meeting. Head table guests were: J. M. Wardle, director of Special Projects, Department of Resources and Development; G. C. McRostie, past chairman, Junior Section; A. A. Swinnerton, councillor elect; Col. D. F. Purves, director of army budget and former member of Department of Research and Development, C.N.R.; J. H. Irvine, commissioner of works of Ottawa, immediate past councillor; J. C. Lessard, deputy minister of transport; S. W. Fairweather; Lt.-Col. M. C. Sutherland Brown, acting chairman; The Honourable Lionel Chevrier, minister of transport; John Watt; J. L. Shearer, councillor; H. E. Treble, secretary-treasurer, Ottawa Branch; Maj.-Gen. G. R. Turner, councillor; Dr. J. J. Green, past chairman Aeronautical Section and member of management and proceedings committee; Norman Marr, chief, Water Resources, Division of Resources and Development and a past chairman and councillor.

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On June 7, 1950, a group of Ottawa members gathered to bid farewell to Harold Treble, the branch secretary, and to welcome W. R. Meredith as new branch secretary.

All members expressed regret at the departure of Mr. Treble, who has been a very active member of the Ottawa Branch for a number of years, and the secretary-treasurer for the past year. However, all felt that Mr. Treble's new position with the Welland Canal Division of the Department of Transport at St. Catherines, will place him near the field work which has been his ambition.

William R. (Bill) Meredith the new secretary-treasurer, an Ottawa patent attorney, was welcomed by all, and full confidence is placed in his ability to carry on the good work which Harold Treble so ably performed.

Peterborough

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

J. C. Allan, m.e.i.c.
Branch News Editor

The Peterborough Branch held a meeting in Belleville on June 1st, to give the engineers in and near Belleville an opportunity to consider the formation of a new local branch. Chairman J. M. King outlined the advantages to be gained. He introduced Messrs. Dobbin, Pope and Sills who had assisted Messrs. Garnet, Holden and Buchan, of Belleville, to organize the meeting. Mr. King later introduced Col. Grant, field secretary for the E.I.C.

Mr. Garnet introduced Dr. O. Holden, assistant general manager of engineering for the Hydro Electric Power Commission of Ontario. Dr. Holden outlined the history of the Ottawa River from the glacial period up to the present time and mentioned the different power sites which had been developed along the length of the river. He then showed a number of slides illustrating the Des Joachims Development, and described the procedure for unwatering the site by means of frames and shutters, the equipment employed, and the surrounding country. Dr. Holden was thanked for his excellent address by Mr. R. Dobbin.

Mr. King asked Col. Grant to speak on behalf of the E.I.C. Headquarters, and Col Grant thanked Dr. Holden and the Peterborough Branch for this opportunity to do so. He mentioned the need for new branches, three of which had been formed last year, bringing the total for the Dominion to thirty-two. Referring to other technical bodies, he pointed out that the E.I.C. was the only all-Canadian, all-professional society in the Dominion. Concerning the provincial associations, conditions about 1918 necessitated the protection of the public from the practice of unqualified men; this was found to be a provincial affair, hence the provincial associations were formed. Alternatively the E.I.C. was able to do things outside the scope of the provincial associations. The branches of the E.I.C. were able to influence local affairs and several instances were given of the advantages to engineers of this action. It was the hope that dual membership of both organizations by all engineers would eventually exist.

Mr. King then threw the meeting open to the Belleville group for a discussion of the formation of a Belleville Branch. Col. Grant was asked to give the qualifications for membership of the E.I.C. and Mr. King commented on the working of a branch and the steps necessary for its formation; he suggested that a Committee be formed for this purpose.

It was moved by Mr. C. H. Smith and seconded by Mr. R. Davey (both of Belleville) that a Committee of three be formed to request ten members to forward a petition to Headquarters E.I.C. for the formation of a branch. An amendment by Mr. Bradford seconded by Mr. S. Sillitoe moved that the committee to be formed should first ascertain the number of those wishing to support the formation of a branch. This amendment was satisfied by a show of hands, which showed that over thirty of those present wished to do so. Elected to the Committee were Mr. E. G. Gurnett, Mr. S. Sillitoe, and Mr. G. A. Bradford.

Mr. Buchan then thanked the Peterborough Branch for their initiative and work in organizing the meeting.

Saguenay

F. E. Hogg, m.e.i.c.
Secretary-Treasurer

Activities of the Saguenay Branch for the 1949-50 season have been completed and a ballot has been taken for the election of a new executive.

The executive having authorized the organization of a party, on April 22nd an evening of cocktails, dancing and refreshments at the Saguenay Inn, was enjoyed by members and their ladies. A great many members proposed that this should be an annual event. A committee composed of Messrs. G. T. Malby, F. H. Duffy, and F. E. Hogg made the arrangements for this very successful event.

Two field trips were carried out in the month of May. At 2 p.m. on the 20th a group of 35 engineers gathered at the Simonds (Canada) Abrasive Co. Ltd. W. J. Thomson, m.e.i.c., explained briefly the process of converting bauxite into grinding abrasives. The party was then shown charge preparation, furnace operation and recovery of the fused aluminous material. The presentation of descriptive literature and of souvenirs made from aluminum oxide abrasive grain for sharpening small tools, completed the tour.

A group of members visited the Shipshaw Power Plant in May through the courtesy of A. C. Johnston, m.e.i.c. The complete tour included examination of forebay and head works and a trip by elevator and tunnel paralleling the course of the water to the 12 turbines. The members examined the large diameter shaft connecting a giant turbine to a generator and examined also the auxiliary services and equipment. This was an instructive and interesting field trip.

PRELIMINARY NOTICE

of Applications for Admission and for Transfer

August 20th, 1950

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

BOND—RAYMOND ARTHUR W., of Montreal, Que. Born at Swindon, Eng., July 3, 1922. Educ.: B.Sc. (Eng.), London Univ., 1949; dftsman., jr. estimator, taking off and working up quantities, Tydeman Bros. & Sons, Ltd., Swindon, Eng.; 1940-45, R.A.F.; 1945-46, estimator, engr., Tydeman Bros. & Sons; 1949 to date, engr., Foundation Co. of Canada Ltd., Montreal (Health Centre, Rosemount).

References: R. F. Shaw, J. F. Benjafield, W. Griesbach, P. Hall, J. B. Stirling.

CONNELLY—WILLIAM ARGYLE, of Dundas, Ont. Born at Ottawa, Jan. 27, 1920. Educ.: B.Eng. (Mech.), McGill, 1949; 1943-45, R.C.N.V.R. as Warrant Officer; R.C.A.F. Transport Command, dftsman.—fitting of communication equipt. in aircraft; Dept. of Transport, Radio Divn., Aviation Section; 1946, 1947 & 1948 (summers), linesman, genl. constrn., pole inspection & treatment in field, genl. office training of routine duties in an engrg. capacity, Bell Telephone Co. of Canada; with Canadian Westinghouse Company, 1949 (1 mo.), engrg. sales, apparatus divn., Montreal (4 mos.), testing, inspecting, tool design, etc., air brake divn., Hamilton, Sept. 1949 to date, resistance welding engr., solving electronics & mech. problems, research & develop't. lab.

References: A. A. Moline, R. Thomasson, H. E. Tovee, H. A. Cooch, E. M. Coles, J. T. Thwaites, L. C. Sentence, J. A. Loy, J. C. Buchanan.

HEWITSON—LIONEL GEORGE, of Des Moines, Iowa. Born at Hawkesbury, Ont., Nov. 5, 1926. Educ.: B.Eng. (Mech.), Clarkson College of Technology, Potsdam, N.Y. 1949 (Acc.ECPD); 1944 (summer), rigger helper, Defence Industries Ltd.; with Courtaulds Canada, 1945, 1946 & 1947 (summers), helper, fitters, electricians & lead burners, engrg. divn., 1948 (8 mos.), jr. engr.; 1949 to date, asst. supt., water filtration plant, R. V. Leary Construction Co., Des Moines, Iowa.

References: G. G. M. Eastwood.

HICKEY—WINSTON EDWARD, of Toronto, Ont. Born at Alma, N.B., June 6, 1912. Educ.: B.Eng. (Civil), N.S.T.C., 1933; R.P.E., Ontario; instru'man., N.B. Dept. of Highways—1936 & 1937 (summers) and 1938-40; H.E.P.C. of Ontario, as follows: 1940-42, jr. engr., 1942, design engr.; 1942-45, R.C.E.; 1946, design engr., H.E.P.C. of Ontario; with Foundation Co. of Canada, Ontario, as follows: 1946-48, structl. engr. 1948-49, asst. to engrg. dept. head, 1949 to date, district engr.

References: M. C. Hendry, S. Bowen, W. G. Reekie, W. Griesbach, R. F. Shaw, W. M. Walkinshaw.

HOPPER—DAVID ALAN, of Montreal, Que. Born at Carberry, Man., July 20, 1917. Educ.: B.A.Sc., (Chem.), 1942; M.A.Sc., 1945, British Columbia; 1942-44, dftsman., process engr., Imperial Oil Limited; with McColl-Frontenac Oil as follows: 1945-46, dftsman. and engr., 1946-47, refinery process engr., Montreal, 1947-49, refinery process engr., Toronto, 1949 to date, power engr., Montreal East works.

References: J. E. Oles, T. T. Anderson, E. H. Brooke, I. D. MacKenzie, J. A. Alexander.

KINNEY—JAMES B., of West Hill, Ont. Born at Syracuse, N.Y., March 16, 1897. Educ.: Civil Engr., Syracuse Univ., 1919 (Acc. ECPD); R.P.E., Ontario; 1919-20, St. Lawrence Transmission Co., Potsdam, N.Y.; 1920-32, Wallace & Tiernan Co., Inc., Newark, N.J.; 1932 to date, manager and director, Wallace & Tiernan Ltd., Toronto, Ont.

References: R. L. Dobbin, A. E. Berry, I. P. Macnab, J. F. MacLaren, C. E. Carson.

LEA—NORMAN DALE, of Montreal, Que. Born at Toronto, Sept. 20, 1923. Educ.: B.A.Sc., (Civil), Toronto, 1945; M.Sc., Harvard, 1950; 1942 (summer), timekeeper, supt., McNamara Construction; 1943, (summer), jr. engr., i/c part., Dept. Mines & Resources; McNamara Constrn., 1944 (summer), grade foreman, 1945-46, res. engr. i/c testing of asphalt paving materials; with Foundation Co. of Canada, as follows: 1946-47, field engr., Ontario, 1947-48, field engr., Ontario. 1948 to date, structl. design, soil mechanics and foundations, Montreal (1949-50—graduate student Soil Mechanics at Harvard).

References: G. G. Leroux, P. Hall, D. Murphy, R. F. Shaw, W. Griesbach.

MANNING—RALPH EDWARD, of Toronto, Ont. Born at Youngstown, Ohio, March 25, 1926. Educ.: B.A.Sc., (Civil), Toronto, 1948; R.P.E., Ontario; 1944 and 1945 (summers), dftsman., checker, surveying, Redfern Construction Co.; 1945 and 1946 (summers), dftng., Housing Enterprises; with Truscon Steel Co., Toronto, as follows: 1946 and 1947, (summers), dftng., 1948 to date, dftng., designing and estimating.

References: F. P. Flett, D. Beam, C. F. Morrison, D. D. Whitson.

MITCHEL—GLEN HENRY, of Dorval, Que. Born at Los Angeles, Cal., April 23, 1926. Educ.: B.Sc. (Elect.), California Institute of Technology, 1948 (Acc.ECPD); 1946-47, Construction Officer, supervised constrn. open-wire telephone lines, North. Italy; 1948-50, engr., i/c develop't. work, Western Precipitation Corp.; 1950 to date, sales engr., Precipitation Co. of Canada, Montreal.

References: A. B. McEwen, I. R. Tait, L. A. Wright, W. D. Laird.

PANABAKER—DAVID DEANE, of Hamilton, Ont. Born at Detroit, Mich., April 15, 1909. Educ.: B.A.Sc., Toronto, 1933; R.P.E., Ontario; M., A.S.M.E.; 1927-28, lab. asst., Turnbull Elevator Co., Ltd.; 1929-32, shop, production control, constrn., Otis Elevator Co. Limited; 1933-37, product design, industrial engrg., C. Richardson & Co., St. Mary's, Ont.; 1937-40, sales engr., Otis Elevator Co. Limited; 1940-45, asst. prof., mech. engrg., Univ. of Toronto; 1945-47, sr. engr., Stevenson & Kellogg, Limited; with Otis Elevator Co., Ltd., as follows: 1947-49, standards engr., 1949 to date, admin. asst. to president.

References: W. J. W. Reid, E. G. Wyckoff, E. A. Allcut, G. R. Lord, C. R. Young, H. E. Steventon.

PARKINSON—JOHN, of Toronto, Ont. Born at West Cowich, Eng., Oct. 10, 1922. Diploma Aero. Engrg., Loughborough College,

(Continued on page 730)

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, or chemist required for chemical plant in Ontario. Applicant should have some experience in analytical chemistry, or training for testing oil emulsions or synthetic resins. Salary according to qualifications. Apply to File No. 1516-V.

CHEMICAL ENGINEER required in Montreal to act as project engineer. Applicant should have a minimum of 3 to 5 years experience in installation work and plant engineering, involving estimating layout, process equipment design, requisitioning and job cost control. Apply to File No. 1530-V.

CIVIL

CIVIL ENGINEER with about 5 years experience in concrete building design, detailing and estimating of reinforcing bars. Location Western Canada. Applicant would be obliged to take control of this department. Salary would be commensurate with experience offered. Apply to File No. 1517-V.

McGill University

REQUIRES

Graduate Mechanical Engineers for Sessional appointment as Instructors and Demonstrators for 7 months from 1st October 1950 in THE DEPARTMENT OF MECHANICAL ENGINEERING. Apply to File No. 1529-V giving qualifications and salary required.

ELECTRICAL

ELECTRICAL ENGINEER with approximately 10 years experience in industrial electrical maintenance and design to act as electrical superintendent in large pulp and paper mills, located in Ottawa Valley. Reply stating age, qualifications and experience to File No. 1504-V.

GRADUATE ELECTRICAL ENGINEER with at least 10 years experience in distribution field work and planning. Applicant would design, make economy studies of distribution extensions and reconstruction of the system in Brazil. Age 35-45 years. Apply to File No. 1525-V.

ELECTRICAL ENGINEER required in the Maritimes to take charge of the electrical maintenance and construction. Mill is completely electrified and power generated by means of a steam turbo generator. Apply to File No. 1526-V.

MECHANICAL

CHIEF MECHANICAL ENGINEER with extensive design and applications, required to supervise an engineering department for design and development of hoisting machinery and construction equipment, pumps, transmission equipment and general engineering products; develop product applications with customers. Applicants with Canadian experience and associates in this field preferred. Apply to File No. 1508-V.

MECHANICAL ENGINEER required in Montreal by large firm. Applicant should have about 4 or 5 years pulp and paper experience, preferably in the actual making of paper. Apply to File No. 1512-V.

MECHANICAL ENGINEER, recent graduate, required by large paper industry in Ontario, to work in the industrial engineering department. Applicant would be obliged to complete a 3 months training period in time and motion study, work simplification, scheduling, routing production control, synthesis, etc. Applicant should also be preferably bilingual. Apply to File No. 1513-V.

YOUNG MECHANICAL ENGINEER required by firm located in Montreal for their Ontario branch. Applicant should have 2 or 3 years experience in project work and plant maintenance. Apply to File No. 1515-V.

TWO MECHANICAL DRAUGHTSMEN required by firm located in Ontario. Applicants should be familiar with the design of jigs, fixtures, dies, etc., also the design of special purpose tools for use in mass or multiple production. A knowledge of hydraulics would be advantageous. Apply to File No. 1521-V.

MECHANICAL ENGINEER required by large mining company to act as plant engineer located in Ontario. Applicant should have at least 10 years experience. Reply giving full details of previous experience and salary desired to File No. 1522-V.

YOUNG MECHANICAL ENGINEER required by firm located in Montreal. Duties include field work and estimates of heating equipment. Future prospects excellent. Apply to File No. 1524-V.

McGILL UNIVERSITY requires graduate mechanical engineers for sessional appointment as instructors and demonstrators for 7 months from 1st October, 1950, in the department of mechanical engineering. Apply to File No. 1529-V giving all qualifications and salary required.

MISCELLANEOUS

A CHIEF for the department of resources and development at Ottawa. Details and application forms at Civil Service Commission Offices, National Employment Service Office and Post Office. Salary $5,700.00 to $6,300.00. Apply to File No. 1505-V.

SENIOR DESIGN ENGINEER required in Ottawa, with a degree in mechanical or chemical engineering. Applicant should have a minimum of 5 years experience in mechanical design particularly with reference to chemical plant equipment and process. Apply to File No. 1507-V.

A CITY ENGINEER is required in Southern Alberta, applicants to state age, marital status, technical education, submitting detailed statements of experience, salary expected and photo. The applicant must be a registered professional engineer of Alberta. Apply to File No. 1509-V.

ASSISTANT to the city manager required in Southern Alberta. Applicant should state age, marital status, technical education, salary expected and submit a photo. Preference will be given to an electrical or mechanical engineer. Apply to File No. 1509-V.

ENGINEER PREFERABLY MECHANICAL, with production and erection experience on hydraulic turbines. This is an important position and one that involves responsibility for supervision and erection of equipment at site. Person selected will spend some time at plant in Toronto. Reply giving full details of experience, age, salary, etc., and enclose photo. Apply to File No. 1511-V.

CIVIL AND MECHANICAL ENGINEERS, required by pulp and paper mill in Ontario. Applicants should be experienced in pulp and paper industry. Salaries open. Apply to File No. 1514-V.

STRUCTURAL STEEL DETAILERS and checkers required in Vancouver, B.C., by large steel fabricating firm. Must be experienced. Salaries open. Apply to File No. 1518-V.

SALES ENGINEER required, recent graduate in electrical engineering, for Province of Quebec. Applicant should have definite sales aptitude and be able to converse in French. Car provided. Short training period in plant located in Ontario. Apply to File No. 1519-V.

CANADIAN SUBSIDIARY of a world renowned British engineering company located in Toronto, requires engineer to prepare quotations. Eventual prospects unlimited. Wide engineering knowledge and experience in filtration, fan engineering, compressors, prime movers, etc., an asset. Write giving fullest details, salary required, when available, and if car owner. Apply to File No. 1520-V.

JUNIOR SALES ENGINEER required for Toronto office of large electrical manufacturing company. Products range from generation equipment to domestic appliances. Candidates must be able to prepare own schemes and quotations and generally deal with technical correspondence. Apply to File No. 1523-V.

A CANADIAN UNIVERSITY wishes to receive applications from engineering graduates preferably civil, mechanical or electrical, under thirty years of age to teach engineering problems and drawings. Applications should be sent to File No. 1527-V, Engineering Institute of Canada and should give applicants age, university and experience. The salary offered is $1,500.00 to $2,000.00 for the session depending on qualifications.

PROVINCE OF ALBERTA requires the services of a director of town and rural planning, commencing October 1, 1950. Duties include administrative and advisory work, supervision and direction of technical and clerical staff of the Provincial planning branch, supervision of technical staff of the Edmonton district planning commission, to serve with the Provincial parks board as member or consultant. University graduate in architecture or civil engineering with under-graduate or graduate specialization in urban and/or regional planning. Age 45 years maximum. Salary $4,260.00 to $5,000.00 per annum plus cost of living bonus. Apply to File No. 1528-V.

PRESSURE VESSEL, safety and fire protection engineer required in Montreal. Electrical or mechanical engineer with experience in electrical engineering. Recent graduate or up to 3 years plant experience. Knowledge or special training in pressure vessel inspection, safety engineering in fire protection an asset. Apply to File No. 1530-V.

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

CIVIL

YOUNG CIVIL ENGINEER required in Ontario, preferably one who has had some experience in the construction of sewers and waterworks. Excellent opportunity offered. Apply to File No. 1461-V.

UNIVERSITY INSTRUCTORS WANTED

A Canadian university wishes to receive applications from engineering graduates, preferably civil, mechanical or electrical, under thirty years of age, to teach engineering problems and drawing. Applications should be sent to File No. 1527-V, Engineering Institute of Canada and should give applicant's age, university and experience. The salary offered is $1,500-$2,000 for the session depending on qualifications.

GRADUATE CIVIL ENGINEER required in Ontario, preferably with experience in reinforced concrete and structural design. If possible paper mill experience or experience with a consulting engineering firm. Applicant must be single. Salary $300.00 to $350.00 depending on qualifications and experience. Apply to File No. 1474-V.

CIVIL ENGINEER required in Montreal, with about 8 years experience in construction, to act as assistant in ordering material, scheduling job and general supervisory duties. Permanent position offered. Applicant should be preferably bilingual. Apply to File No. 1491-V.

ELECTRICAL

GRADUATE ELECTRICAL ENGINEER required in Ontario for design and development of instrument transformers and watthour meters. Two or more years experience necessary. If satisfactory position is permanent with future prospects excellent. Apply to File No. 1388-V.

ELECTRICAL ENGINEER, required in Montreal capable of making surveys of complete electrical installations in existing plants, recommending improvements, of designing, ordering and preparing drawings for complete electrical installations in new plants. Applicant would be the electrical engineer for company and its subsidiaries. Salary open. Apply to File No. 1458-V.

APPLICATIONS FOR AN ELECTRICAL ENGINEER, as assistant general manager for a public utilities commission in a city of 20,000 population in Western Ontario, will be received with references and salary expected. Apply to File No. 1472-V.

ENGINEER WANTED. Experienced man who has an established connection with architects and engineers to promote the sale of a line of well known building materials. Must have the ability to act in an advisory capacity to the contract department of the company. The successful applicant will be associated with a company producing in Canada materials that have heretofore been available in limited supply. Replies held in strictest confidence. Apply to File No. 1473-V.

ELECTRICAL ENGINEER required in Province of Quebec with a minimum of 4 or 5 years experience in supervising an electricians crew in an industrial plant. Applicant must have a proven record of success in industrial electrical maintenance. Salary open. Preference will be given to a man with pulp and paper experience. Apply to File No. 1497-V.

GRADUATE ELECTRICAL ENGINEER, required by firm located in Ontario. Applicant must be capable of both sales and development work. Development work would involve the preparation of schematic and actual wiring diagrams and field service work. Apply to File No. 1500-V.

MECHANICAL

MECHANICAL ENGINEER required in Ontario with sales ability and experience by manufacturer of air conditioning and ventilating equipment. Apply to File No. 1470-V.

MECHANICAL ENGINEER required in Montreal by steel fabricating plant for shop supervision and sales. Salary $300.00 to $400.00. Apply to File No. 1478-V.

THREE MECHANICAL ENGINEERS required with a minimum of one years experience in the petroleum, heavy chemical, or pulp and paper industry, by chemical company located in Ontario. Apply to File No. 1481-V.

TWO YOUNG MECHANICAL ENGINEERS required by a steel company in Montreal, to work in production department. Salary open. Applicants should have 1 or 2 years experience. Apply to File No. 1487-V.

MECHANICAL ENGINEER not over 45 years of age for sulphite mill in Lake St. John district. One with paper mill experience preferred. Apply to File No. 1496-V.

METALLURGICAL

LARGE PROGRESSIVE ENGINEERING COMPANY located in Toronto requires a metallurgist to take over the supervision and direction of the metallurgical department. Must have 5-10 years practical experience in all phases of metallurgical analysis. Apply to File No. 1484-V.

MISCELLANEOUS

PATENT ATTORNEY, preferably graduate in electrical or engineering physics, capable of preparing and prosecuting electrical and mechanical patent applications, for patent law firm located in Toronto. Applicant should furnish full particulars of qualifications and experience to File No. 1400-V.

LONG ESTABLISHED Canadian Manufacturer offers an attractive opportunity to an experienced sales engineer. Equipment handled, overhead cranes and allied equipment. State experience in full, first letter. Apply to File No. 1448-V.

TECHNICAL SALES REPRESENTATIVE, for the Province of Quebec. Applicant should be conversant with foundry practice, or have sufficient metallurgical knowledge to act as a service representative for the sale of chemical compounds and coatings to foundries. Salary open. Apply to File No. 1452-V.

SALES ENGINEER, for a permanent position in Toronto office. Preferably one who has had some experience in fan application work such as heating and ventilating, mechanical draughting, etc. Salary open. Apply to File No. 1453-V.

SALES ENGINEER, required in Montreal for the sale of construction material. Applicant must be bilingual. Car necessary. Apply to File No. 1454-V.

ENGINEER preferably mechanical, required by a large industrial plant in Montreal for plant layout and development work. Salary open. Apply to File No. 1462-V.

ASSOCIATE PROFESSOR OF CIVIL ENGINEERING or assistant professor of civil engineering required in the Maritimes. Duties involve responsibility for instruction in applied mechanics and associated subjects, including laboratory instruction, investigation and research. Applicant preferred with post graduate training, practical experience and teaching experience. Apply to File No. 1467-V.

ENGINEERS required by French manufacturer of refractory materials to act as sole agents or representatives in every country for the distribution of its products. Full range of refractory concretes, grouts and coatings, delivered in dry state, air setting or heat setting, for every use up to 2000° C. (3630° F.). Apply to File No. 1469-V.

PLANT ENGINEER required by paper industry located in Province of Quebec. Applicant must have some experience in plant maintenance and be preferably bilingual. Apply to File No. 1476-V.

TOOL ENGINEER, required for supervisory position in large automotive plant. Mechanical preferred. Age 30-45, with 10 years practical experience in machine tool, gauge and die design and automotive body assembly methods. Must have general knowledge of motion study, processing and cost estimating, pattern making and foundry practice, welding, inspection, and tool room methods. Man required with reorganizing ability, good judgment and proven supervisory qualities. Apply to File No. 1482-V.

POWER ENGINEER, (Mechanical preferred) required for large oil refinery in Montreal. Age 35 or over. About 10 years experience in the design, construction, operation and maintenance of both steam generating and electric power plants and distribution systems. Applicant must have to a high degree, qualities of initiative and co-operation. Salary open. Submit qualifications with recent photo. Apply to File No. 1485-V.

MECHANICAL OR ELECTRICAL ENGINEER required by large food industry in Montreal. Duties include project work in connection with plants. Applicant should have 2 or 3 years experience. Salary open. Apply to File No. 1489-V.

EXPERIENCED CONSTRUCTION ENGINEER, 45 to 50 years of age, capable of handling district supervisory responsibilities and contacts. Excellent opportunity for the right man. Our organization is aware of this advertisement. Apply to File No. 1492-V.

ENGINEER REQUIRED, by large machinery sales organization, with about 10 years experience in the operation of a large production plant using various machine tools and possessing good knowledge of design. Duties include in-

The Public Service of Canada

REQUIRES

AN ENGINEER (Electrical and Power)

AND

AN ENGINEER (Construction Design)

Up to $5,700

for the Department of National Defence, R.C.A.F., at Ottawa

Details and application forms at Civil Service Commission Offices, National Employment Service Offices and Post Offices.

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spection of various machine tool agencies, directing machine tool sales under supervision and travelling with other sales engineers on the sale and application of machine tools, attachments and machine shop supplies. Apply to File No. 1494-V.

GRADUATE MECHANICAL OR CHEMICAL ENGINEER, up to 35 years of age, for well established company handling widely known automatic control equipment, valves, gauges, etc., for the process industries and steam plants. Ontario only, working out of Toronto. Instrumentation experience in sales or plant necessary. Excellent prospects. Apply to File No. 1495-V.

FULLY EXPERIENCED STRUCTURAL ENGINEER required by firm in Western Canada. Applicant must have experience on bridge work or reinforced concrete. Apply to File No. 1499-V.

EXPERIENCED DESIGN ENGINEER required by a large Western Canadian steel fabricating shop. Must be experienced in design of boiler and pressure vessels, material handling equipment, structural steel. Apply to File No. 1502-V.

PROFESSOR sought by Electrical Department of a Canadian University, for class room and laboratory assignments in Electronics and general electrical engineering. Requirements are practical experience in research and design in the Electronics field and aptitudes for teaching. Preference will be given to bilingual candidates. Attractive salary and working conditions. Apply to File No. 1503-V.

Situations Wanted

MECHANICAL ENGINEER, M.E.I.C., P.Eng. Established in Vancouver as consultant and mechanical designer of wide experience desires work on plant layout, machinery design, quantity surveying, preparation of complete industrial plans, reports, etc. Apply to File No. 304-W.

CHEMICAL ENGINEERING GRADUATE, S.E.I.C., Jr.C.I.C., B.E. (Chem.) N.S. Tech. '49, age 24, single. Experience: summer work in aluminum, petroleum, rubber and steel industries; 1 year in pulp and paper industry. Desires permanent position and will consider any reasonable offer, either sales where background can be used to best advantage Available immediately. Prefer to locate in Eastern Canada or U.S. Apply to File No. 775-W.

MECHANICAL ENGINEER, P.Eng. of Ontario, M.E.I.C., M.A.S.M.E., age 39. Graduate from Queen's University B.Sc. (mechanical) 1934; Rensselaer Polytechnic Institute M.M.E. (Hydraulics) 1936; Ten years experience with general contractor estimating, field work and supervision. Three years paper mill experience. Engineer officer during world war II with R.C.N.V.R. Some experience in concrete, steel and timber design. Presently employed but desires position with consulting engineer preferably in hydraulic or reinforced concrete design. Also interested in city engineering. Available on a month's notice. Apply to File No. 1898-W.

HEATING AND VENTILATING engineer, P.Eng., M.E.I.C. Many years experience in heating, ventilating and plumbing design. Available this fall for short term employment or consultation. Location preferred. Eastern Ontario. Apply to File No. 2091-W.

CIVIL ENGINEER, M.E.I.C., B.A., B.Sc., McGill 1940, P.Eng., veteran R.C.E., bilingual, age 35, married. Experience in municipal engineering and building construction, specializing in reinforced concrete design. Has worked for consulting engineer and contractor. Desires work in Montreal or Quebec district with some degree of permanency. Available immediately. Apply to File No. 2140-W.

ELECTRICAL ENGINEER, Jr.E.I.C., 1944, Queens. Age 37. Experience in radio and electronics. Seeks part time employment to work independently or with a small industrial firm located in Province of Quebec. Apply to File No. 2635-W.

GRADUATE CIVIL ENGINEER wants change. Preference with consultant or inspection engineers. Presently working as construction superintendent on small jobs. Available immediately. Apply to File No. 3182-W.

CHEMICAL ENGINEER, S.E.I.C., Laval 1949, B.A.Sc., P.Eng., age 24, single, bilingual. Experienced in wood cutting operations, galvanizing mill, coal carbonization and by-products, refining and hydrogenation of oils, various chemical process, sewage disposal. Desirous of obtaining a position with a consulting firm dealing with the process industries, installation of heating ventilating and air conditioning systems, etc. Would also consider seriously an engineering position with medium or small manufacturing plants. Available shortly. Apply to File No. 3183-W.

MECHANICAL ENGINEER, Jr.E.I.C., Sask. '45, married, desires position in Western Canada. Experience includes four years plant engineering for large manufacturer of building products in Ontario. Interested in mechanical design, layout and field supervision. Will visit Calgary area in July, invites personal interviews. Apply to File No. 3261-W.

ELECTRICAL ENGINEER, S.E.I.C., graduate from the University of Alberta in May 1950, desires permanent employment preferably in Western Canada. Veteran, married, age 30, excellent health. Experience includes 4 years as electrician in the services and 4 years in construction work. Interested in power field, production, sales or construction engineering. Apply to File No. 3262-W.

ELECTRICAL ENGINEER, S.E.I.C. Recent graduate desires permanent employment. Veteran, married, approximately 7 years experience in radio and electrical servicing. Five years radar experience. Interested in production or sales engineering. Location not important. Apply to File No. 3263-W.

CIVIL ENGINEER, S.E.I.C., recent graduate, University of Toronto 1950. Age 22, single. Desires permanent position with good future prospects, preferably in industry or construction. Experience includes three summers with Department of Highways Ontario. Willing to travel or work anywhere. Best references. Apply to File No. 3264-W.

ELECTRICAL ENGINEERING GRADUATE. University of Alberta, 1950, S.E.I.C., A.I.E.E., desires position in power field. Experience in electrical wiring and power plant installation. Four years R.C.N.V.R. Age 30, married. No location preference. Apply to File No. 3265-W.

CIVIL ENGINEER, S.E.I.C., 1950 University of New Brunswick. Age 27, single, R.C.A.F., veteran, bilingual. One summer as instrument man for the department of roads and streets, Edmundston, New Brunswick. One summer as chief of survey party, Department of Transport (Air Services) Moncton, N.B. Interested in gaining experience in steel and concrete construction, will work anywhere in Canada. Apply to File No. 3268-W.

MECHANICAL ENGINEER (Sask. 1948) Jr.E.I.C., age 26, married, family one. Experienced in plant layout and design, mechanical design and plant maintenance. Desires position with responsibility and opportunity for advancement with manufacturing firm preferably in Ontario. Apply to File No. 3269-W.

ENGINEER AND ADMINISTRATIVE MANAGER. Professional Engineer, Ontario and Quebec, M.E.I.C., A.S.M.E., C.I.C., etc. Age 36, wide experience and connections. Executive ability in advertising, sales and technical fields. Available on reasonable notice. Consider association with metal manufacturing or associated industries in administrative or liaison capacity. Location Ontario, preferably in a small town. Apply to File No. 3273-W.

ELECTRICAL ENGINEER, S.E.I.C., A.I.E.E., B.Sc., Alberta, 1950. Age 27, married, one child. Experience, engine room and electrical artificer courses (R.C.N.V.R.). Summer work with the electricity and gas meter inspection department (Dominion Gov't.) as a student assistant (7 months). Desires position with a future depending on ability. Apply to File No. 3274-W.

GRADUATE ENGINEER, S.E.I.C., B.Sc., Alberta 1949, age 28, married veteran, mine surveyor (Alberta). Experienced in underground and surface surveying, underground and open pit mining, road construction and maintenance. Desires position with responsibility, preferably in city. Apply to File No. 3275-W.

ELECTRICAL ENGINEER, S.E.I.C., B.S.A. Laval 1950, P.Eng. Age. 23, bilingual, single. Summer experience: 3 army base workshops RCEME for maintenance, repair, testing electrical and mechanical equipment. Interested in maintenance, sales, manufacturing, design, heating, lighting, ventilating, refrigeration, power field, electrical distribution, available 1 week notice. Apply to File No. 3276-W.

CHEMICAL ENGINEER, B.Sc. 1950. S.C.I.C., S.E.I.C. Age 25, single, bilingual. Interested in production and sales. Available immediately. No location preference. Apply to File No. 3280-W.

CIVIL ENGINEER, B.E., S.E.I.C. Graduated from Nova Scotia Technical College May 11, 1950; Age 33; Married: four years surveying experience with the Government of St. Lucia, B.W.I. as a licensed land surveyor, experience in all types of surveying, land, road, airfield, swamps, sub-divisions, land reclamation etc. Three summers with town planner and surveyor in Halifax, one summer with N.S. Tech. in campus layout for buildings, road and sewer line installation. A good knowledge of French. Apply to File No. 3288-W.

MECHANICAL ENGINEER, A.S.M.E. fifteen years experience, desires employment on part or full time basis, on improving plant layout stressing handling and flow of material, and/or equipment development design. Apply to File No. 3295-W.

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PUBLIC SERVICE OF ALBERTA

The Department of Public Works, Province of Alberta, requires the services of a Director of Town and Rural Planning, commencing October 1st, 1950

Duties: **Administrative and advisory work; supervision and direction of technical and clerical staff of the Provincial Planning Branch; supervision of technical staff of the Edmonton District Planning Commission; to serve with the Provincial Parks Board as member or consultant.**

Qualifications: **University graduation in architecture or civil engineering with under-graduate or graduate specialization in urban and/or regional planning. At least four years experience in a responsible technical and/or administrative capacity under a public planning authority.**

Age Limit: **Forty-five (45) years maximum upon appointment.**

Salary: **$4,260-$5,100 per annum plus cost of living bonus. Starting salary will be within this range according to qualifications.**

Application forms and further particulars may be had from the Director of Personnel, Parliament Building, Edmonton, Alberta.

CHEMICAL ENGINEER, M.E.I.C., P.Eng., (Alberta). B.Sc. Alberta '46. Age 34, married. Pregraduation experience covers; teaching school, 3 summers surveying and draughting, one summer in hard rock mining and metal processing. Since graduating, 4 years as assistant manager in an industrial plant in complete charge of production and plant maintenance. Good knowledge of electrical equipment, plant layout and design, and processing; some experience in steam generation and power. Desires permanent employment with reliable firm preferably in the west. Available on reasonable notice. Apply to File No. 3297-W.

CHARTERED ELECTRICAL ENGINEER, B.Sc. (Engineering) at University of London (1936), A.M.I.E.E., age 35, married. Has wide experience of E.H.T. switchgear research with foremost Empire manufacturers (3 years), steam power plant operation as junior shift engineer (1 year), and generation, transmission and distribution of power in rapidly expanding urban and rural area as technical assistant (9 years). Duties included installation, commissioning and maintenance of equipment for 110 KV and lower voltages, E.H.T. operational and standby duties, specification and design of E.H.T. substations and equipment. Desires similar employment. Immediately available. Apply to File No. 3298-W.

GRADUATE IN ELECTRICAL ENGINEERING, University of Saskatchewan, May 1950. Married, age 26. 3 years service in the R.C.A.F., as a navigator. Experience includes 2 summers of general city surveying in connection with construction, and draughting of completed work. 1 summer survey work on placing and construction of irrigation canals. Approximately 1 year as electrician's helper. 8 months as a machinist's apprentice. Would like to obtain work giving experience in power line apparatus and switchgear with the eventual goal being either production supervision or sales engineering. Apply to File No. 3301-W.

CHEMICAL ENGINEER, S.E.I.C. (Alberta '49). At present employed in Southern Ontario. Desires position in Western Canada. Two years experience in chemical plant operations. Available for personal interview in early August. Apply to File No. 3303-W.

METALLURGICAL ENGINEER, M.E.I.C., P.Eng. of Ontario. McGill '39. Age 32. Married. 4 years steel mill production and sales. Four years Canadian Army Overseas (R.C.E.M.E.) 2½ years sales engineer non-ferrous alloys. Sound business background. Interested in broadening experience in metallurgy and business administration. Preferably permanent position with large, well-established organization. Available on reasonable notice to present employer. Apply to File No. 3308-W.

CHEMICAL ENGINEER, Jr.E.I.C., P.Eng., Queen's 1944, age 30, single. Experienced in technical and control work in pulp, fine and coated paper manufacture, and in synthetic fibre field. Specialized training in statistical quality control, work simplification, human relations in management. Some experience as production foreman and in conference leading and public speaking. Seeking broader experience and more congenial job relations. Willing to undertake any work for which experience and training would qualify. Present salary over $4,000.00 per year. Apply to File No. 3314-W.

CIVIL ENGINEER desires part time employment, evenings and week-ends. Design, detailing and draughting in reinforced concrete and steel. Apply to File No. 3315-W.

CIVIL ENGINEER, S.E.I.C. Fluent French and English, desires part time employment, evenings and Saturdays. Surveying, draughting, estimating etc. Apply to File No. 3317-W.

ELECTRICAL ENGINEER, S.E.I.C., graduated from U.N.B., May 1950, desires permanent employment. Veteran, single, age 25. Three years experience as wireless mechanic, R.C.A.F.; summer experience in dielectric heating as applied to the wood working industry, Forest Products Laboratory of Canada, Ottawa. Interested in employment in electronics field, will also consider power or appliance production. Location in Eastern Canada preferred. Available on three weeks notice. Apply to File No. 3318-W.

CHARTERED MECHANICAL ENGINEER, A.M.I.Mech. E., seeks position of interest. Monetary considerations of first importance. Wide, varied experience covering mining and steelworks, aeronautical research, design of logging, pulp and paper mill machinery. Five years in British Civil Service. Excellent references. Apply to File No. 3319-W.

ELECTRICAL ENGINEER, M.E.I.C. graduated 1942, age 37, married, no children, 3 years experience in erection of industrial plants and 8 years in design and construction of transformer substations and switchgears in Canada and Europe. Desires position with responsibility in electrical power field. Available in one month notice. Location no object. Apply to File No. 3321-W.

ELECTRICAL ENGINEER, Laval '49, experienced in sales, draughting, repair of motors, wiring of ships, electrical and mechanical design of electric motors; desires a position, preferably in sales. Apply to File No. 3323-W.

Design Engineer and Draughtsman

Engineering Department of two-machine newsprint mill requires the services of a design engineer and draughtsman.

The applicant should be between thirty and forty years of age, hold a degree in Mechanical Engineering from a recognized Canadian University and have at least ten years experience in design work. Paper mill experience is not absolutely essential, but would be desirable. This is a permanent position.

In reply, send complete details, references and recent photograph. Sample drawings will be requested at a later date. Mill located in the Maritimes. Apply to File No. 1533-V.

Attention, Members

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

This will result in a better service to everyone concerned.

TELEPHONE PLATEAU 5078

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

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BOOK REVIEW

WELD DESIGN

Harry D. Churchill and John B. Austin New York, Prentice-Hall, Inc., 1949. 216 pp. incl. 16 pp. appendices, bibl., 8 pp. and index 6 pp. 5¼ x 8¼ in., cloth, price $6.65.

This book is of primary interest to designers of machine bases and machine frames, but its approach is not confined to these limits, and the side range of possibilities for welding which it will suggest to the reader makes the book of considerable interest to engineers designing any type of metal structure.

The basic data on stress analysis and design and the various useful materials and their properties is outlined in the first three chapters and in Appendix I, forty-two pages being devoted to the ground-work. Chapter four begins the treatment of actual welding design (21) covering the relatively simple applications of welding to the design of machine bases, and chapter five a more advanced treatment of complex machine bases, machine frames and related structures which may be fabricated by welding. The photographs and drawings are good throughout the book.

In chapter six, the author reviews concisely welding specifications and symbols, and chapters seven to nine deal with the operative side of the subject — weldery procedure, welding processes, flame cutting and flame hardening. Closely related is chapter ten on metal forming. This section gives the designer ample knowledge of fabrication to enable him to determine the practical advantages and disadvantages, and the amount of labour involved in whatever form of fabrication he may specify.

Estimating of costs is discussed in chapter eleven. It is shown that the weldment designer should not only be cost-conscious in the sense of ensuring that his welded structure compares favourably with equivalent structures otherwise produced, but also that the given design be as economical as possible. How costs are computed is clearly shown, with a practical example as worked out by a United States company, starting with the design drawing of a structure with the specified welding thereon followed by tables of the bill of material, the estimate of weld-rod and flame-cutting costs and the final estimate.

There are two appendices, the first setting out stress-design data and the second a bibliography listing periodicals and tests for further reference.

As to the authors, Mr. Churchill is professor of engineering mechanics at Case Institute of Technology, and Mr. Austin is welding engineer at Republic School Iron Works. This book was recommended for publication by the jury of award on the textbook award programme of the James F. Lincoln Arc Welding Foundation.

W. R. Meredith, M.E.I.C.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Calcul d'Heaviside: Exposé Elémentaire et Applications à l'Electrotechnique, 3rd ed.:
T. H. Turney. Paris, Dunod, 1950. 140 pp., illus., paper.

Canadian sales and Excise Tax Guide:
Montreal, CCH Canadian Ltd., 1950. 194 pp., paper.

Design of Direct Current Machines:
L. Greenwood. London, Macdonald, 1949. 222 pp., illus., cloth.

Dictionary of Electronic Terms:
Chicago, Allied Radio Corporation, 1950. 61 pp., illus., paper.

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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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Books, periodicals, photostats, translations, etc., may be borrowed for 2 weeks, or purchased by any member of the Institute, resident in Canada.

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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.

Estimating Manual for Heating and Piping Systems with Tables of Time Periods for Various Job operations:

Harry A. Erickson. New York, Plumbing and Heating Journal, 1949. 112 pp., cloth.

Frictional Phenomena:

Andrew Gemant. Brooklyn, Chemical Publishing Co., 1950. 497 pp., illus., cloth.

Handbook of Aerial Mapping and Photogrammetry:

Lyle G. Trorey. Cambridge, University Press, 1950. 178 pp., illus., cloth.

Hydrology, the Fundamental Basis of Hydraulic Engineering, 2nd ed.:

Daniel W. Mead. New York, McGraw-Hill, 1950. 728 pp., illus., cloth.

Industrial Electrochemistry, 3rd ed.:

C. L. Mantell. New York, McGraw-Hill, 1950. 781 pp., illus., cloth.

Industrial Organization and Management, 2nd ed.:

Lawrence L. Bethel. New York, McGraw-Hill, 1950. 851 pp., illus., cloth.

L'industrie du gaz d'éclairage:

Causse, Leon Paris. Armand Colin, 1950. 193p. illus. paper.

Information Film:

Gloria Waldron. New York, Columbia University Press, 1949. 281 pp., illus., cloth.

Introduction to the Transfer of Heat and Mass:

E. R. Eckert. New York, McGraw-Hill, 1950. 284 pp., illus., cloth.

Plasticity of Crystals with Special Reference to Metals:

E. Schmid and W. Boas. London, F. A. Hughes, 1950. 353 pp., illus., cloth.

Steam Turbines and their Cycles:

J. Kenneth Salisbury. New York, Wiley, c1950. 645 pp., illus., cloth.

Welding Design and Processes:

B. Richard Hilton. London, Chapman, 1950. 342 pp., illus., cloth.

PAMPHLETS, ETC.

Civil Engineering as a Career:

Institution of Civil Engineers. London, The Institution, 1946.

Effective Teaching: A Manual for Engineering Instructors:

Fred C. Morris. New York, McGraw-Hill, 1950.

Four Basic Documents about UNESCO:

Paris, UNESCO, 1947.

Piston Rings and Their Relation to Diesel Engine Efficiency:

Chicago, Cooktite Ring Sales Co., 1950.

St. Lawrence Seaway Project: a Brief Historical Background:

C. Frank Keyser. Washington, Library of Congress, 1947.

Semi-Conducteurs Electroniques et Complexes Dérivés:

Stanislas Teszner. Paris, Gauthier-Villars, 1950.

TECHNICAL BULLETINS, ETC.

American Petroleum Institute. Paper:

Factors Affecting the Precision of Viscosity Measurements with the Torsion Crystal, P. E. Rouse and others.

American Welding Society. Recommended practices:

No. C1. 1-50 — Resistance Welding. No. D8. 3-50T — Salvaging Automotive Gray Iron Castings by Welding.

British Standards Institution. Standards:

No. 482:1950 — Wrought Iron and Mild Steel Hooks.

Central Mortgage and Housing Corporation:

Housing Progress Abroad. A. Quarterly Review.

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

No. 1233 — The Behaviour of Nickel-Chromium Alloys in Carbon-Bearing Gases in the Range 900° - 1000° C, D. M. Dovey and I. Jenkins. No. 1234 — A Method for Assessing the Relative Corrosion Behaviour of Different Sea-Waters, T. Howard Rogers. No. 1235 — Static Models of Dislocations, B. A. Bilby. No. 1236 — Note on the Use of Electropolishing in the Metallographic Study of Plastic Deformation, G. R. Wilms. No. 1237 — The Structure of Eutectics, E. C. Ellwood and K. Q. Bagley. No. 1238 — A Preliminary Study of the Solidification of Castings, R. W. Ruddle. No. 1239 — Correlation of Tensile Properties of Aluminum Alloy Plate Castings with Temperature Gradients During Solidification, R. W. Ruddle. No. 1240 — Use of Diamond Dust for Polishing Metallographic Specimens of Non-Ferrous Metals and Alloys, E. C. W. Perryman. No. 1241 — Atomic Displacement Associated with Elasticity in Plastically Deformed Metals, W. A. Wood and N. Dewsnap. No. 1242 — Modification in Aluminium-Silicon Alloys, B. M. Thall and Bruce Chalmers. No. 1243 — Presidential Address, H. S. Tasker. No. 1244 — The Mechanical Properties of Some Wrought and Cast Aluminium Alloys at Elevated Temperatures, P. L. Thorpe and others. No. 1245 — The Calculation of the Activation Energies of Recovery and Recrystallization from Measurements on Copper, N. Thorley. No. 1246 — The Constitution of Magnesium-Rich Alloys of Magnesium and Zirconium, G. A. Mellor. No. 1247 — The Effect of Applied Load in Micro-Indentation Tests, W. Rostoker.

Institution of Electrical Engineers. Papers:

No. 918 — Fifty Years' Development in Telephone and Telegraph Transmission in Relation to the Work of Heaviside, W. G. Radley. No. 924 — A Million-Volt Resonant-Cavity X-Ray Tube, B. Y. Mills. No. 949 — An Appreciation of Heaviside's Contribution to Electromagnetic Theory, Willis Jackson. No. 958 — Heaviside's Operational Calculus, Balth, Van der Pol. No. 977 — Some Unpublished Notes of Oliver Heaviside, H. J. Josephs. No. 993 — Oliver Heaviside — The Man, Sir George Lee.

Institution of Mechanical Engineers. Papers:

Automobile Test Rig, L. H. Dawtrey. Caustic Cracking: Stress-Corrosion Tests in Sodium Hydroxyde Solutions at Elevated Temperatures, C. D. Weir. Dust Deposition from Chimney Stacks, C. H. Bosanquet and others. Education and Training in Engineering Management. Liquid Methane as a Motor Fuel, M. Pearce. Mechanical Engineering in the Midlands, 1925-1950, F. Vincent Everard. The Effect of Tapered Treads on the Motion of Overhead Travelling Cranes, E. L. Diamond and A. M. Frankau. The Practical Application of Frequency Response Analysis to Automatic Process Control, C. I. Rutherford.

Ohio State University. Engineering Experiment Station. Circular:

No. 51 — Holdings in the A. F. Davis Welding Library.
No. 50 — Review of the Estonian Oil Shale Industry, With a Brief Account of Oil Shale Development in the United States, Peter O. Krumin.

Toronto University. School of Engineering Research. Technical Memoranda:

No. 1 — Producer Gas for Motor Transport, E. A. Allcut. No. 2 — New Methods for the Production of Magnesium, L. M. Pidgeon. No. 3 — A Fuel Policy for Canada. E. A. Allcut. No. 4 — The Smoke Problem, E. A. Allcut.

U.S. Department of The Interior. Bureau of Mines. Bulletin:

No. 481 — Safety in the Mining Industry, D. Harrington and others.

U.S. Department of the Interior. Geological Survey. Belletin:

No. 948-E — Preliminary Report on Corundum Deposits in the Buck Creek Peridotite Clay County, North Carolina. No. 955-C — Phosphate Deposits of the Deer Creek-Wells Canyon Area Caribou County, Idaho. No. 966-D — Geophysical Abstracts 139 October — December 1949. (Numbers 11442-11678). No. 968 — Bibliography of North American Geology 1948.

...Professional Papers:

No. 216 — Structural Geology of the Hawthorne and Tonopah Quadrangles, Nevada. No. 219 — Geology and Ore Deposits of the La Plata District Colorado. No. 227 — Pegmatite Investigations in Colorado Wyoming, and Utah 1942-1944.

...Water Supply Papers:

No. 968-D — Ground-Water Exploration in the Natchitoches Area, Louisiana. No. 1078 — Ground-Water Supplies of the Ypsilanti Area, Michigan. No. 1079-A — Ground-Water Resources of Liberty County, Texas; with a Section on "Stream Runoff". No. 1079-B — Ground-Water Resources of Gregg County, Texas; with a Section on "Stream Runoff". No. 1083 — Surface Water Supply of the United States 1947; Part 3. Ohio River Basin. No. 1084 — Surface Water Supply of the United States 1947; Part 4. St. Lawrence River Basin. No. 1088 — Surface Water Supply of the United States 1947; Part 8. Western Gulf of Mexico Basins. No. 1091 — Surface Water Supply of the United States 1947; Part 11. Pacific Slope Basins in California. No. 1099 — Water Levels and Artesian Pressure in Observation Wells in the United States in 1947; Part 4. South-Central States. No. 1103 — Use of Water by Bottom-Land Vegetation in Lower Safford Valley, Arizona. No. 1105 — Hydrology of Massachusetts; Part 1. Summary of Stream Flow and Precipitation Records.

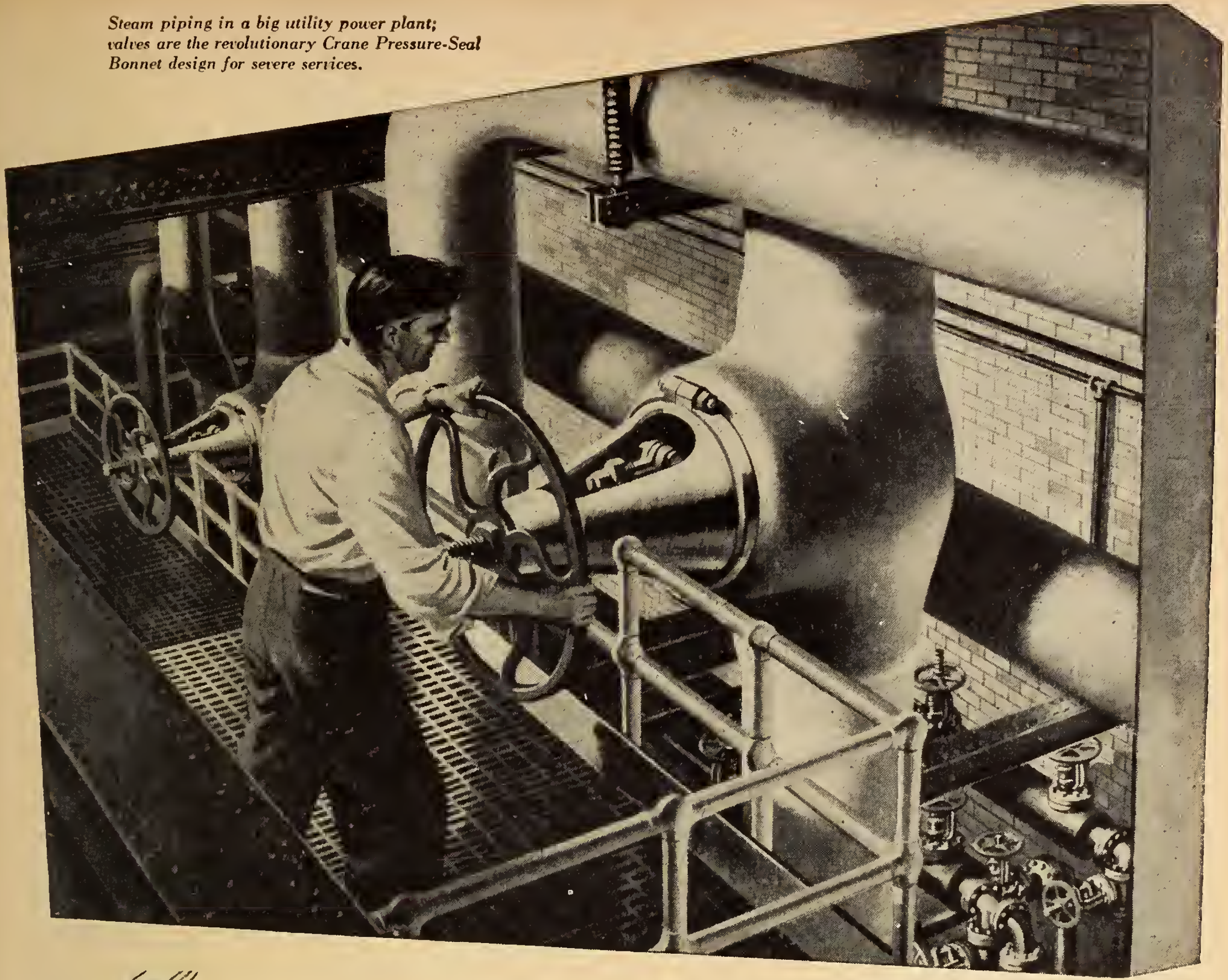
U. S. Highway Research Board. Research Reports:

No. 10-D — Load Carrying Capacity of Roads as Affected by Frost Action.

Winnipeg Hydro. Around the Hydro Circuit:

Red River Flood Edition, May 1950.

Steam piping in a big utility power plant; valves are the revolutionary Crane Pressure-Seal Bonnet design for severe services.



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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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ELECTRICAL YEARBOOK, 1950:

Emmott, London, 1950. 360 pp., illus., cloth. 3/–.

"Electrical Yearbook" covers a wide field of equipment and application and provides useful information for all connected in any way with the subject. The various processes and the features of the plant and material used in arc welding, including automatic operation, are treated, as also are resistance welding, spot welders and their timing devices, and stitch, projection, seam and butt welding.

INDUSTRIAL CHEMISTRY OF THE FATS AND WAXES, 3rd ed.:

T. P. Hilditch. London, Bailliere, Tindall and Cox, 1949. 604 pp., cloth. $5.25.

The objectives of the present volume has been to afford an introduction to the chemical technology involved, to survey the outlets for fats and waxes with due regard to perspective, and to emphasize the connection between the chemical constitution of the raw material and the particular economic application in view. Whilst the author has perhaps had largely in mind the needs of the student who proposes to become engaged in fat technology, the book is intended equally for reference by others already familiar with one or other of the industries discussed.

PHENOMENA, ATOMS AND MOLECULES; AN ATTEMPT TO INTERPRET PHENOMENA IN TERMS OF MECHANISMS OR ATOMIC AND MOLECULAR INTERACTIONS:

Irving Langmuir. New York, Philosophical Library, c1950. 436 pp., illus., cloth. $10.00.

Irving Langmuir, winner of the Nobel Chemistry Award in 1932 for his work in surface chemistry, has set down his thoughts, observations and conclusions in this, his first book. The present work is an attempt to interpret phenomena in terms of mechanisms or atomic and molecular interactions. The first three chapters are devoted to general commentaries on science, science legislation, and world control of atomic energy. The remaining fifteen chapters are technical and deal with the constitution, distribution, orientation, dissociation, forces, condensation, etc. in some types of molecules.

PRACTICAL REPORT WRITING:

Selby S. Santmyers. Scranton, International Textbook Co., c1950. 118 pp., illus., cloth. $2.75.

In this book, the emphasis is on the preparing, planning and designing that lead to making an outline for the smooth running of ideas during the writing of the report. Part one deals with the background needed by the writers, the gathering and organizing of material, and with the writing of the first rough draft. Part two includes means for making the report serve the purpose for which it was designed in the outline.

PRACTICAL SPECTROSCOPY:

C. Candler. London, Hilger & Watts, 1949. 190 pp., illus., cloth. 21s.

This is a course of instruction in all branches of Practical Spectroscopy. The subject matter has been written primarily round the Hilger Barfit Wavelength Spectrometer, although other apparatus is also covered. Each chapter contains sufficient theory to render the experiments given at the close of the chapter intelligible and interesting to the student. This book will also be of interest as a general introductory text for those who do not possess or have access to the actual instruments described.

RADIO OPERATOR'S LICENCE Q & A MANUAL:

Milton Kaufman. New York, Kaufman, c1949. 608 pp., illus., cloth. $6.00.

This book is based upon the latest Study Guide and other FCC releases. It incorporates "Discussion" sections for most of the questions, in order to present much important background material. Each question is divided into two separate sections: a short, but complete answer, and a discussion. A complete section of the book is devoted to the Amateur Radio License questions and answers, and rules and regulations. Amateurs will benefit additionally by cross references made to answers and discussions in the Commercial License section.

THIN FILMS AND SURFACES:

Winifred Lewis. Brooklyn, Chemical Publishing Co., 1950. 120 pp., illus., cloth. $4.75.

This book is a critical survey of the results of research on thin metallic films and surfaces with special reference to aluminum. The various aspects of the structure of metal surfaces, surface films and thin films, the production of thin metallic films, the mechanical, optical, magnetic, electrical and chemical properties of thin films and surfaces are treated at length. Two chapters are devoted to the behaviour of aluminum and its alloys in thin films and surfaces and to the various applications of aluminuim films.

WELDING HANDBOOK, 3rd ed.:

New York, American Welding Society, 1950. 1651 pp., cloth. $12.00.

This third edition of the Welding Handbook is the first revision since 1942, and the changes in arrangement are based on suggestions from users over this twelve year period.

This 1950 edition arranges the individual chapters in groups, and thereunder by processes, materials and applications. The same arrangement is followed in each chapter, which makes for considerable speed and easy reference.

Page format has been changed to a double column arrangement in an effort to keep the volume from being too unwieldy. Cross references are made from one chapter to the other, thus eliminating unnecessary repetition, and bibliographies are included with each chapter. An enlarged index further enhances the usefulness of the third edition.

WORLD OF LEARNING, 1950. 3rd ed.:

London, Europa Publications, 1950. £3.

This 3rd edition of The World of Learning is a most welcome addition to the 1950 book list, and an invaluable reference tool for practically every library.

The usual Europa arrangement has been followed, the countries being listed alphabetically. For each country, names follow alphabetically under the headings Learned Societies, Research Institutions, Libraries and Archives, Museums and Art Galleries, Universities and other educational institutions, both in the technicalities and in the humanities. Great Britain also lists "Educational Trusts". Heads of Departments and Statistics of staff are given for the universities, and full mailing addresses, together with foundation dates, and publications issued, are included with all listings.

Beside the alphabetical table of contents a most welcome addition is an alphabetical index of institutions, at the back of the volume. Attractive format, double column width and good clean type face make this volume of World of Learning a pleasure both to handle and to use.

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.

APPLIED SEDIMENTATION.

Edited by P. D. Trask. John Wiley & Sons, New York; Chapman & Hall, London, 1950. 707 pp., illus., diagrs., charts, maps, tables, 9¼ x 6 in., cloth. $5.00.

Containing 35 original articles prepared by specialists, this practical volume describes aspects of mutual interest to the geologist and the engineer. The articles are grouped under the following headings: basic principles of sedimentation; engineering problems involving strength of sediments; applications of processes of sedimentation; applications involving nature of constituents; economic mineral deposits; petroleum geology problems; and military applications. A list of references accompanies each article.

A.S.T.M. STANDARDS on ADHESIVES, sponsored by A.S.T.M. Committee D-14.

American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., January, 1950. 60 pp., diagrs., tables, 9 x 6 in., paper, $1.25.

This compilation contains all fifteen A.S.T.M. Standards on adhesives. New material in this edition includes tests for: impact strength of adhesives; strength properties of metal-to-metal adhesives in shear by tension loading; and cleavage strength of metal-to-metal adhesives.

COURS de MECANIQUE, Volume III. CHAPITRES CHOISIS de MECANIQUE.

By H. Favre. Dunod, Editeur, Paris; Leeman Frères, Editeurs, Zurich, Switzerland, 1949. 476 pp., diagrs., charts, tables, 9¼ x 6½ in., paper, 3160 frs.

This third volume completes a set of three covering the courses in mechanics required by the Swiss Federal Polytechnic Institute. The three sections in the current volume deal respectively with the theory of elasticity, the vibration of elastic bodies and hydrodynamics with special attention to the experimental use of mechanical similitude. Statics and the dynamics of rigid solid bodies were treated in Volumes I and II.

EFFECTIVE TEACHING, a Manual for Engineering Instructors.

By F. C. Morris, prepared under the sponsorship of American Society for Engineering Education. McGraw-Hill Book Company, New York, Toronto, *London, 1950. 86 pp., illus., diagrs., tobles, 9 x 6 in., poper, $0.60.*

A guide for engineering instructors who are interested in the improvement of their teaching methods. It is designed to give first principles of good teaching and to point out some of the more common teaching faults. Definite directions are given for the effective handling of basic activities.

ELEMENTS of PRACTICAL AERODYNAMICS.

By B. Jones. 4th ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1950. 444 pp., illus., diagrs., charts, tables 8½ x 5½ in., cloth, $5.00.

Intended as an introductory text, this book also provides a general survey of the practical aspects of the subject. In this edition, some non-pertinent material has been omitted, other material amplified, clarified and rearranged, and all problems have been revised. In addition to elementary aerodynamics, the range of topics covers flight characteristics, engine , propellers and control equipment. A knowledge of elementary calculus is assumed.

ENGINEERING FOR PRODUCTION.

By W. Ernst, with an introduction by A. M. Greene, Jr. Research Press, Inc., Dayton, Ohio, 1949. Paged in sections, diagrs., charts, tables, 11½ x 9½ in., fabrikoid, $10.00.

Linking the mechanical engineer and the workshop, this manual contains all the essential information required for the preparation of shop working drawings for structures, machines and useful products. It provides a ready reference for useful engineering information and data design. In addition to drafting technique there are two sections on the characteristics of metals, and threads and thread connections, gearing, and power transmission are also covered.

HANDBOOK OF CONVERSION FACTORS.

By M. H. Green. Educational Publishers 122 North 7th Street, St. Louis, Mo.' 1948. 88 pp., tables, 7¼ x 4½ in., stiff paper, $1.50.

This small reference book lists conversion factors for some 250 units of measurement arranged in fourteen elassifications—area, volume, time, electrical, etc. The figures have been compiled from various sources, chiefly from publications of the U.S. Bureau of Standards. Fundamental assumptions and definitions are given at the beginning of each section.

HEATING VENTILATING AIR CONDITIONING GUIDE 1950, Vol. 28.

American Society for Heating and Ventilating Engineers, 51 Madison Ave., New York 10, 1422 pp., illus., diagrs., charts, tables, 9¼ x 6½ in., fabrikoid, $7.50.

The 28th edition of this comprehensive annual guide has 32 additional pages of text in the Technical Data Section and a new arrangement of chapters under the following section headings; I, Fundamentals; II, Human reactions; III, Heating and cooling loads; IV, Combustion and consumption of fuels; V, systems and equipment; VI, Special Systems; VII, Instruments and codes. Changes have been made in 23 of the 50 chapters. As usual, a section containing condensed manufacturers' catalogs is included, and there are detailed indexes to both parts.

INDEX OF NOMOGRAMS, compiled and edited by D. P. Adams.

Published by John Wiley & Sons, New York, Technology Press of Mossachusetts Institute of Technology, and Chapman & Hall, Ltd., London, 1950. 174 pp., 9¾ x 7¼ in., cloth, $4.00.

This index lists over 1700 published nomograms in 97 important periodicals and thus serves as an invaluable timesaver in the repeated solution of mathematical formulas. It is divided into two main parts. Index A contains an alphabetical list of key words which are associated with each of the diagrams and a key number permitting reference to Index B where the periodical, date of issue, volume, number and page of the nomogram are listed. Abbreviations of the variables employed in each diagram are listed at the beginning of Index B.

Introduction to HEAT TRANSFER.

By M. Fishenden and O. A. Saunders. Oxford University Press, New York; Clarendon Press, Oxford, England, 1950. 205 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, $3.00.

This text for university students provides a detailed analysis of the process of heat transfer by radiation, conduction, and convection under a variety of commonly met conditions. For practical use the data have been reduced to simplified forms, and numerous calculations are given showing the application to design problems.

MATERIALS HANDLING MANUAL (III).

Editors: M. M. Williamson and G. W. Williamson. Paul Elek (Publishers) Ltd., Diamond House, 38 Hatton Garden, London, E.C.1, England, 1949. 364 pp., illus., diagrs., tables, 8¾ x 5½ in., cloth, 30s.

This volume, as its predecessors, deals with aspects of handling applicable to all industries, with the exception that this edition is restricted to the handling of bulk materials, omitting package handling. All its section have been brought up to date, and several new sections have been added, including a detailed treatment of underground materials handling machinery. Both continuous movement (conveyors, elevators, pneumatic systems, etc.) and intermittent movement (earth-moving equipment, cranes, etc.) are covered.

MATERIALS OF CONSTRUCTION, WOOD, PLASTICS, FABRICS.

By A. G. H. Dietz. D. Von Nostrand Co., Toronto, New York, London, 1949. 347 pp., illus., diagrs., charts, maps, tables, 9¼ x 6¼ in., linen, $4.50.

In this book stress is given to the essential nature of the materials discussed and to the development of their applications from those basic attributes. The properties and uses of wood, plastics and fabrics are discussed separately as well as in circumstances where they are used in combinations. Composite materials are treated in the final chapter. Selected bibliographies follow each chapter.

MICROWAVE ELECTRONICS.

By J. C. Slater. D. Van Nostrand Co., Toronto, New York, London, 1950. 406 pp., diagrs., charts, tables, 9¼ x 6 in., cloth, $8.25 (in Canada).

A unified account of the principles of wartime and postwar research in microwave electronics conducted at the Bell Telephone Laboratories and at the Radiation Laboratory of the Massachusetts Institute of Technology. Fundamental in approach, it covers the field in a detailed manner and applies the fundamental theory to the klystron, the linear accelerator, the cyclotron, the synchrotron, the travelling wave amplifier and the magnetron.

RESIDUAL STRESSES IN METALS. (Edgar Marburg Lecture, 1949.)

By W. M. Baldwin, Jr. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 1949. 45 pp., illus., diagrs., charts, tables, 9¼ x 6 in., paper, $1.00.

This lecture covers the fundamental differences in the mechanism by which residual stresses are developed by cold-working operations, by heat treatment, and by casting and welding. Also discussed are experimental test methods, residual stress patterns, and effects of and methods for the elimination of residual stress.

Although the following new books are not available in the Institute Library, inquiries concerning them will be welcome there or may be sent direct to the publishers.

ELECTROMAGNETIC THEORY (Proceedings of Symposia in Applied Mathematics. Volume II).

American Mathematical Society, 531 West 116th St., New York, 1950. 91 pp., diagrs., charts, tables, 10¼ x 7 in., cloth, $3.00.

This volume contains seven papers and ten abstracts of papers presented at the symposium on electromagnetic theory held at the Massachusetts Institute of Technology in 1948. The seven papers discuss: new quantum electrodynamics, electromagnetism, the factorization method, nonlinear electrical networks, ray theory vs. normal mode theory in wave propagation problems, and systems of Wiener-Hopf integral equations. Most of the papers which are abstracted were published in full elsewhere.

PATENT PRACTICE & MANAGEMENT for Inventors and Executives.

By R. Calvert, with foreword by A. N. Mann. Scorsdale Press, Box 536, Scarsdale, New York, 1950. 371 pp., illus., 9½ x 6 in., cloth, $5.00.

Beginning with a discussion of "what to patent", this book goes on to present not only the essentials of patent law but also a wide range of associated problems which may have to be dealt with under various conditions. The emphasis is on procedures for obtaining patents, using them, and administering the patent policy to stimulate research, invention and morale.

Die SELBSTTATIGE REGELUNG, theoretische Grundlagen mit praktischen Beispielen.

By A. Leonhard. Springer-Verlag, Berlin, Gottingen, Heidelberg, 1949. 284 pp., diagrs., charts, tables, 9½ x 6¼ in., paper, 24 D.M.; bound, 27 D.M.

This book discusses the basic theoretical principles of automatic control as well as practical examples of its use. Following a chapter on fundamentals, the determination of a suitable control process is considered in detail. The stability of control is then inspected. The final chapter is devoted to methods for the determination of appropriate control constants. A bibliography is included.

La FONDERIE des ALLIAGES LEGERS et ULTRA-LEGERS.

By M. Caillon, preface by M. R. de Fleury. Service de Documentation et d'Information Technique de l'Aéronautique, 2 Rue de la Porte-d'Issy, Paris (15e), 1949. 224 pp., illus., diagrs., charts, tables, 10½ x 7 in., paper, 800 Frs.

This publication covers in a detailed manner the subject of magnesium casting practice, including foundry sand, melting practice, casting defects, tapping and pouring devices, and an appendix containing notes on certain special points in the process. There is also a discussion of the collaboration between the research department and the shop necessary for the production of sound, effectively designed castings. Much of the information given is of value in aluminum foundry work, as well.

CHEMIE für BAUINGENIEURE und ARCHITEKTEN.

By R. Grün. 4th rev. ed. Springer-Verlag, Berlin, Gottingen, Heidelberg, 1949. 212 pp., illus., diagrs., charts, tables, 9½ x 6½ in., paper, 16.50 D.M.

Written for construction engineers and architects, this book considers the chemistry of inorganic and organic construction materials. Stone, cement, sandstone, brick, iron and steel and light metals are discussed, as well as wood, asphalt, artificial resins, roofing boards, adhesives, putty and paints. A list of related magazines is included.

TACHEOMETRIC TABLES.

By F. A. Redmond. Technical Press, Ltd., London, 1950. 256 pp., diagrs., tables, 8½ x 5½ in., cloth, 12s.

Of interest to surveyors, this book contains tables for use with the "fixed-angle" method of surveying. In the main table, the horizontal and vertical distances required in using a tacheometer are given for angles from 0° 20′ to 20° by 20′ intervals for distances from 50 to 850 feet. The other three tables provide data for special cases.

DOMESTIC MINING INDUSTRY of the UNITED STATES in WORLD WAR II.

By J. D. Morgan, Jr., printed by the National Security Resources Board with the permission of the School of Mineral Industries and the Graduate School of the Pennsylvania State College, 1949. 500 pp., charts, maps, tables, 10¾ x 8½ in., paper, $2.00, for sale by U.S. Government Printing Office, Washington, D.C.

For the planning of future economic mobilization, this book analyses and evaluates the performance of the mineral industry during World War II. Manpower, equipment and supplies, the coal-iron ore-steel complex, domestic mining activities, and transportation are among the important problems discussed. There is a large amount of statistical information. The petroleum industry is not considered nor is the subject of reserves, these having been dealt with elsewhere.

MECHANICAL PROPERTIES of WOOD.

By F. F. Wangaard. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1950. 377 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $6.00.

A thoroughly revised version of G. A. Garratt's 1931 book of the same title, this volume provides information on the properties of more than 150 American woods as well as tables of basic-stress and working-stress values for structural species. The four parts treat; the basic mechanical properties of clear wood; factors affecting the mechanical properties; working stresses for structural lumber; and timber testing. References appear at the end of each section. The Appendix contains a sample plan for testing small clear specimens of wood.

STANDARD SPECIFICATIONS for HIGHWAY BRIDGES.

Adopted by the American Association of State Highway Officials. 5th ed. Published by the Association, 1220 National Press Bldg., Washington, D.C., 1949. 284 pp., diagrs., charts, tables, 9¼ x 6¼ in., cloth, $3.00.

This book serves as a guide for the preparation of State specifications and for reference by bridge engineers. Containing revisions to specifications made since the previous, 1944, edition, it conforms to the latest developments in the profession of bridge engineering and to current practices in bridge design. The more important changes are in Division III on design.

CASTING of BRASS and BRONZE.

By D. R. Hull. American Society far Metals, Cleveland, Ohio, 1950. 186 pp., illus., diagrs., tables 9¼ x 6 in., cloth, $3.50.

This book considers some practical aspects of brass and bronze casting in America from 1900 to 1950. It is not only a record of personal experience, but also a discussion of the development of the casting process including numerous technological details which contribute materially to the quality of the product.

RULES for the CONSTRUCTION, TESTING and SCANTLINGS of METAL-ARC WELDED STEEL BOILERS and OTHER PRESSURE VESSELS.

Associated Offices Technical Committee, National Buildings, 14 St. Mary's Parsonage, Manchester 3, England. 40 pp., diagrs., charts, tables, 6½ x 4½ in., leather, 5s.

This small volume has been issued to provide in compact form information with regard to the design and construction of a wide variety of welded steel boilers and pressure vessels with the intention of encouraging the production of sound vessels using the minimum amount of steel.

PRELIMINARY NOTICE

(Continued from page 720)

1943; Graduate, Royal Aero. Society (transfer to Assoc. Fellowship under consideration); 1943-45, Power Jets Limited, as aerodynamic test engr., production of jet engines, held following positions: head of material control (research), asst. head of works order dept., head of production progress dept., asst. to production controller; with Vokes Limitesm Guilford, Eng., as follows: 1946, outside engr. and home sales mgr., responsible for all functions in connection with sales in U.K., tech. recommendations, etc., 1946-50, genl. sales mgr., at present, vice-president & genl. mgr., (full authority to act on behalf of president who is located in England), Vokes (Canada) Limited, Toronto, Ont.

References: J. S. Lochhead.

RADECKI—ZYGMUNT KAZIMIERZ, of Drummondville, Que. Born at Skole, Poland, July 21, 1910. Educ.: Chemical Engr., Univ. of Lwowaska, Poland, 1936. 1937-1939 section engr., petroleum coop. Malopolska, Poland; 1939-40, Air Force, Poland; 1940-48, R.A.F. Command, Great Britain; with Canadian Celanese Limited, Drummondville, Que., as follows: 1948-49, section engr.; (probation), 1949 to date, section engr. in dept. solvent recovery.

References: J. L. Killoran, J. Ban Damme, J. P. Estabrook, B. Kelimbet.

SHOTEN—HENRY, of Montreal, Que. Born in Kolo, Poland, Oct. 4, 1913. Educ.: Mech. Engr., Politechnika Warszawska, 1938; 1938-39, design & estimating of mach. for felt hats; deported to Russia for forced labour—worked in iron ore mine—dtfng., cranes, cokeries, blast furnaces, open hearths, bldg. rolling & blooming mills, etc., this work on "Magnitogorsk" was being done by Arthur G. McKee, Co., Cleveland—on demand of Polish Gov't. was liberated and returned to Poland; 1946 (8 mos.) chief engr., rayon plant Breslau (German territory occupied by Poland); 1946-48, under supvr. U.S.A. Army as director of vocational training for D.P.'s; with Dominion Bridge Co., as follows: 1948-50, designer, estimator, 1950 to date, sr. dftsman., paper mach. divn.

References: R. H. Findlay, W. G. H. Holt, J. P. Watson, K. O. Whyte, J. Smith, S. A. Craig, H. W. Buzzell.

WALKINSHAW—PETER WARWICK, of Kenogami, Que. Born at Epsom, Eng., Dec. 13, 1925. Educ.: B.Eng. (Chem.), McGill, 1949; May 1949 to date, chem. engr., control dept., newsprint mill, Price Bros. & Co., Kenogami, Que.

References: G. F. Layne, M. F. McCaghey, A. Cunningham, K. A. Booth, A. Sinclair.

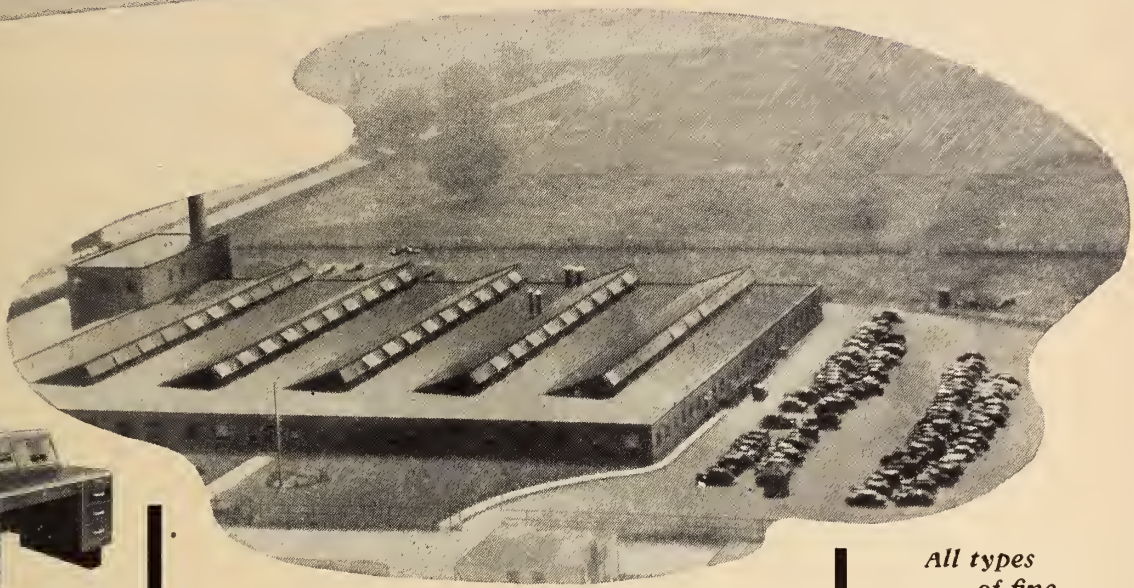
WOOD—WILLIAM MELVILLE, of Kitchener, Ont. Born at Westgate, Eng., Jan. 30, 1917. Educ.: B.Sc. (Civil), Manitoba, 1939; 1939-40, asst. engr., Winnipeg Heating Co.; 1940-41, civil engr., Abitibi Pulp & Paper; 1941-45, Navigation Instructor, R.C.A.F.; 1945-48, plant engr., Building Products Ltd.; 1948-50, chief engr., Fraser Construction Co.; 1950 to date, resident engr., i/c of new constrn., Burns & Co., Ltd., Kitchener, Ont.

References: W. A. Smith, G. C. Davis, M. A. Montgomery, A. C. MacNab, F. H. Midgley, S. Shupe.

ZIEGLER—LESTER WILLIAM, of Milverton, Ont. Born at Kitchener, Ont., April 4, 1915. Educ.: B.Sc. (Mech.), Tri-State College, 1941 (not acc. ECPD); R.P.E., Ontario, 1934-38, 4 yrs. apprent'ship machinist & tool-making; 1941-42, design & testing steam engines, etc., Babcock-Wilcox, Goldie-McCulloch; 1942-43, Dominion Provincial Trade School (organized & taught); 1943-45, prod. control engr. i/c planning, methods & time study, Dominion Electrohome Industries, Kitchener, Ont.; 1945-48, works engr. i/c bldgs., land, mtce. & steam generation, Naugatuck Chemicals, Elmira, Ont.; 1948 to date, genl. mgr., i/c engrg., Ebersol Farm Equipt. Co., Milverton, Ont.

References: M. A. Montgomery, S. Dembicki, S, Shupe, A. M. Snider, W. M. Easton.

ACHIEVEMENT AT BELLEVILLE



Completely modern Sound Systems for sports arenas, industrial plants schools, hotels, institutions.

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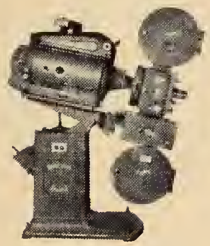
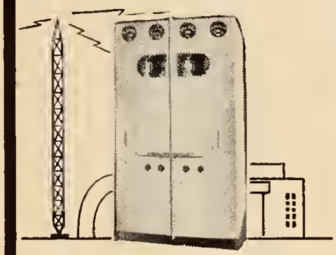


Motion picture Sound Systems for theatres of all sizes.



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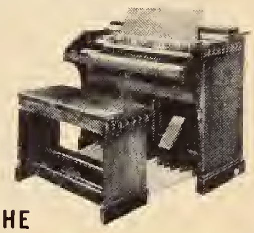

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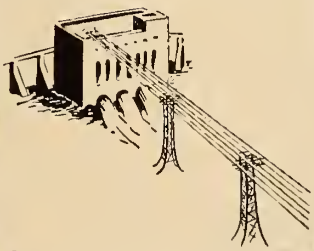
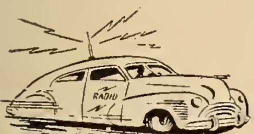
Mine Signalling Equipment . . for voice or signal communication between cage and surface. Designed for rigorous use in Canadian hard-rock mining.



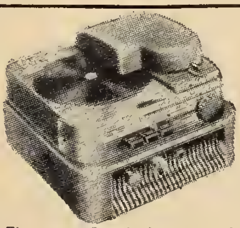
Power Line Carrier Systems for voice communication, generation control, or remote telemetering . . Specifically engineered for the Canadian Central Station industry

Fire Alarm equipment and systems for buildings or municipalities.

All forms of manual and Traffic Actuated Traffic Equipment and Systems.



The latest Mobile Services Equipment, including complete fixed station systems, for Municipal, Provincial and Federal Police, forest conservation, hydro systems, surveyers and prospectors.



Electronic Soundwriters — Dictating machines of distinction for Canadian business men, executives, travellers, teachers, stock supervisors, investigators . . .

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Expert Engineering and Installation Services at your disposal

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1050-1

Business & Industrial Briefs

A Digest of Information received by The Editor

Appointments and Transfers

E. W. R. Steacie.—Dr. E. W. R. Steacie, director of the division of chemistry at the National Research Council has been appointed vice-president (scientific) of the Council.

In his new post Dr. Steacie will be responsible for the co-ordination of all scientific activities in the National Research Council organization; to ensure that the work of the several divisions proceeds according to a general over-all-plan and that the closest integration of research is maintained throughout the laboratories. The new appointment will not affect Dr. Steacie's present research activities. He will continue in the directorship of the division of chemistry where he has built up a research group in chemical kinetics that has won world acclaim.

New Minneapolis-Honeywell Offices.—Two new eastern sales offices of the Minneapolis-Honeywell Regulator Co. Ltd., have been opened. They are located at Ottawa and Halifax. The opening of the two offices is in keeping with the Company's current expansion programme to meet the demands of increased business in the Maritimes and Ottawa Valley markets. The Ottawa office is located at 1174 Wellington Street and will be managed by W. J. (Bill) Robinson, formerly a sales engineer at the Montreal branch of the Company. The Halifax office is located at 25 McLean street and the manager will be R. B. (Bob) Mackenzie. Mr. Mackenzie has been with the Company for four years serving with the Toronto office as a sales engineer.

Canadian Allis-Chalmers Appointments.—Mark C. Lowe, vice-president of Canadian Allis-Chalmers Limited has announced the following appointments in the sales organization of the Company.

R. W. Wright has been appointed manager of the Ontario district office in Toronto to serve the entire province of Ontario. He was formerly manager of the eastern district sales office in Montreal. F. J. Bowden has been appointed manager of the eastern district sales office and will make his headquarters in Montreal. Mr. Bowden was formerly manager of the Company's Calgary district office. A. B. Tuer is now manager of the Calgary district office. Previous to his present appointment he was a sales engineer in the Toronto office.

R. W. Wright — F. J. Bowden — A. B. Tuer

F/L Bruce Warren.—Flight Lieutenant Bruce Warren, D.F.C. and U.S. Air Medal, has been granted two years leave by the R.C.A.F. to assist in the flight test programme of the Avro Canada CF-100 fighter. Flight Lieut. Warren was previously attached to the R.C.A.F. winter experimental establishment at Edmonton. He has flown 28 different types of aircraft and logged over 2200 air hours.

Garton Ward.—Garton Ward has been appointed sales representative by Burndy Canada Limited, 381 Greenwood Avenue, Toronto. He will represent the Company in Toronto and eastern Ontario. Mr. Ward has almost two decades of electrical-industrial experience on two continents. After training with Canadian General Electric Company, he went to Britain in 1934, and was associated there and in Europe with the Rheostatic Company of Slough. For two years he was general manager of a company associated with the Rheostatic Company in Switzerland. He returned to Canada in 1948.

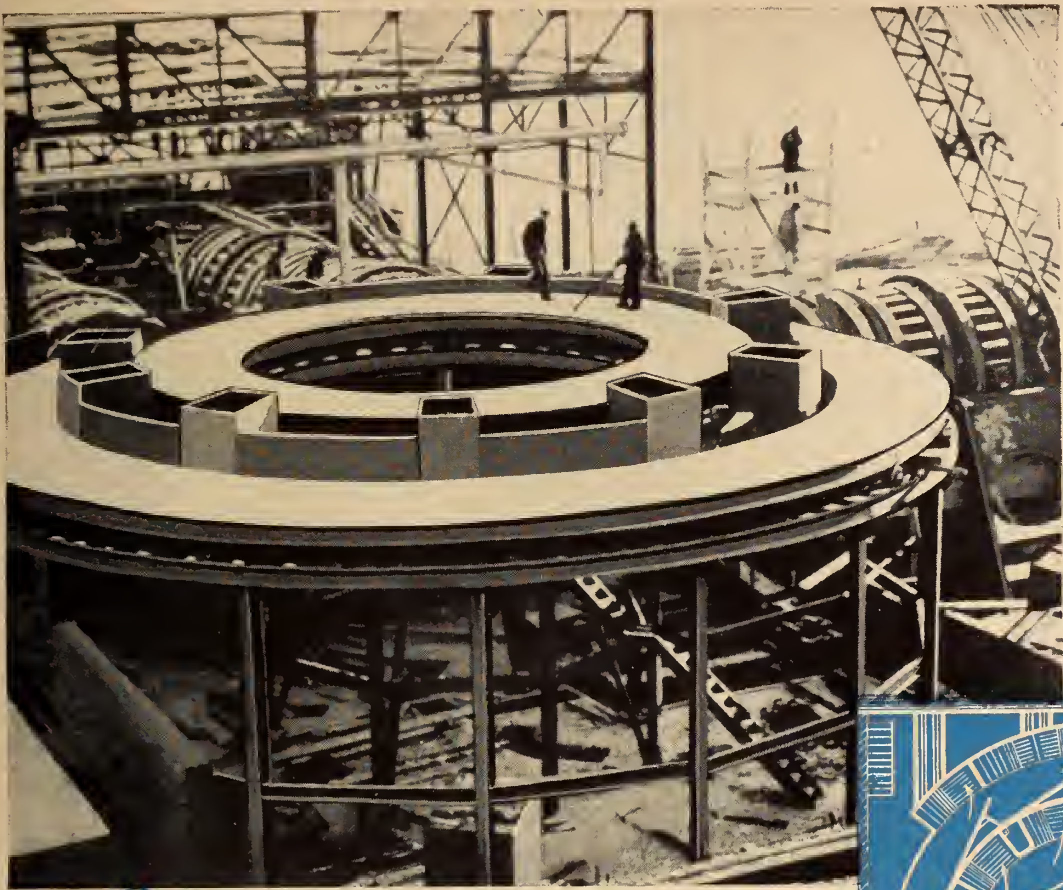
C.G.E. Appointments.—G. B. Batanoff has been appointed sales representative in Toronto, of C.G.E.'s commercial refrigeration division. M. W. G. Johnston has been named manager of the head office, commercial refrigeration section. He is now responsible for the sales programme for commercial refrigeration package and remote equipment in sizes of 1/6 to 75 hp.

E. F. Wahl has been placed in charge of the commercial programme on Silicones and W. J. McGeachie has joined the plastics section of the Company which is responsible for the commercial administration and development of the products of C.G.E.'s Plastic Molding Plant at Cobourg, Ont.

C. G. Lloyd now heads the Company group responsible for engineering of the broad range of transmitter equipment produced at the Royce Works in Toronto. J. G. Smart succeeds Mr. Lloyd in charge of the sale of electronic equipment in the Toronto district.

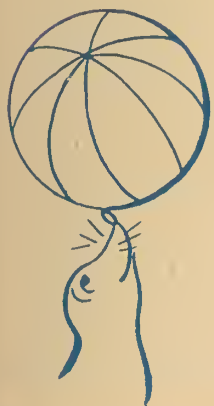
J. E. Boyle and P. G. Kingsmill have been appointed to the staff of the apparatus division of the Toronto district.

Consolidated M. & S. Appointments.—The Consolidated Mining and Smelting Company of Canada Ltd., have made the following appointments. A. G.



Construction view and diagram showing rotary table unit. This is the hub of a conveyor system between the log haulup, barkers, chippers and wood yard of a pulp mill.

THREE RING CIRCUS?



This revolutionary machine is the first of the kind in the world. It is bringing increased efficiency and lower costs to the operation of grading and sorting pulpwood.

Designed by engineers of the Bathurst Power and Paper Company* and now in continuous use, its performance has far exceeded expectations.

The development, fabrication and erection of this outstanding project is an example of the way in which Dominion Bridge engineers and technical resources are helping Canada to maintain leadership in many basic industries.

Tackling out-of-the-ordinary jobs is a speciality with Dominion Bridge. Whether your problem involves structural steel, mechanical handling, platework, combustion engineering—or a combination of all four—our unrivalled resources are at your disposal.

MECHANICAL DIVISION
DOMINION BRIDGE
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*Manufacturers of industrial paper boards.

Plants at: VANCOUVER, CALGARY, WINNIPEG, TORONTO, OTTAWA, MONTREAL

Assoc. Companies at: EDMONTON, SAULT STE. MARIE, QUEBEC, AMHERST

Other Divisions: PLATEWORK, BOILER, WAREHOUSE, STRUCTURAL

Demonstrations

of a revolutionary

Metal Spraying Process

Mr. F. A. Rivett, Managing Director, Schori Metallising Process Ltd., London, England, will be giving demonstrations of the new pressure-fed Schori pistol.

Montreal . . . September 20th-23rd

Toronto. . . . September 25th-30th

Hamilton . . . October 2nd- 7th

Those wishing to attend please AIR MAIL:

SCHORI METALLISING PROCESS LTD.,
BRENT CRESCENT,
NORTH CIRCULAR ROAD,
LONDON, N.W. 10,
ENGLAND.

so that official invitations may be issued.

Robertson has been appointed special assistant to the manager of the metallurgical division. He has been with the Company since 1935. He is a graduate of the University of Alberta where he received a degree in mining engineering. L. M. DeLong has been appointed superintendent of the refining department. Mr. DeLong joined the Company in 1927. He graduated in mining and metallurgy from Queen's University in 1927.

●

New Town Engineers.—Fred W. Iveson has been appointed town engineer for Perth, Ontario. H. B. Mattson has been appointed to serve in the dual capacity as manager of the public utilities commission and town engineer by the council of Iroquois Falls.

●

"Business & Industrial Briefs"

This section of the *Journal* is intended to keep readers informed on developments and changes in those business and industrial enterprises, and on new products, which affect the engineer.

If you write with respect to any of the items in this, or other sections, please mention

The Engineering Journal

Publications

Ironworks Publication.—"The Stantonian", is the name of a magazine published each month by the Stanton Ironworks Co. Ltd., Nottingham, England. Although primarily intended for the employees and agents of the Company, the publication contains much information of general interest. Copies may be obtained by applying to the Editor, The Stantonian, The Stanton Ironworks Ltd., near Nottingham, England.

●

Recording Thermometers.—The Bristol Company of Canada Limited has issued bulletin T840. It is a 44-page bulletin referring to their series 500 recording thermometers for temperatures between 125 and 1000 degrees F. It is complete with typical chart records, typical installations, an outline of the important features and principles of operation. For copies apply to The Bristol Co. of Canada, Ltd., 71-79 Duchess St., Toronto.

●

Aggregate Conveyor Tunnel.—Armco Drainage & Metal Products of Canada Ltd., Guelph, Ont. have had reprinted, from the April, 1950 issue of Engineering and Contract Record, an article entitled "New-type Aggregate Conveyor Tunnels Speed Hydro Construction Projects". The author is Carleton McNaught. To quote the opening paragraph of the article "This is the story of a meeting of minds — the mind of a supplier of materials, and the minds of hydro-electric construction engineers. The outcome was a radical and advantageous change in a longstanding construction technique. It entailed the abandonment of a time-honoured method of building aggregate conveyor tunnels for large hydro-electric development projects, and the adoption of an entirely different method."

Copies of the paper may be obtained by applying to Armco.

●

Voltage Regulating.—The July issue of The Bepco Journal, published by Bepco Canada Limited, 4018 St. Catherine Street W., Montreal, contains an interesting article "Automatic Voltage Regulating Equipment" by W. H. Crosby. To be placed on the mailing list for the Bepco Journal please communicate with the Company at the address given above.

●

Hose & Tube Catalogue.—Numerous types of industrial metal hose, tubing and fittings for conveying solids, fluids or gases at elevated pressures and temperatures are described and illustrated in a new 12-page catalogue recently issued by Universal Metal Hose Co. of Chicago, 2133 South Kedzie Ave., Chicago. Ask for catalogue No. U-101.

●

Brazilian Booklet.—The Brazilian Government Trade Bureau, 505 Place d'Armes, Montreal, offers copies of an excellent handbook "Facts About Brazil". The publication outlines the constitution of the government of the country, it gives geographical and topographical details, and covers all phases of industry and occupation. A section is devoted to transportation and communications, external trade, public health, insurance, council activities, etc.

●

Clutches.—The Automatic Clutch Corporation of Canada, 165 Spadina Ave., Toronto, offer a 12-page publication "BLM Automatic Clutches". In addition to specifications of Company products, the publication contains a handy wall-chart of decimal equivalents.

●

Lighting Catalogue.—The new Westinghouse Commercial Industrial Flood Lighting Equipment catalogue is now available. This publication illustrates, describes and supplies ordering and installation details for the complete Westinghouse line of commercial, industrial, and floodlighting equipment. It has been issued as a source of authoritative data for lighting engineers, contractors, and others who may be responsible for lighting installations. When applying for copies please mention your business connection. Write to: Canadian Westinghouse Co., Ltd., Hamilton, Ont.

●

Trane Booklet.—Following the production early this year of the newly designed Wall-Fin Heater element and enclosures, Trane Co. of Canada Ltd. have released an attractive and well

illustrated booklet on these units. The booklet contains dimensions and capacity data and is available upon request from the above firm at 4 Mowat Ave., Toronto.

●

Safety Code.—The revised safety code for mechanical refrigeration is now available for sale by the American Society of Refrigerating Engineers, 31 West 40th St., New York City. The price is $1.00 per copy. The code has been adopted as an industry standard by the American Standards Association.

●

New Jackhamers.—Two new jackhamers have been introduced by Canadian Ingersoll-Rand Co. Ltd., Birks Bldg., Phillips Sq., Montreal 2, Que. Known as the J-40 and the J-50 these new machines are capable of drilling in any kind of rock and are particularly well suited for general utility service in mines, quarries, and road work.

Powerful blows, strong rotation of drill steel, and plenty of hole-cleaning ability result in faster drilling speeds for the J-40 and J-50. A double-kicker port valve permits full air pressure on the piston for a longer period of time, giving more powerful blows and much stronger rotation. A specially designed auxiliary port allows full line air pressure to pass through the drill steel when the blower valve is opened, giving a strong blowing action which quickly cleans even deep holes of cuttings. The design of the throttle valve and the air-supply port permits the gradual admittance of air into the cylinder, making the collaring of holes easier.

For complete information on this new tool write to Canadian Ingersoll-Rand Co. Ltd. at the address given above and ask for publication CF-508.

●

International Harvester Parts Selector.—Chas. Cusson Ltd., 284 Ontario St. W., Montreal 18, have developed an unique rotary part selector chart, covering both chassis and engines of International Harvester Equipment. By rotating the centre part of the chart so that an indicator points against the items for which replacement is desired, the correct code numbers for ordering are seen at a glance. To users of International Equipment this chart should be a most valuable acquisition. It is available in both French and English. The supply of these charts is limited and requests should be forwarded promptly.

●

Earth-Moving Equipment. — Chaseside Engineering Co. Ltd., Station Works, Hertford, Hertfordshire, England, has produced a catalogue specifically for the prospective Canadian customer. It contains descriptions and illustrations of the front-end loaders, diggers, mobile cranes, bulldozers, and other similar equipment manufactured by the Company. Copies are available.

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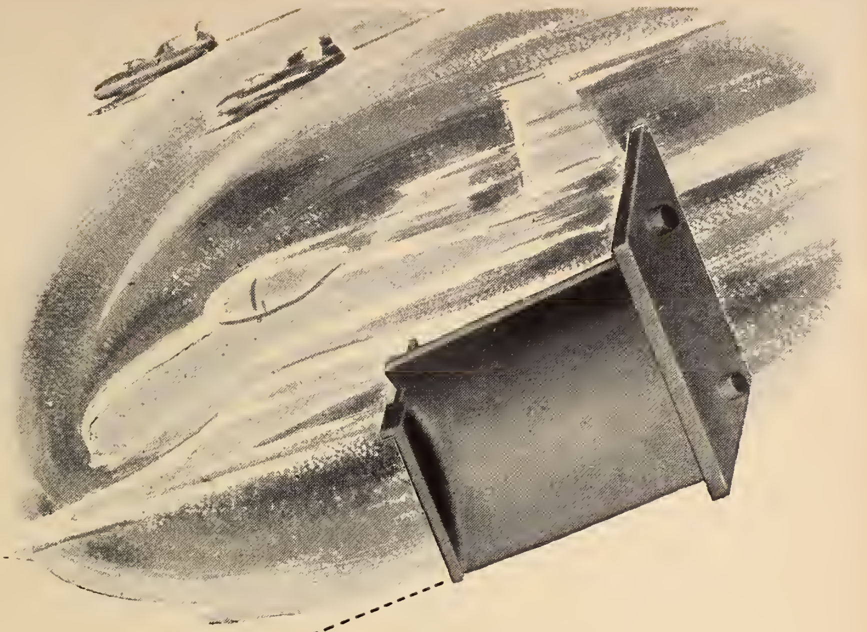
(*Continued on page 753*)



this metal ...maintains efficiency at temperatures up to 1850°F

Breaching the sonic wall was a challenge to Deloro and aviation engineering research. That challenge was met.

At temperatures up to 1850°F Deloro Stellite Grade 8 is resistant to oxidation under lengthy service conditions.

Under these temperature conditions, high creep strength of this alloy has been proved at 25,000 pounds stress per square inch and nozzle guide vanes are now specified in Deloro Stellite castings.

Deloro Alloys stand up to the toughest demands of modern engineering. If you have a specific high temperature problem combined with abrasion, corrosion or erosion, we offer technical assistance. Write today.

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non-ferrous alloy of Cobalt, Chromium and Tungsten

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As illustrated and detailed above.

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Similiar to style U but with copper neutral interspersed with galvanized steel wires.

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Similiar to style U but with a metal tape armour over the copper neutral.

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SEC 4

High-Alumina Cement. — Ciment Fondu Lafarge (Canada) Ltd., Marine Bldg., 1405 Peel St., Montreal 2, offers several booklets on the uses and applications of their high alumina cement. When applying mention specifically the use on which information is desired.

Gearing.—The Hamilton Gear & Machine Co. Ltd., 950 Dupont St., Toronto 4, have issued a small-size "concertina-type" brochure in which are illustrated the various types of gears and couplings manufactured by the Company with recommendations as to their use and brief descriptions of their manufacture. Copies are available.

Processing Equipment.—A new 4 page bulletin describing the Patterson Foundry and Machine Company's services and equipment for the processing of oils, fats, and other organics, is now available. The bulletin points out some of the many processing systems and operations in the hydrogenation and organic synthesis fields, for which the Company provides both equipment and complete engineering planning and service. Ask for "New Profits From Oils and Fats" and apply to the Patterson Foundry & Machine Co. (Canada) Ltd., Toronto, Ont.

Transformer Stock List.—From time to time Ferranti Electric Limited, Mount Dennis, Toronto, publishes a stock list of transformers available at the Toronto headquarters of the Company. The list also contains supplementary information pertaining to stocks on hand at the Winnipeg and Montreal branches of the Company. To be placed on the mailing list for these information sheets please communicate with the manufacturer.

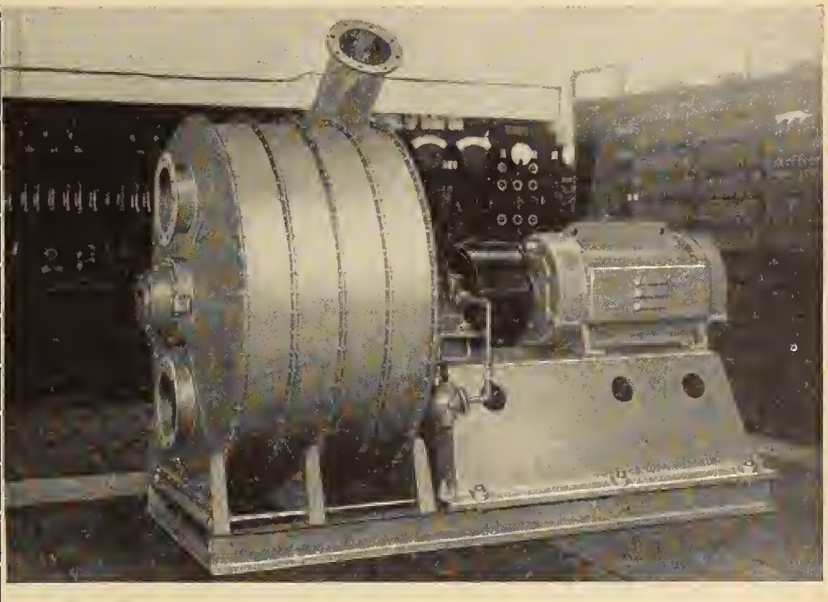
Speed Controls.—A new line of Automatic Speed Controls for the Link-Belt P.I.V. Variable Speed Drive is announced by Link-Belt Limited, Eastern Avenue at Leslie and Keating Streets, Toronto 8. These new controls are job-engineered for automatically controlling the output speed range of the P.I.V. and are available in four basic types — electronic, hydraulic, pneumatic, mechanical. Complete information is given in a new 8-page illustrated Link-Belt Book No. 2349. Copies will be forwarded on request.

Plastics Selector.—Monsanto (Canada) Ltd., 425 St. Patrick St., Montreal, have prepared a new "Material Cost Comparator" to assist in the selection of the right material, and in determining comparative cost figures of plastics and 11 other structural and fabricating materials.

The comparator consists of twin dials and on one side is given the comparative cost of styrene and aluminum, phenolic and zinc, or any contrast of plastics and other materials. The reverse sides of the dials quickly afford condensed information on the mechanical, thermal, electrical, optical, and chemical properties of 12 leading plastics. Pocket-size the Comparator tells specific gravity, cost per pound, cubic inch per pound, and cost per cubic inch of plastics molding powder and alternate materials. For a comparison of films, the comparator swiftly reveals specific gravity, cost per pound, square inches per pound and cents per 1000 square inches. To obtain one of these handy charts apply to the Company.

Textile Plant Film.—Canadian General Electric Co. Ltd., 212 King Street, Toronto, have recently released a new 16-mm. color film "Textiles Unlimited". It describes the latest engineering developments in Canada's textile industry. In addition to the motion picture, a 94-page comprehensive application manual "How Textile Mills Are Modernizing" is available. To arrange for a showing of the film and to obtain copies of the publication communicate with the Company.

Dexion Publication.—Dexion Limited, 34, Fouberts Place, London W.I., Eng., offer a publication "Build Your Own Equipment with Dexion Angle". Dexion Angle is very useful and economical material for building all kinds of structures; frame-works of small buildings and erections, fencing, machine guards, belt guards work benches, etc. The Publication describes the material and gives illustrations of methods of assembly and uses. It should prove to be a useful addition to an engineer's library if he is interested in using light weight sectionalized equipment.



One of a number of "Tornado", three-stage, 36″ turbo superchargers, driven by 150 h.p. electric motor through fluid couplings, giving smooth and economical speed control.

The "Tornado" range includes centrifugal, high efficiency, axial and propeller type fans, air heaters, air washers, dust and fume removal plants; and industrial gas equipment.

by KEITH BLACKMAN LTD., of London, England.

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21 Dundas Sq., Toronto

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New Equipment and Developments

Sugar Refinery Improvements.—A large-scale modernization programme is now under way at Canada's largest sugar refinery in Montreal. The changes, when completed, will increase the plant's capacity by more than 50 per cent. The refinery now produces an average of around 1,500,000 pounds of refined sugar per day. With the new facilities, the capacity will be 2,300,000 pounds. Salient points of the programme are: modern building design and engineering and a marked increase in bulk mechanical handling methods.

F. H. McGraw Co. are consulting engineers and builders.

●

Sludge Contact Reactor.—The Canadian General Electric Co. have announced a new Cochrane-Liquon sludge contact reactor which utilizes the old chemical laboratory principle — that previously formed precipitates added in the form of sludge or slurry will accelerate chemical reactions.

This new contact reactor is designed for such services as clarification of surface water for removal of suspended solids, turbidity, colour, taste, and odour for industrial and municipal purposes; lime or lime-soda softening of any hard water for municipal or industrial application where soft water is desired to save soap, alkali, to avoid scale or deposits in heaters, hot water piping and air conditioning systems, and to aid in the laundering and washing of textiles; clarification and/or softening surface and well waters for make-up to cooling towers, spray ponds, etc.; coagulation and reduction of alkalinity of surface or well waters as a pretreatment ahead of ion exchange or hot process softeners for boiler feed; removal of silica from hard water by absorption in contact with ferric hydroxide or magnesium oxide or hydroxides in the sludge to avoid silica deposits in boilers and turbines; removal of fluorides by absorption in contact with magnesium hydroxides in the sludge; clarification and de-alkalization of water used for production of carbonated beverages; removal of alkalinity from water used in manufacture of raw-water ice; iron and manganese removal from well waters for municipal and industrial purposes; separation of fibre stock and filter from white water in paper mills, permitting the recovery and re-use of this stock as well as the re-use of the treated water; waste water treatment in general to reduce pollution of streams.

Complete information on this equipment may be obtained from Canadian General Electric Co. Ltd., 212 King St. W., Toronto. If a bulletin is required ask for No. 5001.

●

Non-corrosive Pump.—A non-corrosive pump, in which the transferred liquid or gas never touches any part of the metal parts has been developed by the Vanton Pump Corp. of New York City. The pump has been so designed that it is particularly suitable for handling corrosive liquids such as acids, alkalis, industrial alcohols, and corrosive gases.

The construction of the pump is such that the fluid flows on the outside of the "flex-i-liner" and on the inside of the body block. The liner material can be specified in either a pure gum rubber or a synthetic depending on the particular application, while the body block can be obtained in a special corrosion and abrasion resistant bakelite. An eccentric rotor mounted on a ball bearing rides inside and activates the flex-i-liner. W. K. Davidson Co., 1838 Dorchester St. W., Montreal, Que., is the Canadian representative of the Vanton Pump Corpn.

●

New Microscope.—A new portable microscope, built on the unit principle and claimed to have more than 100 uses in industry, has been marketed by a London, England, firm.

By adding units and accessories, the instrument can be transformed from a simple microscope for general inspection to a small but complete measuring microscope which has co-ordinate micrometer stages and a circular table and alternative methods of illumination for various classes of work. Easily adapted for travelling and for toolpost use in examining thread forms in machine tools, taps, screws, profile gauges and templates up to 1 in. square, the microscope has other applications such as the measurement of levers, pressed parts, tooth thicknesses of small gears, etc.

●

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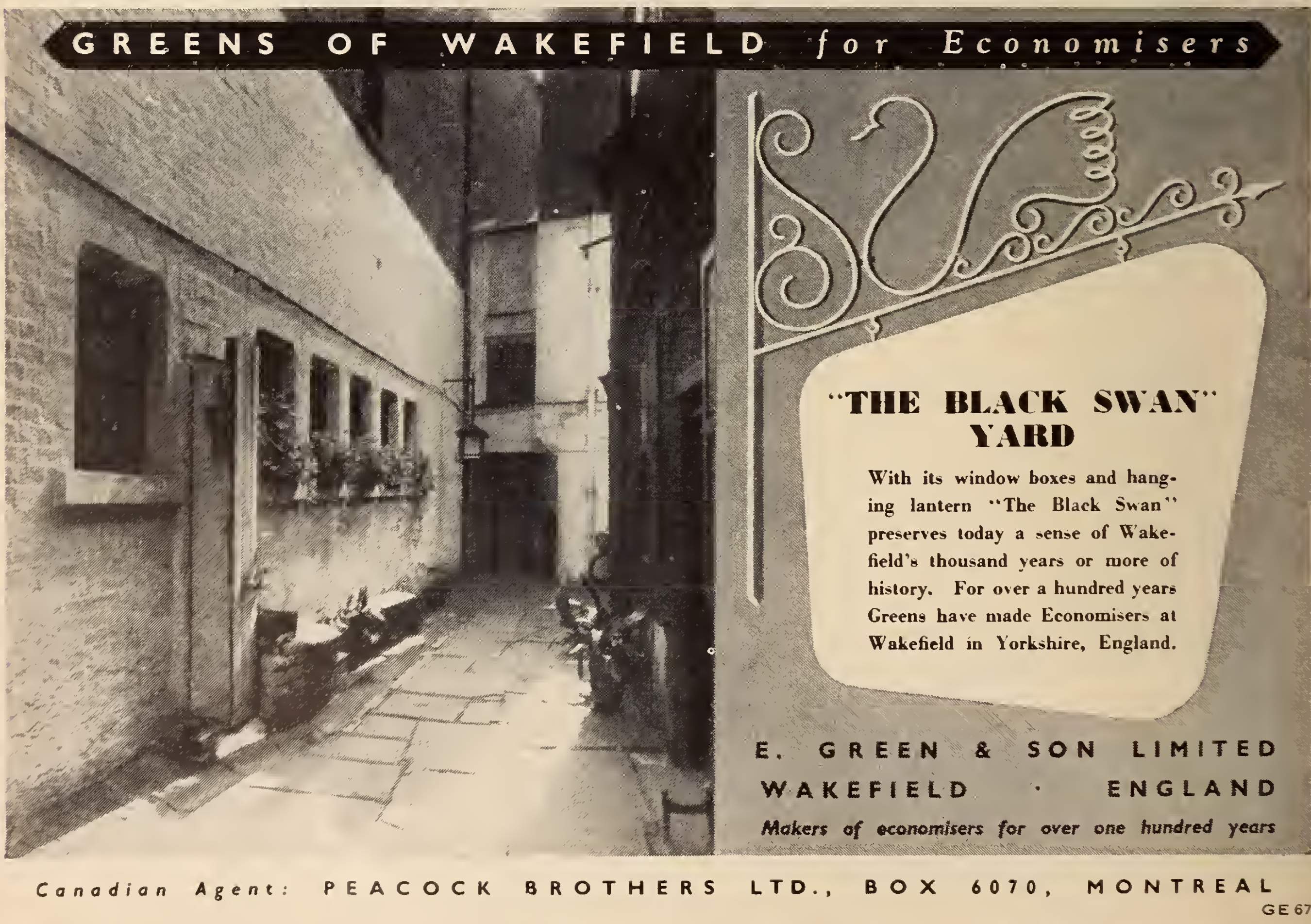

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TIMESAVER PLANERS

These PLANERS embody every modern refinement in design, giving maximum performance with ease of operation. They are made not only in Double Housing style as illustrated, but also in Open Side type. They have many outstanding features, some of which are listed below:—

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- ★ Balanced Helical Table Drive
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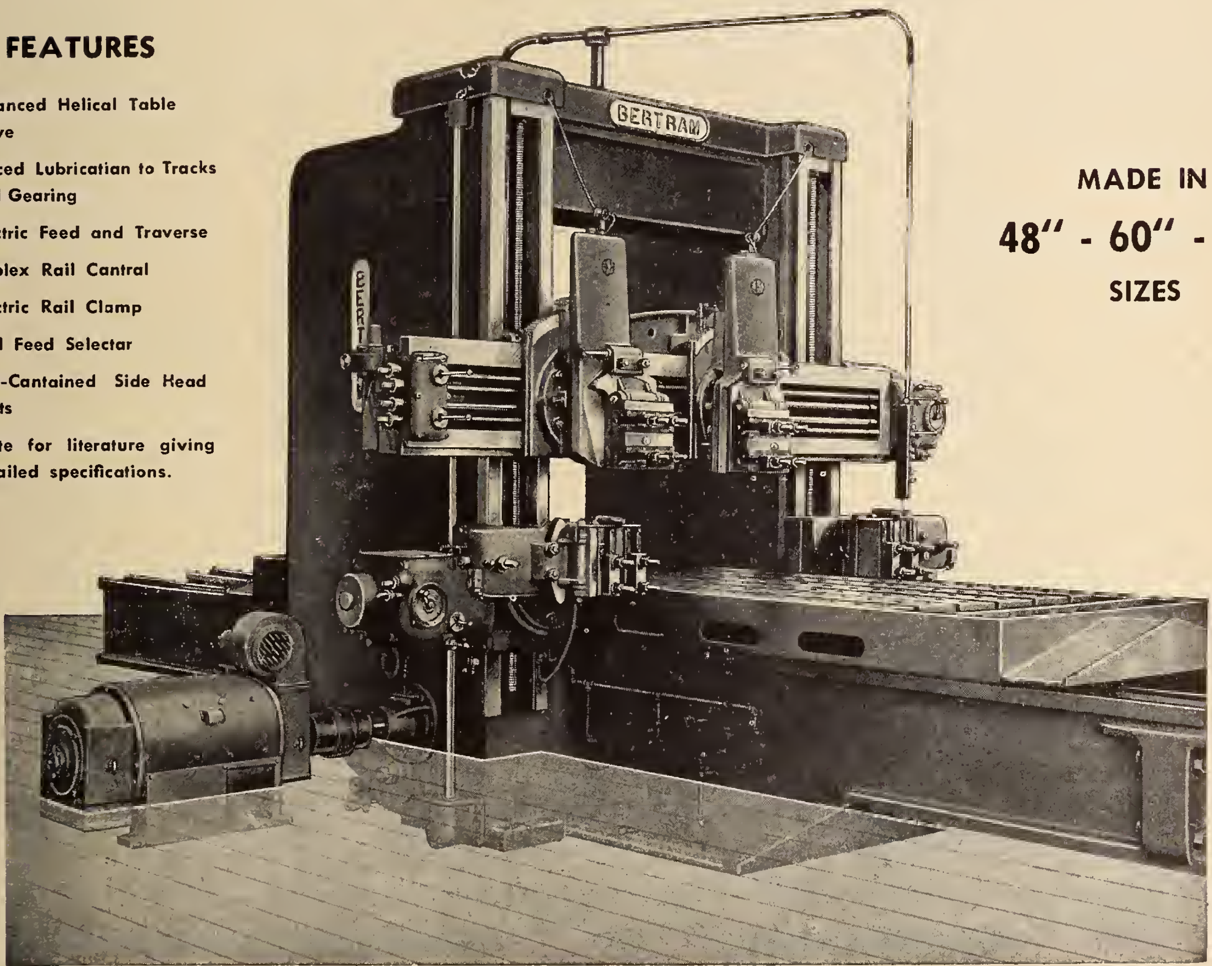
- ★ Write for literature giving detailed specifications.



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Venus...the Symbol of Perfection

In 2000 or more years of sculpture, the Venus de Milo stands alone, unequalled in perfection.

And through all the modern changes in art and methods of drawing . . . Venus Pencils are preferred by artists, architects and draftsmen, as the most perfect drawing pencils.

Whether the artist seeks sharp, clean lines, soft shadows or "imagination" . . . he can always unfailingly find exactly the grade of pencil he needs in one of the Venus 17 degrees.

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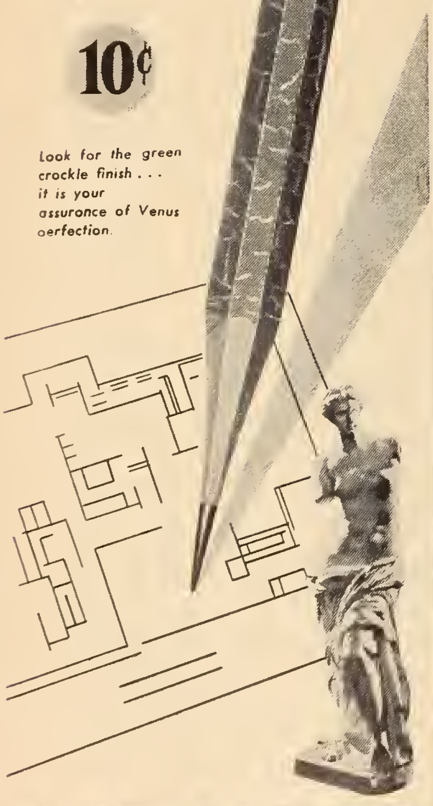
Look for the green crackle finish . . . it is your assurance of Venus perfection.



VENUS

DRAWING PENCILS

Venus Pencil Co. Limited, Toronto, Ont.

Paint Application.—To speed up painting mechanically while retaining the advantages of brush application, a U.K. firm has developed a new self-feeding painting equipment. It consists of a pressure container, which delivers the paint to the interior of the brush, and charges the bristles.

●

High-Alumina Cement.—In order to give the best possible service to firms and individuals interested in the use of high-alumina cement, Ciment Fondu Lafarge (Canada) Limited, Marine Building, 1405 Peel St., Montreal 2, Que., have secured the services, for a limited time, of Mr. P. Wilson, a member of the staff of the British manufacturer of this well-known cement. For further details as to the availability of Mr. Wilson's services please communicate with the Canadian representative.

●

C.G.E. Plant Expansion.—Construction will begin soon on an addition to conduit production facilities at C.G.E. Davenport Works. The storing and handling of finished heavy-wall and thin-wall conduit will be improved in the new building by means of mechanical handling and a specially-designed storage pit.

●

Plastics Exhibition.—The British Plastics Exhibition and Convention will be held in London from June 6 to 16, 1951. It will be held in the National Hall, Olympia, London, and the exhibitors will be British and Commonwealth firms which produce, mould, or fabricate plastic materials or supply raw materials or equipment to the plastics industry. The Convention is being organized by a committee on which are represented the British Plastics Federation, the Plastics Institute, and the Plastics and Polymer Group of the Society of Chemical Industry. Convention sessions will fall into three categories—morning lectures for technicians in the plastics industry, afternoon technical or semi-technical lectures for the chemical and consumer industries generally, and special sessions for the public including women's organizations on such subjects as the uses of plastics for the home.

●

Norstel Scaffolding. — Arrangements have been completed whereby the Dominion Bridge Co. is the sole Canadian distributor of Norstel Scaffolding which is made in Southport, England, by the Northern Steel Scaffolding and Engineering Co. Ltd.

Ample stocks are available in Montreal and it is expected that, in due course, stocks will be carried in Dominion Bridge Co. plants from coast-to-coast. The principal features of this scaffolding are — extreme lightness, absolute safety, ease of erection and instant ability to meet various site conditions. It is approved by Canadian municipal and other safety regulations.

The scaffolding is of tubular construction and as it is very light, being made of high-duty aluminum alloys, it weighs approximately one-third of corresponding steel parts. Only one tool (a box wrench) is required for erection and dismantling and by the addition of simple ball bearing castors it can be adapted for interior use. The scaffolding is available either for rent or for outright sale.

Address enquiries to Dominion Bridge Co. Ltd., P.O. Box 280, Montreal.

●

Canadian-Built Buses. — Marmon-Herrington Co. Inc., Indianapolis, Ind., has just completed arrangements whereby its new line of motor coaches will be built, sold, and serviced in Canada by the Welles Corpn. of Windsor, Ont. Marmon-Herrington recently acquired all manufacturing and sales rights of Ford Motor Coaches. While the coaches being produced under the Marmon-Herrington name are basically the same as those manufactured by Ford, a number of design improvements have been incorporated to increase strength and length of life. Made in two size ranges—27-29 passenger and 31-35 passenger—the new motor coaches are ideally suited for service on feeder and cross-town routes in large cities, main routes in small cities and suburban routes.

●

Large Transformers. — What are claimed to be the 8 largest capacity auto-transformers built in Canada have been completed by Canadian General Electric Co. Ltd. for the Hydro Electric Power Commission of Ontario. They are rated as follows: type OFP, 3 phase, 60 cycles, 55 degree C rise, 228800/116900 Grd. Y volts, Tertiary winding 12750 volts delta. The main winding has an input capacity at 228800 volts of 90,000 k.v.a. and an output capacity at 116900 volts of 100,000 k.v.a., 90 per cent power factor lag when simultaneously loaded with the tertiary winding rated 45,000 k.v.a., 0 per cent power factor lead. The transformer is cooled by five forced-oil, forced-air three-fan coolers.

●

WATERTIGHT DAMPPROOF GASTIGHT

Concrete made with the addition of 'PUDLO' Brand Waterproofer is gastight for the same reason that it is watertight . . . owing to its densification and to the elimination of pores and capillary canals. How these qualities are achieved is fully described in our useful waterproofing specifications booklet (EJ-508). A copy will be sent to you free on request.

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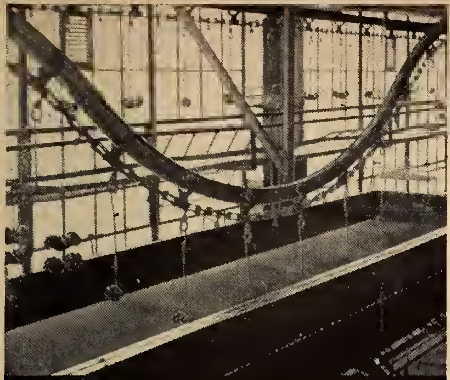
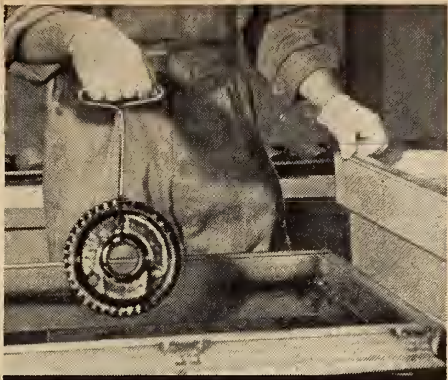
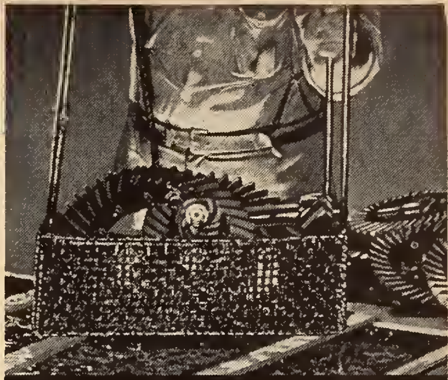


Hot or cold dip by conveyor system automatically coats parts with NO-OX-ID.



Hand application of NO-OX-ID by hot dip using thermostatically controlled tank.



Ring gears, pinions, steering knuckles dipped in NO-OX-ID by means of a wire basket.

Typical spray gun application of NO-OX-ID rust preventive on engine head castings.

Applying NO-OX-ID rust preventive to plowshares by means of brushing.

There's a NO-OX-ID rust preventive for every requirement and application method.

PROTECT YOUR PRODUCTS FROM RUST WITH THE CORRECT NO-OX-ID

There is a NO-OX-ID specifically suited to prevent corrosion on the metal products which you manufacture—while in your plant, in storage, in shipment and on your dealer's shelves. Whether the nature of your products requires a coating that is transparent, heat resisting, cold resisting, lubricating, solvent-free or dry to the touch, there is a NO-OX-ID to fill your requirements.

There is also a method of application suited to your operation. NO-OX-ID may be applied by hot or cold dip—either by hand or conveyor. It may be sprayed or brushed on—it may be protected in NO-OX-IDized wrappers.

NO-OX-ID will also play an important part in protecting the equipment in your plant, your out-buildings, storage tanks, and metal surfaces wherever corrosion threatens. Lower maintenance costs are made possible with NO-OX-ID.

Dearborn has been serving industry since 1887—put these years of experience to work for you, preventing corrosion on your products and in your plant. Consult with a Dearborn Engineer—he will advise you as to which NO-OX-IDs are best suited to your needs.

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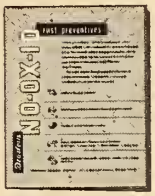

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A complete introduction to Dearborn NO-OX-IDs with valuable information to help you protect against rust in your plant and on your product. Mail the coupon.

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City.............................*State*.........

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THE ORIGINAL RUST PREVENTIVE

NO-OX-ID
IRON + OX = RUST

Power Show.—From November 27 to December 2, 1950, the nineteenth exposition of power and mechanical engineering will be held in the Grand Central Palace, New York. This year's exposition will be held under the auspices of the American Society of Mechanical Engineers. Plans for the exposition are far advanced assuring exhibits covering every aspect of power from the raw fuel to the light switch or the production machine. A large proportion of the exhibits will deal with fuels, fuel handling and combustion, and a number will reveal improvements directly aimed at the suppression of fumes and dust.

●

Temperature Control.—A new proportional action recorder-controller, useful in many of the processing industries and in all applications where a record of the controlled temperature is desired, has been announced by Johnson Temperature Regulating Company of Canada Ltd. The new instrument is called the "Record-O-Stat". It is designed to control either air or liquid temperatures. It may be operated as either a direct-or reverse-acting controller to suit the requirements of the application. Sensitivity of control action is readily adjustable to any required degree simply by varying the throttling range, which is adjustable up to 100 per cent of the chart range.

●

Air Transportation Conference.—New developments in ground facilities for landing and dispatching aircraft and for handling air passengers and cargo will be the subject of a conference on ground facilities for air transportation, to be held as a part of the 1950 summer session at the Massachusetts Institute of Technology, September 12-14, 1950.

●

Cold Rolling Plant.—Cold Rolling Equipment for heavy steel billets, believed to be the only installation of its kind in Canada, is now in use in the Davenport Works (Toronto) of Canadian General Electric Company. This equipment is used primarily for the formation and rolling of heavy steel plate for magnet frames, wrapper plates, and similar components for G.E. motors and generators. It is anticipated, that there will be adequate capacity to serve other firms as well as to do work for the Company. The equipment consists of two rolls, one medium and one large and a 1,000 ton hydraulic press. Mild steel plate 1½ in. thick x 30 in. wide can be rolled into complete circles on the medium roll and 2¼ in. thick by 48 in. wide on the large roll. Plate up to 5 in. thick, but in correspondingly narrower widths, can also be handled. All the equipment was made in Canada.

●

Metal Spraying.—Metal Spraying, using wire, has been known since 1910. In 1935 an improved method of spraying metals utilizing metallic powder instead of wire was developed by the Schori Metallising Process Ltd. of London, Eng.

As the result of wide experience in the field of metal spraying and as a culmination of many years of experimental and development work, the Company has now produced a completely new type of pressure fed powder spraying pistol which can spray metal at the rate of 400 sq. ft. per hour. This new pistol also makes it possible to apply a much heavier coating than with older types of equipment. Further, it has no moving parts and it is claimed to be the only spraying pistol where the gas and powder flow ceases when the operator is turning work and relights automatically when it is desired to recommence spraying.

The new equipment can apply a wide variety of metallic coatings such as zinc, aluminium, tin, lead, steel, cast iron, in fact practically any metal having a melting point below approximately 2,000 deg. centigrade. Typical applications of the process are the use of zinc to prevent corrosion of iron and steel, aluminium to prevent corrosion in sulphurous atmosphere and to counteract attack by heat corrosion. Many plastic coatings can also be applied both for protective and decorative purposes, some of the most commonly used plastics being polythene, thickol, polymerised shellac and cellulose acetate butyrate.

The managing director of the Schori Co. is planning to visit Canada in September and October to give a demonstration of this new equipment and to appoint Canadian agents.

●

New Glass Block.—A new type of light-directing glass block, designed to provide better distribution of daylight for school classrooms, has been introduced by Pilkington to the Canadian market.

JUST ONE REPAIR IN 10 YEARS OF USE!

"U.S." Electric Plants are Dependable!

This 15-KW "U.S." unit has operated approximately 6,500 hours in a garage in Hadley, Mass., with just one minor repair—the replacing of a coupling bolt! Another proof that "U.S." simple design and rugged construction pay off. There's a "U.S." unit to fit your needs. Write for information.

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INSPECTION & TESTING...
— of foundations, concrete and steel.
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LIGHTWEIGHT
BOILER BLANKETS

SPUN ROCK WOOL HEAT COLD SOUND INSULATION

Spun Rock Wool Blankets, used as lagging of boilers in industrial steam plants, are amazingly light in weight. They can be made in any thickness and shape, fit any contour. Breaching; hot ducts; feed water tanks; in fact; any part where the temperature does not exceed 1000°F, can be vastly improved by application of Spun Rock Wool Insulation.

In Bulk, Batts, Blankets, Pipe Covers. For samples and information write

SPUN ROCK WOOLS LIMITED
THOROLD ONTARIO
Represented by
NORMAN A. SMITH CO., 96 Vine Ave., Toronto 9
ASBESTOS LIMITED, 1192 Beaudry St., Montreal

The new block is known as Insulux Light-Directing Glass Block No. 363. For details apply to Pilkington Glass Ltd., 165 Bloor St. E., Toronto.

●

Street Lighting Recorder.—Canadian General Electric Co. Ltd. have developed a new light-measuring and recording device for street illumination. It consists of an "electric eye" mounted on a small carriage, connected by a 30-foot aluminum tube to an automobile carrying an amplifier and graphic recorder. The light-sensitive "eye", riding only six inches above pavement level, trails far enough behind the auto to have an unobstructed view of the highway lighting. The set-up is said to permit the accurate measurement and recording of varying amounts of light along many miles of roadway at the rate of ten to twenty miles per hour. Driving mechanism of the recorder is connected to the auto's speedometer cable with the result that distance travelled is accurately recorded on six-inch paper roll of tape. Further details may be obtained from the Company.

●

Temperature Control. — The Minneapolis-Honeywell Regulator Co., Leaside, Ont., announce a new device for measuring and controlling extremely high temperatures, up to 7,000 deg. F., in nuclear and atomic energy research and other projects. "It is designed," said Honeywell engineers "for sighting on relatively small targets, through a clear path of but one-quarter inch in diameter. It consists of a lens and thermopile. In operation, radiant energy from the hot target is focussed by the lens on the sensitive thermopile. The amount of radiant energy received by the thermopile determines the temperature to which the hot junction will rise. By a continuing series of determinations and evaluations the temperature of the hot object can be constantly indicated or recorded".

The chief purpose of the new instrument is facilitating measurement of very high temperatures, for nuclear work and in the operation and maintenance of atomic energy projects.

●

Building Research Conference. — A comprehensive congress on building research is to be held in London, England, from September 11th to 20th, 1951. It will be the first of its kind ever to be held and will mark the rapid development in building science made since the end of the war.

The congress is sponsored by British professional institutions and learned societies interested in building science and by government departments, with the support of representative industrial federations in Great Britain. The department of scientific and industrial research is providing the central organization for the conference. Papers are being invited from research workers in many countries on a wide range of topics, and arrangements are being made to welcome to the congress a large number of visitors from overseas.

The congress will be organized in three divisions which will hold concurrent meetings. Visits to buildings of interest and to civil engineering works will be arranged. Complete details may be obtained from the Division of Building Research, National Research Council, Ottawa.

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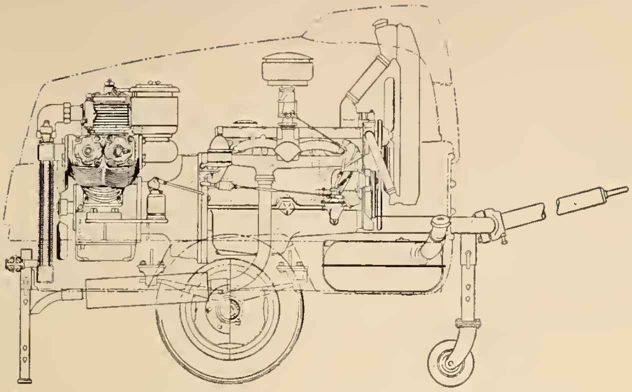


NEW AIR COMPRESSOR

Lighter—More Efficient
All-Canadian Design and Construction

A new, light, air compressor, all Canadian in design and construction, has been developed by the Canadian Ingersoll-Rand Co. Ltd. Announcement of this machine appeared in the July issue of the Journal.

The compressor, known as the "All-Canadian" was designed, and will be manufactured entirely at the Company's Sherbrooke, Quebec plant.

Great Efficiency

The manufacturer claims that the compressor has 19 per cent greater capacity and is 30 per cent lighter and 25 per cent smaller than previous equipment designed by them to do similar work.

The delivered capacity is 125 c.f.m. at 100 lb. pressure. This performance was selected as the most suitable for use in Canada by municipalities, public utilities, steel erectors and similar users of portable air tools.

Compressor & Power Units

The compressor is of the two-stage type with channel-type valves, and dual-flow intercooling.

Air output is controlled by a regulator known as the U.L. 83 which controls the engine speed according to the demand for air and therefore maintains maximum working pressure. This method of control effects fuel economies and reduces wear. The power unit is made in Canada by Chrysler and is rated at 40 hp. The compressor draws 28 hp. at a full load speed.

Plastic Housing

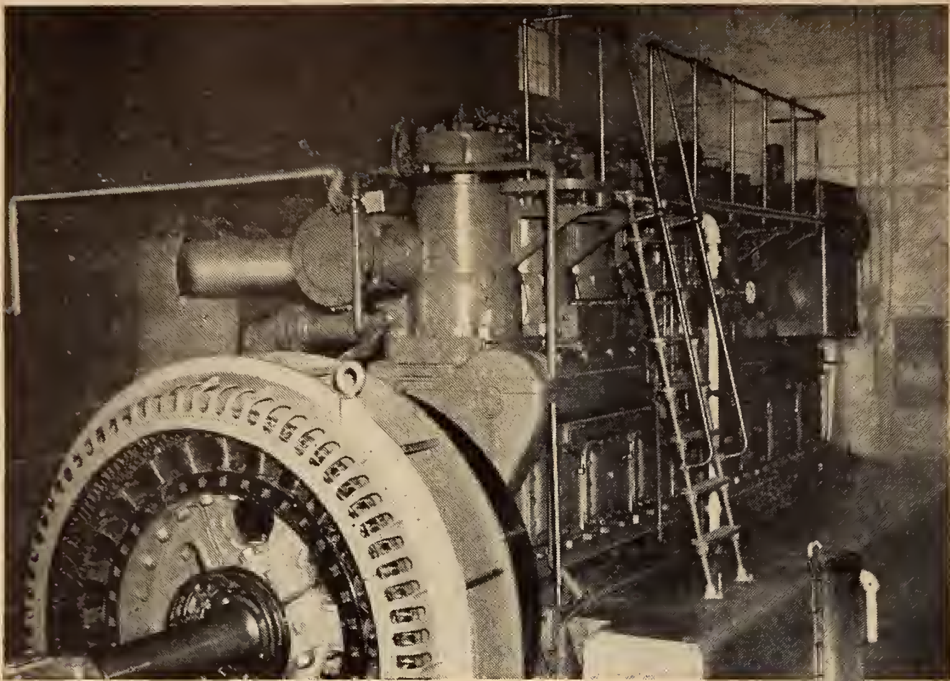
The frame and air receivers are combined and are of tubular construction. The housing is made of "Fiberlast", a plastic moulded from fibre glass which is impregnated with a synthetic resin. This covering is light and extremely strong — having an impact resistance higher than a sheet steel housing.

Many new features have been introduced to make operation control convenient and simple. All air connections are accessible from the outside of the machine.

All instruments can be seen when the unit is operated with the housing closed. The tow-bar can be easily adjusted to the height of the towing vehicle and swung into a vertical position when the machine is not in use to save storage and parking space.

Dimensions

The principal dimensions are: 7 ft. 6 in. long (with tow-bar raised), 5 ft. 4 in. high, 5 ft. 8 in. wide. Total weight is only 2,500 lbs. Descriptive literature can be obtained from Canadian Ingersoll-Rand Co. Ltd., Birks Building, Montreal.



CANADA CEMENT COMPANY INSTALLS ANOTHER **FAIRBANKS-MORSE DIESEL**

Other equipment supplied by Fairbanks-Morse to Canada Cement Company in its Steep Rock modernization programme:

Two Fairbanks-Morse Centrifugal Pumps with 7½ H.P. motors for water cooling.

One Waterous Rotary Pump driven by a 10 H.P. motor for pumping lubricating oil.

One Fairbanks-Morse Centrifugal Water Pump.

One Fairbanks-Morse type HI Compressor, V-belted to a Fairbanks-Morse 3 H.P. gasoline "Z" engine.

When Canada Cement Company Ltd., decided to expand its quarrying operation at Steep Rock, Man., it selected a Fairbanks-Morse Diesel and Generator to supply the necessary power. The decision was made as a result of the economical and dependable operation of a 6 cylinder, type Y, 360 H.P. Fairbanks-Morse Diesel in service at Steep Rock since 1927. The new unit installed was a Fairbanks-Morse Model 33, pump-scavenging, 805 H.P. Diesel, directly connected to a Fairbanks-Morse 695 k.v.a., 2400 volt, 60-cycle generator.

Power is transmitted from the power house to the crushing plant and quarry at the generated voltage, with step-down transformers at both places. At the quarry, power is used to operate the blast hole drill and also an electric shovel for loading blasted rock. This shovel replaces a steam shovel which is now kept for standby service.

The Steep Rock plant, most northerly of Canada Cement Company's quarries, is now a flexible, well-powered operation, and is an excellent example of the efficiency and dependability of Fairbanks-Morse Diesel engines and generators. At each one of the Fairbanks-Morse branches the services of competent engineers are available to discuss Diesel power in all its applications. For full information call our nearest branch.

The CANADIAN **Fairbanks-Morse** COMPANY *Limited*

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APPLICATION of DIESEL ELECTRIC LOCOMOTIVES

by

P. L. Mathewson, M.E.I.C.

Transportation Engineer,
Canadian National Railways, Montreal.

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

This paper is an attempt to describe the principle characteristics of the diesel electric locomotive, to explain why it has attained its present favourable position, and to touch briefly on the applications of this type of motive power which have been made on the Canadian National Railways.

A diesel electric locomotive utilizes a diesel engine as a prime mover, with electrical equipment transmitting the power from the engine to the driving wheels. Such a locomotive has in effect three power plants; first the diesel engine, second the generator driven by the engine, and third the motors which are geared to the driving axles.

In order to change the constant torque characteristic of the diesel engine to that desired for locomotive use, namely high torque at low speeds varying to lower torque at high speeds, a transmission of some sort is necessary. Mechanical transmissions have not proved satisfactory for the amount of power which must be handled, although they are used occasionally in the United States and to a greater extent in England and on the continent of Europe on small locomotives. The electric transmission, while heavy and expensive, is well suited to the job. By means of the proper combination of generator, motors and control equipment, a constant horsepower is delivered to the driving wheels of the locomotive

Fig. 1 (above). A modern 3,000-hp., 2-cab, diesel electric road freight locomotive.

through practically its entire speed range, as long as the diesel engine is operating at a constant speed.

The types of diesel engine used in the standard locomotives built in North America vary considerably. They may be 2 or 4 stroke cycle; conventional design or opposed piston type; normally aspirated, or equipped with a blower or with a turbo-supercharger driven by the engine exhaust gases. Each type represents its particular manufacturer's ideas of balanced design, having consideration for ruggedness, efficiency, ease of maintenance, weight and cost.

The generator, which is coupled to the diesel engine, is a variable voltage d-c machine, the voltage being altered automatically to maintain substantially constant horsepower output from the engine for any throttle position as the current changes. The motors, which are geared to the driving axles, are of the direct current series type which has the characteristic of increasing torque with decreasing speed. In order to obtain good engine horsepower utilization over the speed range it is necessary to resort to field shunting of the motors, and usually to re-grouping the motors in series across the generator.

The arrangement which is practically standard in most of the larger units today consists of four driving motors fed from one generator. At slow speeds the motors are connected in series parallel, that is in two groups of two motors in series across the generator armature. As the speed increases the motor fields are shunted. With a further increase in speed the motors are connected so that all four are in parallel across the generator armature, with no field shunting. When the speed increases still more the fields are again shunted. These various steps or transitions may be made manually or automatically. Automatic transition ensures that the change takes place at the most favourable time. It also relieves the engineman of the duty of manipulating the transition lever.

In addition to the main power plant and transmission the locomotive contains the necessary items of auxiliary equipment; the principal ones being an exciter and auxiliary generator, storage battery, air compressor for train and engine brakes, cooling fans for the engine and electrical equipment, and lubricating, fuel oil, and air intake filters.

Describing the principal characteristics of diesel locomotives, this paper lists the various classes of locomotives presently available. The factors responsible for the favoured position of diesels are shown, and the economies that can be effected in main line services through their use are discussed. In conclusion the application of diesel locomotives on the Canadian National Railways is given.

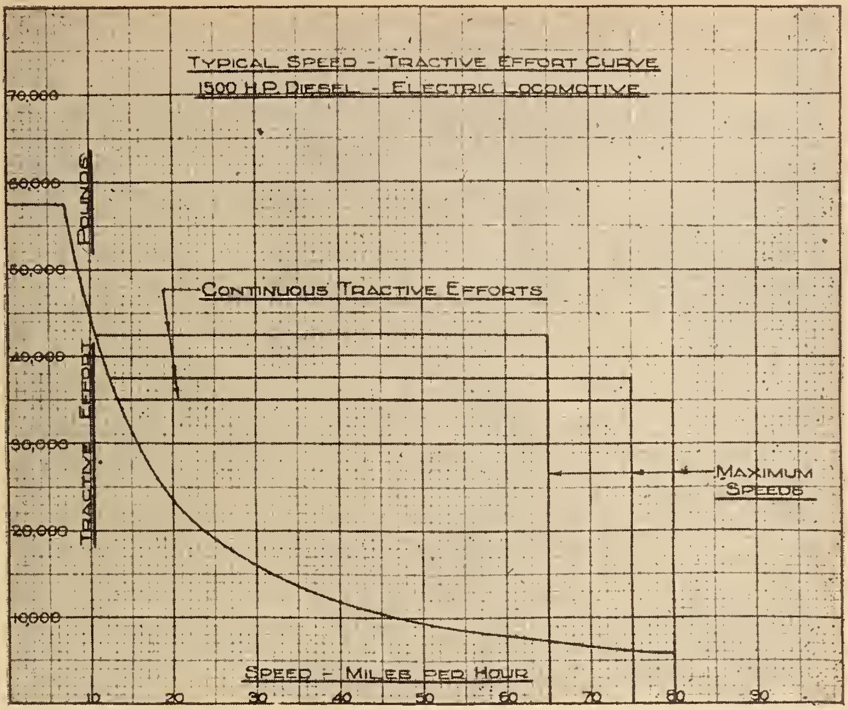
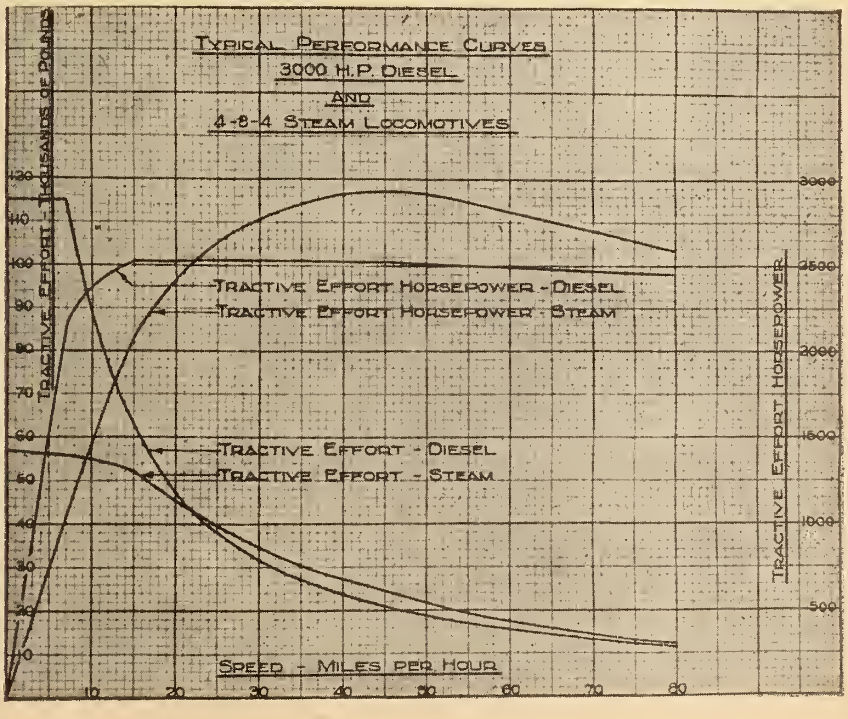


Fig. 2. Speed vs. tractive effort for a 1,500-hp. diesel electric locomotive. (Three curves shown are for three different gear ratios.)

Fig. 3. Performance curves for 3,000-hp. diesel and 4-8-4 steam locomotives.



Various Types Available

The locomotives available today in this country can be divided into four main classes, namely freight, passenger, road-switcher and switcher. The division between classes is not clear cut, and in many cases a locomotive can be used interchangeably in various services. Generally speaking, a locomotive designed specifically for passenger service will have a higher ratio of horsepower output to continuous tractive effort than a freight locomotive. It will usually have built into it a steam generating unit for heating the passenger cars, and tanks with an adequate supply of water for this train heating boiler.

A typical freight unit is rated 1,500 or 1,600 horsepower, with a total weight, all on drivers, of 230,000 to 250,000 pounds, and a continuous tractive effort of 25,000 to 52,500 pounds. A typical passenger unit is built in sizes from 1,500 to 2,400 horsepower with a total weight varying from 230,000 to 320,000 pounds, and a weight on drivers between 202,000 and 252,000 pounds. Its continuous tractive effort varies from 19,500 to 52,000 pounds.

The switcher is built in smaller horsepower ratings than either the road passenger or freight types, to conform to the work for which it is intended. As starting tractive effort is important in this service, its weight in relation to its horsepower is usually greater than for the road types. The range in this classification is generally between 600 and 1,200 horsepower, with weights, all on drivers, ranging from 198,000 to 250,000 pounds and a continuous tractive effort varying from 23,000 to 41,000 pounds.

The road-switcher is intended, as its name implies, to be used either in yard switching service or in handling freight and passenger trains; usually smaller trains than would be hauled by the straight road types. It can be purchased in sizes from 600 to 1,500 horsepower, in weights 140,000 to 250,000 pounds, with continuous tractive efforts between 23,000 and 52,500 pounds.

The horsepower ratings mentioned indicate the maximum horsepower available from the diesel engine to the main generator for traction. The engine must be capable of delivering power some 10 per cent in excess of this amount, in order to drive the various auxiliaries. This description of the various classes of units is merely illustrative of recent stock models, and does not take into account special locomotives. In the lower horsepower sizes particularly, there is a large variety of switching locomotives ranging upward from 150 hp. and 50,000 pounds weight. These are intended primarily for industrial switching applications, rather than railroad use, although the C.N.R. does possess a few units of some 350 hp. and 88,000 pounds weight. At the other end of the scale locomotives have been built with an output of 3,000 hp. from two engines in a single cab.

Flexibility in Operation

Any of these types of locomotives can be operated in multiple unit. Two, three or four units can be connected together and operated as a single locomotive by the driver in the leading cab. As a result, a further distinction has grown up in the freight and passenger classes particularly. Units, generally designated as "B" cabs are built without an operator's compartment. These are designed to run in multiple unit with an "A" cab which has the necessary operating controls. Various combination of "A" and "B" cabs are used, depending upon the service requirements.

The continuous tractive effort is the tractive effort which the locomotive can exert continuously without damage to the electrical equipment. The tractive effort varies directly with the motor current, so this value depends upon the current rating of the generator and motors, as well as the ratio of the gearing between the motor and driving axle. A choice of different gear ratios is available, as illustrated in Figure 2, which represents one particular make of locomotive. It will be seen that the use of a gear ratio which gives a high continuous tractive effort limits the maximum speed at which the locomotive can operate, to a lesser value than is the case with a gear ratio giving a lower continuous tractive effort.

It is advantageous to utilize the overload capacity of the motors for a relatively short time in order to exert more than the continuous tractive effort. This feature is of great value in certain territories where fairly short and steep grades must be negotiated. An indication of the permissible overload for one make of traction motor is given in the following table.

Time	*Percent of Continuous Tractive Effort*
Continuous	100
45 Minutes	111
20 Minutes	122
10 Minutes	133
6 Minutes	144
4 Minutes	155

The continuous rating is, of course, nearly always exceeded for short times in starting a heavy train, and in switching operations. The maximum tractive effort is also limited by the adhesion of the locomotive to a value of about 30 per cent of the weight on drivers during starting with a normal rail condition.

A feature which can be incorporated into these locomotives which is of great value in many cases is that of dynamic braking. The traction motors are used as generators, and the energy generated is dissipated in resistors. This saves considerably on brake shoe and tire wear, and makes for improved handling of the train, especially where there are long grades to be descended.

Advantages Claimed for Diesel Locomotives

There are five factors chiefly responsible for the present day favoured position of the diesel electric locomotive compared to the steam locomotive. These are:

(1) Smaller fuel costs,
(2) Lower repair and servicing costs,
(3) Greater availability,
(4) Higher utilization of available horsepower over the speed range,
(5) Increased flexibility.

Fuel costs will naturally vary in different sections of the country, but basically the diesel electric locomotive has an overall thermal efficiency from fuel to driver rim of approximately 25 per cent, while a steam locomotive in road service will have an efficiency at full load of not much over one quarter of this. The overall efficiency of a steam locomotive in switching service is still lower. At present day fuel prices in Central Canada the ratio of diesel locomotive fuel costs to those of steam locomotives is approximately 1 to 2 for passenger and through freight service, and 1 to 4 for yard switching service.

In any specific application the fuel cost ratios may vary from those given above due to variations in the profile of the railroad, and the type of steam motive power in service. Yet these figures indicate the order of magnitude of the possible fuel economy. In Western Canada the oil burning steam locomotive can utilize the relatively cheaper bunker "C" oil or equivalent heavy crudes, and here the fuel economy of the diesel is less pronounced.

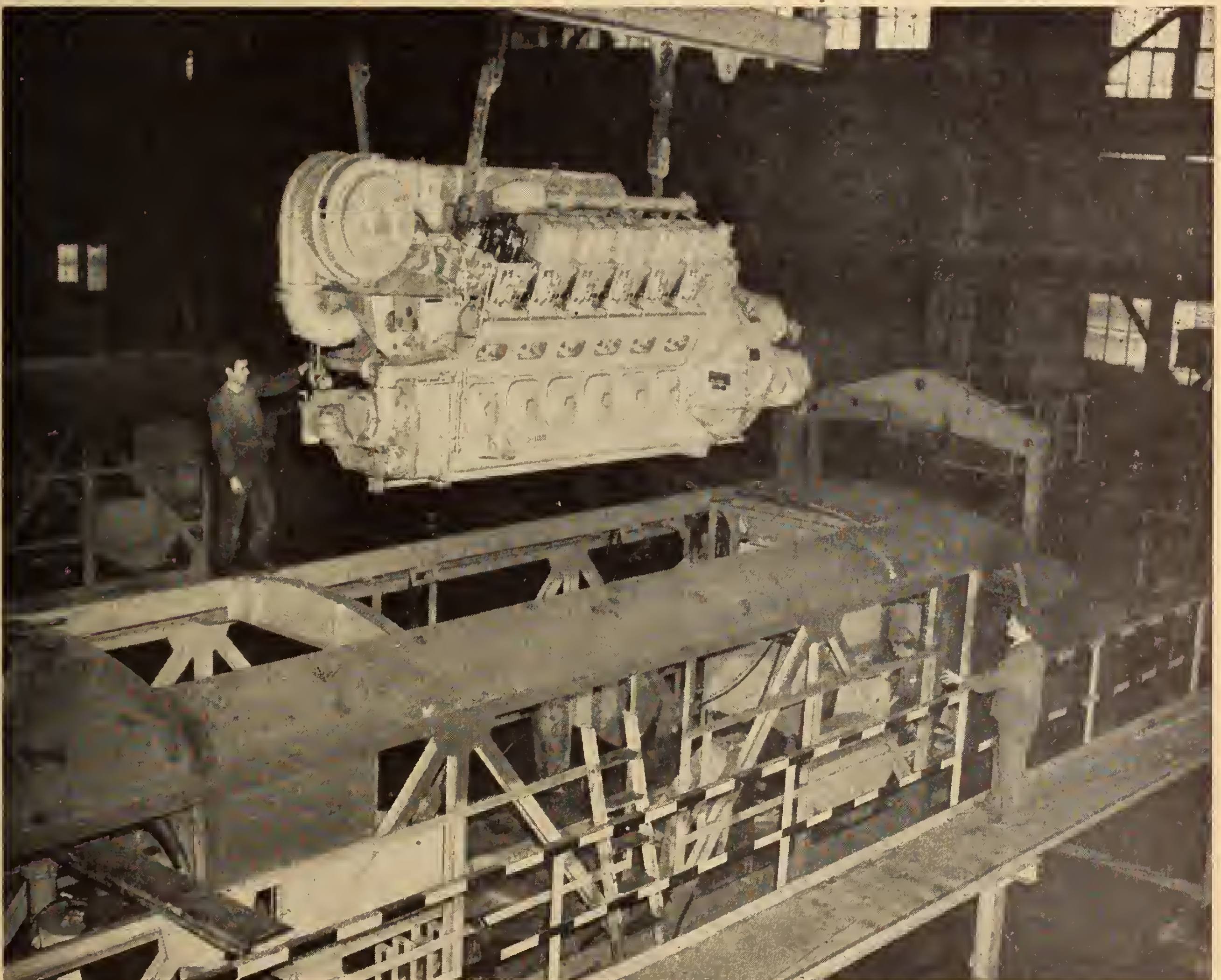
It is difficult to give truly comparable figures of repair costs of steam and diesel power, as usually a relatively new diesel locomotive is being compared to an older steam unit. Making allowance for this feature, and attempting to put both types of power on the same basis, the comparison is about as follows: Diesel road locomotives will average slightly lower repair costs per mile than steam road locomotives over their life. Diesel switchers repair costs per mile will average about 65 per cent of those for steam switchers. Enginehouse expense per mile for diesel locomotives will be about one third that of steam power. Enginehouse expense is the term used to designate servicing costs of a locomotive as distinct from repair costs.

In order to show the relative importance of the possible savings, fuel cost per mile for a steam locomotive can be taken as $2\frac{1}{2}$ to 3 times greater than the repair cost, while enginehouse expense will average from 15 to 35 per cent of the repair cost. These figures are approximate, and apply to coal burning locomotives in freight service in Central Canada.

Availability is a term used to designate the percentage of time the locomotive is available for use by the transportation department of the railroad. The more time required for servicing and repairing the locomotive the lower the availability. For diesel electric locomotives in road, freight or passenger service, an availability of 85 per cent can be sustained, and in switching service a figure of over 90 per cent is to be expected. Steam locomotives, on the other hand, will seldom exceed 65 per cent in this index, and in general will show a lower value. This means that two diesel locomotives will do the work which requires nearly three steam locomotives of comparable size. This factor goes a long way towards discounting the higher first cost of a diesel locomotive compared to that of a similar size steam unit.

As mentioned earlier, the diesel electric locomotive will deliver practically constant horsepower over most of its working speed range. This is not true of the steam locomotive. It will deliver its maximum horsepower at some designed speed, usually between 30 and 60 miles an hour. At lower speeds the horsepower falls off considerably, and at a speed of 10 to 15 miles an hour where a freight locomotive is expected to work in handling a train up comparatively short

Fig. 4. Lowering engine into cab of a 1,500-hp. unit.



grades, the horsepower available may be only two thirds or less of the maximum. This, of course, has a direct bearing on the size train it is able to handle up the grade. Comparative curves for typical diesel and steam locomotives shown in Figure 3 illustrate this point.

More Efficient Service

The diesel electric locomotive derives its greater flexibility from the ability to connect as many cabs together in multiple unit as desired. The motive power can thus be adjusted to the load more closely than is possible with steam locomotives, by adding or subtracting units as required by traffic or schedule changes.

There are other minor advantages of this type of power, among which are its high starting tractive effort compared to a steam locomotive, and its freedom from smoke, cinders and sparks. The high starting tractive effort is valuable for switching purposes, for starting heavy freight trains, and for getting passenger trains under way without the jolting sometimes encountered with steam locomotives. Its freedom from smoke and cinders makes it a much appreciated unit in cities, while the absence of sparks reduces the fire hazard on lines traversing heavily wooded areas.

It will be seen from the foregoing that the economic advantages of the diesel electric locomotive are most apparent in the case of switching locomotives, especially in locations where they can be operated 24 hours a day. Next in order come freight applications in heavy grade territory, when it is necessary to resort to double heading of steam locomotives to handle a sufficiently heavy train, and where the inherent high tractive effort at low speed characteristic of the diesel electric locomotive is very advantageous.

The use of diesels in heavy mainline freight or passenger service will often yield substantial economies. In this type of service, however, the steam power is usually the most modern and efficient on the railroad, and it is necessary to select the runs for the diesel locomotives with care in order to take full advantage of their higher availability. They can be used to handle part of the base freight load in high traffic sections, but for each section there is a definite number of locomotives which will produce the greatest annual saving per unit purchased. Beyond that number the average utilization will decline, and each additional locomotive will yield progressively smaller savings.

The complete dieselization of a section of the railroad, replacing all steam locomotives, may prove attractive in many cases, as it allows the complete removal of facilities for steam locomotive maintenance and for coal and ash handling, and the retirement of intermediate water stations. This type of programme does not always yield as high a return on invested capital as might be first expected, as it is necessary to provide sufficient diesel locomotives to take care of peak traffic conditions. Unless these can be utilized to advantage elsewhere during light traffic periods, the savings effected, expressed as a percentage of the first cost, may be less than if some steam locomotives were permitted to remain to handle the peaks.

Every location is different and has its own problems and peculiarities. It is possible, at present fuel prices, however, to find territories or runs where the application of diesel locomotives will return annual gross savings up to 20 per cent on the capital invested. As long as these conditions exist the purchase of this type of power will continue.

Diesel Equipment of Canadian National Railways

A brief description of the application of diesel locomotives on the Canadian National Railways will illustrate some of the points mentioned earlier. The C.N.R. pioneered in the application of this type of motive power in North America, commencing with diesel electric railcars in 1925. In 1928 the first road diesel electric locomotive was put into service. Rated 2,660 hp. in two cabs, it remained the largest of this type of power in the world for a number of years. Like many radically new designs this locomotive had certain weaknesses and it was eventually scrapped, but not before much valuable experience had been gained. In 1930 our first diesel electric switcher, a 71-ton 400-hp. unit, was put into service in Montreal, and it is still in operation and apparently good for many more years' work. At the present time there are 114 1,000-hp. diesel electric switchers in use on the C.N.R. System, in addition to 7 units of less than 1,000 hp.

There are four 3,000-hp., two-cab locomotives in freight service between Montreal and Jonquiere, which is the freight terminal of the line in the Lake St. John territory north of Quebec City, some 312 miles from Montreal by rail. The country traversed by this line is very rugged, and the grades encountered are among the most severe on the system. In this territory one 3,000-hp. diesel electric locomotive handles the size of train formerly hauled by two steam locomotives with a combined maximum horsepower output some 50 per cent greater.

There are eleven 3,000-hp. two cab units in freight service between Chicago and Port Huron and three similar locomotives in the same type of service between Montreal and Toronto. During 1949 the latter three locomotives ran over 450,000 miles, produced more than 1,600,000,000 freight gross ton miles, and achieved a saving in fuel costs of some $300,000 over steam operation.

The railway service on Prince Edward Island is now completely handled by diesel locomotives. There are eighteen 600-hp. 70-ton locomotives on the Island, in addition to two smaller units which were required for one branch line where bridge limitations prohibited the use of the 70-ton size. These locomotives do not have a high utilization, but a satisfactory economy is being achieved in comparison with the very old light steam locomotives formerly used.

During the past winter extensive tests were conducted with diesel electric locomotives on passenger trains between Montreal and Winnipeg, in order to investigate the problem of heating these trains in extremely cold weather with the equipment available for this type of power. These tests showed that satisfactory operation could be expected in that part of the System where very severe winter conditions exist.

The railroads will continue to purchase diesel electric locomotives as long as there is economic justification for doing so, or until some improved form of motive power comes to the fore. Although it will be many years before the last steam locomotive is taken out of service, we are now witnessing the end of a century during which steam reigned supreme, and the beginning of a new era in railroad progress.

The Romance of Vertical Transportation

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

by

A. Pinto

Chief Consulting Engineer,
The Otis Elevator Co.,
New York City.

Tracing the early history of vertical transportation, this paper outlines the development of electric and traction elevators and the evolution of the gearless motor, which brought about great advances in building construction. The demand for increasing speed, and the solutions for this problem, including that of signal control, are discussed.

Various mechanical and electrical safety devices are described, as well as automatic supervising devices and "group supervision". The question of how much elevator capacity is needed for a building is dealt with, showing how escalators can best be used to reduce elevator capacity. In conclusion some examples of recent outstanding installations are recorded and a forecast made of future developments in this field.

All of us enjoy the safety, comfort and convenience of modern vertical transportation, exemplified by the elevator equipment in the many outstanding buildings of your fine city. Let us take a look at the lowly beginnings of this art, and stress the highlights of the various developments which have finally culminated in the present day modern fast equipment. In this way we may fully appreciate the strong technical foundations upon which the industry rests.

The problem of vertically transporting men and material undoubtedly goes back to the very dawn of civilization. Certainly some means must have been provided, of a crude form to be sure, to lift material for the Pyramids, and in later ages for the monuments and large buildings erected during the Greek and Roman civilizations, and, still later, for the Renaissance period. The operation of any lifting devices of this type was manual, and sometimes by animal power.

It was not until the middle of the nineteenth century that mechanical power was applied for the operation of what has since been called an "elevator" or a "lift". In 1853 at the World's Fair in the Crystal Palace in New York an "elevator" was exhibited, conceived by and made under the direction of Elisha Graves Otis, having what is now called a "safety", namely, a device for preventing the fall of a car in case of parting of the ropes.

No attempt will here be made to trace in detail the development of the elevator since that time. Suffice it to say that the early developments were in the direction of hydraulic operation, either water or oil. Maximum speeds of 600 feet per minute were reached by this method, with maximum rise of twenty-five stories. It is evident, however, at least up until now and within the foreseeable future, that the electric elevator has almost entirely replaced the hydraulic elevator.

Early Electric and Traction Elevators

The hoisting machine of the early electric elevator consisted of an electric motor driving a worm gear reduction, which in turn operated a drum upon which a rope was wound to vertically move the car. A counterweight was also operated by the same drum, so that the amount of power needed to operate the car was much less than would otherwise be the case. This type of construction had serious limitations, both as to the height of the building and the speed of operation. The height was limited by the fact that for high rise buildings the drum would be very large and require a great deal of space, and the speed was limited to about 500 f.p.m. without producing objectionable vibrations.

The next important step was the adaptation of friction drive to the elevator. This brought about what is known as the "traction type" of elevator, which greatly simplified matters. The worm gear reduction was retained, but the drum was replaced by a sheave with a multiplicity of ropes, the car being at one end of the ropes and the counterweight at the other end. The "driving" was done through the friction developed between the ropes and the sheave. Various types of groovings were used, depending upon the required amount of "traction", the type of service and the material used for the sheaves.

In the "traction" elevator the same size sheave can fundamentally be used for any rise of building, thus removing the practical limit which drums had imposed on building height. However, the "traction elevator", based on the use of a gear reduction, did not overcome the speed limitations. A later development solved this problem, namely the so-called "gearless machine", wherein the motor drives the traction sheave without the interposition of any gears. The motor used for this purpose must operate at a low speed.

Thus, if the sheave is, say, 30 in. in diameter and the speed is to be 600 f.p.m., the motor speed is required to be only 76.5 revolutions per minute! It is obvious, of course, that the motor speed could be readily increased by reducing the diameter of the sheave. This, however, is not practical beyond a certain limit because the life of the hoisting ropes greatly depends upon the diameter of the sheave as well as on the linear speed of operation. Leading steel rope manufacturers have at all times co-operated with the manufacturers of elevator equipment, so their product could stay "keyed up" to the advances in the elevator art.

A gearless motor does not successfully operate on alternating current, and its field has so far been restricted to direct current. The first installation was made in 1904 at the Duane Street Power Station of the New York Edison Company.

Levelling or "Microing"

A great development in building construction was "sparked" by the arrival of the gearless machine. However, it was not long before it was apparent that more had to be done to keep pace with the needs of vertical transportation. Some means had to be devised whereby after reaching a floor the elevator would automatically bring itself to a position level with the landing. This has since been known as "levelling" or "microing".

The gearless motor was controlled in starting and in slowing down by the use of steps of resistance in series and in parallel with the armature. This resistance form of control was satisfactory only to a limited extent, in that these steps were felt in the car during acceleration and retardation. Furthermore, because the action of the resistance steps varied with the load in the car, it was difficult for the average operator to make correct landings for different loads. These considerations limited the speed of resistance control to approximately 600 f.p.m.

The "variable voltage" or "Ward-Leonard" form of control, wherein a d-c generator armature is directly connected to the armature of the elevator motor, and the field of the generator varied to obtain the desired operation, was, and still is, the answer to this problem. As a result of the application of this form of control, a great impetus was given to vertical transportation and to building, in that both higher speed with smooth operation, and also the question of stopping level with the floor were simultaneously taken care of.

Previous to this, however, the levelling, or microing, operation was also brought about by various other methods, mostly of a mechanical nature, all of which were intended to reduce the speed to a very low value during the so-called "levelling" operation. These methods had, up to then, been particularly applied to freight elevators.

More and More Speed Demanded

It is evident that the elevator area should be restricted to the smallest possible amount. The figure generally used is ten per cent of the total rentable area. From time to time, however, at various stages, it has appeared that a point would be reached beyond which it would be impossible to plan taller buildings, because such buildings would require so many elevators and so much space therefore as to leave the rentable or usable area too small a percentage of the total. The lower the speed the greater the number of elevators required to service a building, and to reduce this number it was first necessary to increase the speed. Thus the speed of 600 f.p.m., which seemed at one time to be a maximum, was later found to be inadequate, and speeds up to 1200 f.p.m. had later to be used.

Not only was it necessary to produce higher speed elevators, but to take stock of all the items which added to what is known as the "round trip time" of the elevator. This is the average time which an elevator takes in moving from the bottom landing to the top landing and back to the bottom landing, making an average number of stops.

In order to give satisfactory service to a building, either the round trip time must be comparatively short, or the number of elevators must be very large.

It behooves us, therefore, to make the round trip time as short as possible, and, in addition to the elevator speed, certain other important problems must be considered, such as:

1. The time for opening and closing of the doors.
2. The time for acceleration and retardation and levelling.
3. The time for the so-called transfer of passengers, namely, taking on or leaving off passengers, or both.
4. Positive pick-up of the hall calls by a group of elevators so as to have only one elevator, preferably the nearest one, stop and pick up the passengers. This may be included as one of the items of efficient operation of an elevator bank.

The solution of these problems required an extremely large amount of work, calling for voluminous statistical data and also the development of new ideas and equipment. However, solutions were found.

Solution 1: In connection with the doors, automatic power-operated equipment was developed which could safely open and close the doors in a comparatively short period of time. At present, the opening of the doors is synchronized with the arrival of the car within the levelling or "micro" zone, so that the doors are opening while the car is levelling, thus saving considerable time in this part of the operation.

Solution 2: Control systems and machine characteristics have been developed which give the elevator smooth, comfortable and yet fast acceleration and retardation. This is of extreme importance in connection with the floor to floor time, particularly where the car stops frequently, and runs of one or only a few floors are the rule. In these

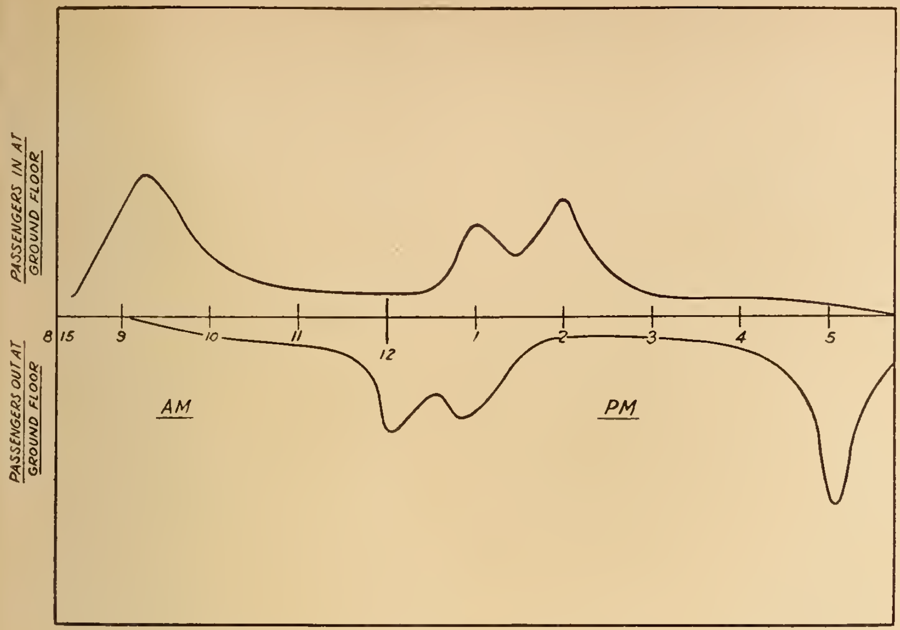


Fig. 1. Passenger traffic flow in a diversified tenancy building.

situations the elevator machine is generally in the process of accelerating or slowing down, and it operates at full speed for only a small fraction of the total running time.

Solution 3: Transfer of Passengers. Transfer time has been improved by the use of reasonably wide door openings, particularly in department stores where cars are large and many passengers are carried at one time.

Signal Control

But the study of the problem involved in group operation brought about one of the greatest contributions to vertical transportation. It is known as "Signal Control" operation. Prior to "Signal Control" a bank of elevators was operated as follows: If a passenger pressed, say, a down hall button, his call was either registered on an annunciator in all the elevators, or was made to give a light flash and sound a gong in the down elevator nearest to the call. Whether an elevator would stop or not, in answer to this call, was dependent upon the elevator operator himself, and in some cases it required great dexterity and fast manoeuvring, following receipt of the signal, to stop at the proper floor. On the other hand, in some cases more than one car would stop at the same floor in answer to the same call.

Thus, the operation of causing a car to stop for a passenger was generally wasteful and inefficient, in that either the passenger was neglected or a car's time was wasted. Furthermore, for speeds above 600 f.p.m. it is very difficult for a human being to react with sufficient promptness to always stop at a floor without over- or under-shooting it. It followed that with the advent of 700 f.p.m. speed and over, a new scheme of operation had to be developed. Signal Control brilliantly met this challenge for high speed group operation of elevators.

Signal Control took away from the operator the entire responsibility of stopping both for hall calls and car calls. When landing buttons are pressed (or "touched" as with electronic touch buttons), the hall calls are automatically registered on a registering panel in the machine room. This automatically causes the car nearest the floor to stop without any action on the operators' part. For calls initiated in the car, the operator presses a button and the car stops at the desired floor. With Signal Control the operator merely has to close the doors and start the car in operation. Thereafter the car will automatically stop either in response to hall calls, of which the operator is not even aware, or in response to car calls which he initiated when the passengers entered the car and announced their destination.

Signal Control was the "signal" for an extremely extensive building development, culminating in some of the most prominent buildings in the world. None of these buildings could have met the challenge of transporting the passengers comfortably and with dispatch without the use of high speed Signal Control equipment and variable voltage control.

During this period great improvements were also made in relocating control equipment which had been previously spread throughout the hatchway, concentrating it in the penthouse where it is accessible for checking and adjustments. Thus, what are known as "selectors" were devised, which are capable of automatically controlling the car through its acceleration, running, slowing down and levelling before stopping.

A selector is, in brief, a miniature replica of the elevator. It is driven by the car through the means of a toothed steel tape in exact synchronism with the car. The motion imparted to the selector drive by the toothed tape is transmitted to a screw, which moves a crosshead up and down, and also to a vertical shaft upon which are placed a series of so-called micro cams. The crosshead

Fig. 2. A very early type of vertical transportation.

motion faithfully reproduces, to a reduced scale, the motion of the car. Stationary "floor bars" carry electrical contacts on each bar which are engaged by electrical brushes placed on the crosshead.

Through these means the selector is made the "brains" of the modern elevator installation. It, together with the car and ball registration devices remembers to stop the car at every floor where a passenger wishes to get on or off; it regulates the retardation; it levels the car at the landing; it controls the opening of the doors, also the signals and indicators, and performs several other important functions primarily in connection with the control of the behaviour of the driving machine with reference to the length of runs, namely, short runs or long runs.

Mechanical Safety Devices

What about safety? During the various stages of this great development taking place in vertical transportation, safety requirements and devices were keeping abreast of the situation. The most important contribution to safety in vertical transportation was the traction elevator, in that the generation of sufficient friction, or traction, between the ropes and the sheave requires from three to eight ropes. This number of ropes is almost always higher than would be required to support the weight of the car, plus the load, plus the ropes themselves (with the car at the bottom) and produces a very high factor of safety. Furthermore, if anything should happen whereby the motor should continue to run and permit either the car or counterweight to strike the bottom, loss of "traction" results. It follows that even if the motor should continue to operate and the sheave continue to turn, neither the car nor the counterweight would be "driven" into the overhead, and the ropes would not be pulled out of their fastenings.

Since the advent of the traction elevator as against the drum, there has been no record of all ropes on this type of elevator having parted, thus dropping the elevator car, except in the case of some unusual happening, such as the crashing of an airplane through one of the elevators at the Empire State Building in New York on July 28, 1945, which cut all ropes, including the governor ropes.

In addition, great improvements have been made in the "mechanical safety" which is designed to operate should the downward speed of the elevator car reach a predetermined value over normal due to any cause whatsoever, such as, perhaps, loss of control of the motor, weak motor field, or any other possible cause including that of rope breakage.

The action of the safety is generally brought about through the operation of a speed governor in the machine room. This governor is connected to the car by means of a governor rope entirely independent of the hoisting ropes. At a predetermined speed above the normal the governor grips its own rope. In so doing it operates the safety on the car by causing "wedges" or "dogs" to extend themselves onto the rails, thus stopping the car.

A variety of safeties have been developed, the application of which generally depends upon the speed of the elevator and the load which it is intended to transport, and also, to some extent, the area of the platform and the physical size of the elevator.

It will be noted that when the governor balls are caused, by excessive speed, to deflect over a certain amount, a rod causes the two geared segments to turn so as to grip the governor rope. The gripping of the rope while the elevator is moving causes the linkages on the car, to which the governor rope is connected, to be pulled into action. This occurs in such a manner as to cause the two wedges to grip the rails on both sides of the car, with a force dictated by the spring in the rear of the wedges and the friction developed between the wedges and the rails. The design is such as to maintain the retardation and the stopping distance within the limits prescribed by the Safety Code for Elevators.

In addition, a buffer is provided in the pit for the car and another buffer for the counterweight. The buffer takes the form of a spring for low speed elevators, and of a hydraulic piston operating in a cylinder for higher speeds. In both cases a piston moves in a cylinder filled with oil—in the case of the car buffer the oil escapes through ports in the cylinder, while in the case of the counterweight the oil escapes through axial slots of varying length on the surface of the piston. Both the ports and the slots are so designed as to bring about allowable retardation if the buffer should be brought into action.

It is important to note that the oil buffer is not planned to safely stop a car falling freely from any height. It simply stops such a car if it over-runs a terminal and if the "safety" is not permitted to act because the speed reached by the car is short of the "tripping speed" of the governor.

Electrical Safety Devices

In addition to these mechanical safeties and refinements thereof, a large number of electrical safeties are interposed in the system, such as final limit contacts, also operational limits, interlocks at each door (to prevent the car from moving unless the doors are not only closed but also locked) and various methods of connecting the safety contacts in the control circuits. The control circuits of a high speed bank of elevators have become quite complicated because of all the many functions which they have to perform. It is therefore extremely important for equipment to be manufactured with a view to greatest reliability and best performance under all conditions. Much experience and study form the background of a "safe" elevator installation.

An element of importance in connection with the electrical systems is the type of contact to be used for the main current circuits. It has been found that if a metal contact is used, "freezing" of the contacts may be the result. It is, therefore, the general practice to use metal to carbon contacts, which do not "freeze" but which, of course, must be properly designed for a reasonable life and greatest dependability.

Because of the extremely large number of operations performed by all the elements involved in vertical transportation all over the World, it is of the greatest importance to spare no efforts in making these elements safe, because, even after reducing the probability of failure to the minimum possible, the possibility of an actual failure taking place must be considered and guarded against. Thus, what may seem safe for other applications, may be unsafe for an elevator. Indeed, this is an element which necessitates further specialization within a highly specialized art.

For example, during the car levelling operation, while the doors are opening, it is of paramount importance to make certain that the speed of the elevator must not increase above that required for this performance, namely, 20 to 40 feet per minute. It is therefore the practice on variable-voltage (Ward-Leonard) control, for which a separate generator is used for each elevator motor, to supply a separate set of high resistance generator fields for the levelling operation. This is to provide that, no matter what fault may take place in this circuit, the speed of the elevator cannot be excessive.

A companion of the "Signal Control" operations is now called Selective-Collective control. This form of control is most frequently used where the elevator is operated without attendant. It automatically performs all the duties that a good attendant would perform. This differs from the earlier "single automatic operation" which permitted the car to be monopolized by one passenger. It is primarily intended for apartment houses or apartment hotels, smaller office buildings, small hospitals and the like.

With Selective-Collective control the passengers are "picked up" at the various landings in each direction of travel in the same manner as if the elevator had an attendant. That is, the car answers all up calls on the way up and all down calls on the way down, instead of answering one call per trip as the older equipment did. This was a great development in non-attendant elevator operation. This, and signal control, were two of the most far-reaching developments of the 20's, and to these I believe we owe the greatest forward steps in the building industry.

Supervision

But other problems were soon to come up! One of these was that in a group of elevators it is necessary to "supervise" the operation so as to make it fit the direction and volume of traffic at different times of the day. It was evident that a group of elevators, although designed to take care of the maximum traffic in a manner which will give the speediest and most reasonable service, must be handled with due

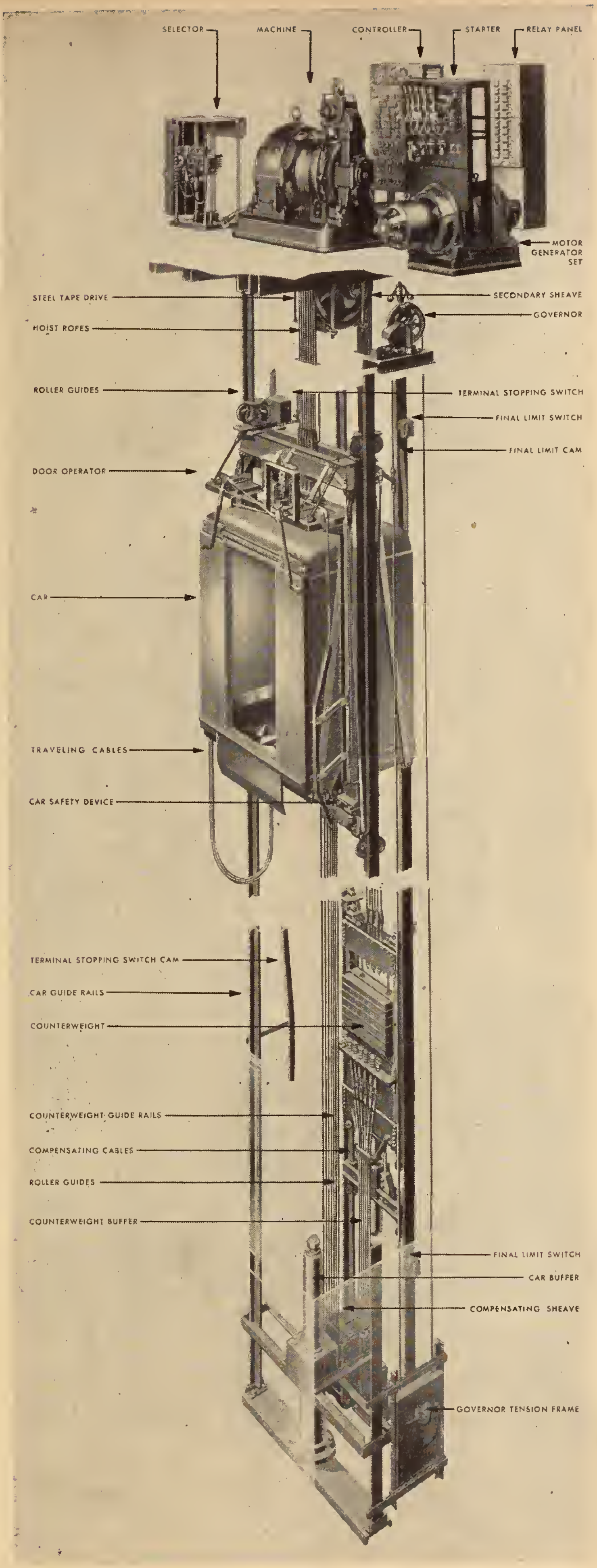


Fig. 3. Passenger elevator with gearless machine arranged for double wrap and with variable voltage control.

regard to obtaining the greatest service out of the elevators.

Thus, during the morning traffic peak, when most of the passengers are people coming to work, it is of the greatest importance to "hurry" the elevator cars to the main floor and to make this the main point of dispatch. During the so-called "balanced traffic condition" of mid-morning or mid-afternoon, the best type of service is rendered by an equal number of cars operating in each direction, and it may at this time be possible to take some car, or cars, out of service. During the luncheon period and the evening "emptying out" peak, the type of traffic is again different and the elevators must be operated to suit, with emphasis being placed on starting cars down from the top as frequently as possible. Thus, "dispatching" or "scheduling" or "supervisory" devices came into being.

Returning to what is known as the "elevatoring" of a building, it must be emphasized that vertical transportation equipment must be designed on the basis of its efficient operation *as a group*, and must, therefore, be supervised to be sure that the group performs as intended, otherwise it will render the building less valuable, since the waiting time and the quality of the service will accordingly suffer. Thus, if the elevators during the mid-morning or mid-afternoon period, when traffic is generally equally divided in both directions, were to "bunch" themselves at either the top or bottom landing, the result would be extremely ragged performance.

Group Supervision

The optimum performance of an elevator bank is realized when the "waiting time" is the minimum obtainable with that particular number of elevators, and is practically the same for all passengers and all floors of the building. Thus, suppose the number of elevators in service at a particular time permits of an interval time of an average of, say, 25 sec. It certainly would be poor performance if, because of poor "supervision" some passengers had to wait double this amount. To this end a number of devices and ideas have been used in connection with group supervision. This subject has been given intensive study and will continue to be actively studied for the next several years.

The newer installations, and two in particular in Toronto, i.e.: The Bank of Nova Scotia and the British-American Oil Building, combine the latest thinking and the equipment to meet this thinking. This type of equipment, which really forms *a system of operation*, is based on causing the cars to leave the bottom terminal or the top terminal at either scheduled intervals or at times required by the traffic conditions as determined by the setting of a supervisory control. The supervisory control is arranged for six programmes, namely balanced up and down; heavier down; heavier up; up peak programme; down peak programme; and night programme.

The performance of this system for the morning up peak is based on the fact that the cars must be kept moving away from the main lobby. Nor is it necessary to dispatch them in rotation, since this would waste time. They are therefore dispatched as soon as they arrive and are filled. Signals for keeping the passengers posted as to which cars are next to move up must be provided in order to make the system efficient and practical at this time. Furthermore, the cars must not go any higher than the last call. Highest call return arrangement must therefore be provided.

During the mid-morning and mid-afternoon traffic when a more or less balanced condition of passenger load exists, the supervisory device is set so that cars are automatically dispatched at regular intervals, and in a balanced pattern from the upper and lower terminals, viz., as many cars are kept moving in the up direction as in the down direction at all times. If this condition should be temporarily disturbed, the device readjusts itself to a balanced arrangement. During this period cars may be taken out of service if necessary, and the supervisory system adjusts itself to this change.

Some interesting features are embodied in the arrangement for the evening peak traffic. One of them is that the waiting time for calls in the down direction at various floors is measured and integrated so as to provide an indication of the floor or floors at which traffic is heaviest. When a condition of heavy demand is indicated, the elevator bank is automatically separated into two groups, which serve the high and low sections of the building respectively, so as to quickly clear the traffic at the congested floors. When the congestion is eliminated, the system automatically resumes normal down-peak dispatching.

This newest arrangement of "dictating" the performance of a bank of elevators, in line with the direction and amount of traffic at all times of the day, is the last word in elevator group operation, and is achieving great success. It takes advantage of recent advances in electrical engineering, including electronics, without which some of the important features could not have been successfully carried out. Close to one hundred of these supervisory systems have been installed and are operating satisfactorily.

How Much Elevator Capacity?

How is it possible, to begin with, to determine the proper amount of vertical transportation in a building? The answer is that not only is it possible, but it is also imperative that the degree and type of vertical transportation be given a minute and intelligent study by engineers experienced in this type of work. This is with a view to providing the most efficient and least expensive transportation, and with *the least infringement upon the utilization* of the building area. Why use ten elevators if eight properly designed, placed and operated elevators will do just as well?

These estimates are based, in many cases, on the rentable area for an office building, and on other considerations for other types of buildings. Starting with certain assumptions as to the speed and type of elevator, and the average number of stops, *the round trip time* is obtained for the assumed elevator during the period over which the estimated maximum number of passengers must be distributed from the main lobby to the various floors, or must be transferred from the various floors to the main lobby as during the evening "rush out" period. On the basis of a certain desired "interval time", the number of elevators is equal to the total round trip time divided by the interval time. Thus, if the interval time is required to be 25 sec., and if the round trip time is 150 sec., the number of elevators required to produce the interval of 25 sec. will be six. A 20-second interval is known to give very good service and 30 seconds very fair service.

In some cases the joint use of elevators and so-called escalators should be considered. In department stores the tendency of late is rightly in the direction of close to one hundred per cent escalators, since these are carriers of great capacity, even though they operate at low speed compared to elevators. Several office buildings have been planned, and some have been erected, where the first few floors are equipped with escalators operated in both directions, while elevators serve the upper floors.

For such applications as subway stations, even of great rise, escalators have been found to be of the greatest value. The most striking illustration of this type of operation is the Underground Railways in London. These escalators have a maximum vertical rise of 80 ft. 9 in., and were known up to recently to be the highest rise escalators ever installed. They are, however, losing this distinction through the installation of still higher rise escalators under the River Tyne in England for the serving of the Tyne Tunnel. These escalators will have a rise of 85 ft.

Vertical transportation has spread to carrying eighteen billion passengers per year in the United States. This colossal traffic is handled with an extreme degree of safety. The largest percentage of accidents has been due, and continues to be due, though decreasingly, to the doorway entrances, primarily because of improper or defective interlocking arrangements still in use on some of the older equipment. The modern elevator takes full cognizance of this point, and, particularly for non-attendant or automatic operation, the interlocks must be carefully scrutinized for their compliance with the rules set forth by the Standard Elevator Code and for their ruggedness and continued reliability. Needless to say, the presence of a gate or of a door on the car itself is of paramount importance.

In 1948 the total number of accidents on which we obtained reports and which occurred on passenger elevators of all types and makes in the United States was 156. Of these, 134, or 86 per cent took place at the hoistway and car entrance. 74 were serious or fatal, and it is estimated that this number could have been reduced to 28 if the elevators involved had been equipped with adequate safety devices and safeguards. Interested readers may wish to peruse this Safety Report for 1948, compiled by G. H. Reppert.

Present and Future Progress

A few of the many interesting and outstanding applications of vertical transportation which are extremely special and will require a great deal of engineering attention, deserve mention:

The Grand Coulee Dam elevators which are placed within the dam and have a capacity of 10,000 lb. at 500 f.p.m. for a rise of about 300 ft.

An elevator in the Port of New York Authority Building in New York City, rated at 40,000 lb. The platform is of such size that a dinner was held on it for sixty-four guests.

A pair of elevators in a hydro-electric station in Italy wherein supervisors are carried to the top of a mountain, or a distance of 600 meters (over 2,000 ft.). The wellway is circular and carries six sets of 13,200-volt, 3-phase bus bars from the power house to the top of the mountain where the high tension transformers are located. Many and difficult problems are involved in this equipment.

An 85 ft. rise escalator under the River Tyne, which has been already mentioned.

An elevator in the Washington Masonic National Memorial which operates at a vertical inclination of 7.5°. Inclined elevators have previously been used at low speed (such as the Eiffel Tower) but this installation is operating at 700 f.p.m. with automatic door operation.

A look into the future reveals a tendency towards the increased use of automatic operation. This type of operation, which started in a very modest manner, primarily in connection with residences and small buildings with light traffic, and in which the car was " monopolized " by a single passenger, has now been practically replaced by an operation wherein the use of the car is shared by all passengers moving in the same direction. This created a milestone in non-attendant operation which will, it is believed, continue to gain in popularity.

An interesting instance of this is a recent application in the new office building of the Atlantic Refining Oil Company in Dallas, Texas. It employs the same type of supervisory system previously described, except that instead of the supervisory system signalling to the attendant in each car when to leave a terminal, the system actually causes the car to leave the terminal even though no attendant is present. In this case, of course, the car passengers have to press their own buttons for the floors at which they wish to alight, and two-car operating panels are provided so that the passengers can readily reach the car buttons. Means are also provided whereby passengers are safeguarded if the doors should start closing when a passenger is passing through the doorway.

Vertical transportation is enjoying an extremely vigorous growth. The writer has been connected with practically all of the major developments in vertical transportation since 1921. During this period all of the outstanding modern features have been developed, and the art still retains great vitality and youth, with new ideas being continuously scanned in a broad-minded and painstaking manner, a fresh outlook being the password. Further great progress and improvements are therefore assured.

WALLACE TURNBULL

Canadian Pioneer in Aeronautics

So much has been said and written of the Wright Brothers and their flight at Kitty Hawk, of Santos Dumont, Bleriot, and Lindbergh, of Langley, Graham Bell, McCurdy, Whittle, and many others who have made flying possible, that Canadians need to be reminded of another outstanding engineer, a Canadian, and a member of the Engineering Institute of Canada, who is also one of the world's foremost pioneers in aeronautical research. As if this were not enough of a claim to fame, for good measure he also pioneered in inventions concerned with consolidated wood, bomb sights, and torpedo screens. Besides all this, he found time to study exhaustively the possibilities of applying the principle of tidal power to harnessing the tides in the Bay of Fundy.

Wallace Rupert Turnbull was born in New Brunswick on October 16th, 1870. Following his graduation in 1893 at Cornell University in Mechanical and Electrical engineering, he spent a year each in post graduate work at Cornell and at the University of Berlin. During the next five years, as research engineer with the General Electric Company at Harrison, New Jersey, he frequently corresponded with Dr. Samuel Langley who first formulated the theory of flight, with Otto Lilienthal who experimented with gliders in 1896, and with Gustav Eiffel of Eiffel Tower fame, who built the first wind tunnel.

Wind Tunnels to Adjustable Propellers

In 1902 his interest in the subject of "heavier-than-air" flight led him to resign this position and to establish his own laboratory at Rothesay, New Brunswick. Here fourteen years of brilliant progress in the field of aeronautical research won him recognition as a pioneer in this new science. Here he built the first wind tunnel in Canada in 1902, using it for tests on the properties of Aerofoils. Passing on to experiments with scow type hydroplanes driven by air propellers, he constructed a 375-foot experimental track for testing airscrews in the open; the first in aviation history in which power absorbed by the airscrew was compared with the power delivered by the airscrew in axial motion. The results, published in the Scientific American on April 3rd, 1909, won him a bronze medal and a Fellowship in the Royal Aeronautical Society.

In 1914 he closed his laboratory and went to Britain, where he engaged in the design of various wartime devices such as air propellers, bomb sights, and torpedo screens. Returning to Canada in 1918, he continued his work on the development of a "controllable pitch" propeller, commenced in 1916 while he was overseas. His first idea of mechanical brake control, attempted in 1923, turning out to be impracticable, he now sought a solution for changing the pitch of the blades by an electrical control. A second model working on this principle was developed and built by Canadian Vickers Ltd., and was successfully tested at Camp Borden in 1927. Patents on the Turnbull Controllable Pitch Propeller were taken out in Britain by the Bristol Aeroplane Co., and in America by the Curtis Wright Corporation. Today every propeller type aircraft aloft uses this control device for changing the pitch of the blades, a small metal cylinder at the hub of the blades. His model of this controllable pitch propeller now rests in the National Aeronautical Museum at Ottawa.

Wallace Turnbull, M.E.I.C.

Gifts to Pure Science of Aeronautics

He also conducted research on wing surfaces, patenting the double curvature wing surface, though he allowed this patent to lapse, thereby sacrificing a handsome return in royalties. But Turnbull's greatest contribution to flying, according to the experts, lies in the field of pure science, rather than in his inventions; for example, his 2 fundamental Laws of Aerodynamics, put forward in 1912. He gave the world new data on the principles of the Flying Machine, on the "lift of a wing", on "drag forces", and on "centre of pressure". Another discovery in the realm of pure science was announced in 1911. His "Laws of Airscrews", published in the Aeronautical Journal in London in January, 1911, announced the discovery of the now well-known laws of Air Propellers; namely, that thrust varies as the square of the revolutions multiplied by the fourth power of the diameter, and that power absorbed varies as the cube of the revolutions multiplied by the fifth power of the diameter. These "static" laws of the air propeller were discovered by Turnbull, as the result of a large number of experiments, and they were later confirmed, theoretically, by the Russian Scientist Riabochinsky.

Tidal Power for the Maritimes

During his four years in Britain he observed with great interest three small mills that operated with power produced from the tides. He read up all available reports on proposals for large tidal plants in the Bristol Channel, Menai Straits, and Chichester Harbour. Why, he wondered, wasn't this the perfect answer to the shortage of water power in the Maritime Provinces? On his return to Canada in 1918 he set to work at once on a plan for harnessing the tides of the Bay of Fundy at the confluence of the Petitcodiac

(*Continued on page 782*)

Construction Problems in Silty Soils

A paper presented before the 64th Annual General and Professional Meeting of The Engineering Institute of Canada, and the Annual Summer Meeting of the American Society of Civil Engineers, in Toronto, Ont., July, 1950.

by

Robert M. Hardy, M.E.I.C.

Professor of Civil Engineering, and Dean of the Faculty of Engineering, University of Alberta, Edmonton.

Dean Hardy is one of Canada's foremost authorities on soils and soil mechanics. In this paper he turns the spotlight on certain western soil problems. Silts in Alberta and loess in British Columbia and their behaviour under loads are discussed, as well as the precautions to be taken to assure satisfactory foundations on soils of these types.

Silts are of wide occurrence in many parts of Canada, including Southern Alberta and Central British Columbia. This paper deals specifically with problems arising in these latter areas in connection with the construction of runways, roads and building foundations on inorganic silts.

Soils known as silts have a predominant grain size between 0.05 and 0.002 mm., although rock flours, which may exhibit the properties of silts, frequently have a large percentage of particles finer than this range. Such silts classify as type A-4 in the U.S. Public Roads Classification system, and as type ML in the Casagrande Classification system. They have little plasticity, low cohesion when dry, and have poor drainage characteristics. Their reaction is rapid to the "shaking test"[1], and they are highly susceptible to frost action.

Roads and Runways

In the City of Calgary, Alberta, Canada, in the spring of 1948 some thirty city blocks of pavement suffered extensive damage during the spring break-up. The construction was 2 in. to 3 in. of asphaltic concrete, placed on a mechanically stabilized gravel base 6 in. to 9 in. thick laid on the natural inorganic silt subgrade. The pavement and base had been laid the previous fall during considerably wetter than average weather conditions. The winter was normal, but was followed by a late and sudden break-up.

The average depth of frost penetration below the pavement is not definitely known, but it was not less than 4 ft. and may have been as much as 6 ft. Failure occurred after thawing had penetrated a few inches into the silt subgrade soil. Several severe and spectacular frost boils developed, but in general the failure was characterized by the typical alligator coat pattern of pavement cracks. (Fig. 1). This is indicative of excessive deflection of the pavement due to inadequate support.

The road was carrying trolley busses with maximum wheel loads on dual tires of 10,000 lb., in addition to medium intensity city traffic. The trolley busses were the governing loading, both in terms of magnitude of wheel load and frequency of repetition. Except at locations of extreme frost action the initial failures occurred on the straight runs rather than at the bus stop points. This is contrary to the experience on trolley bus routes with clay subgrade soils. In these circumstances initial failure usually takes place at the stop points.

Similar break-ups occurred on an airport runway in the same area during the summer of 1949. The runway construction was 2 in. of asphaltic concrete, placed on 6 in. of mechanically stabilized gravel base laid on a silt subgrade soil. Load bearing tests on this section of the runway made two years previously rated the runway as being adequate to carry North Star aircraft, with dual wheel loads of 40,000 lb. The runways, in fact, did successfully carry these wheel loads with a low frequency of operation for a period extending over two annual climatic cycles.

Incidental to the reconstruction of a section of the same runway waste excavation was hauled over this section of the runway in trucks, exerting a maximum wheel load of 9,000 lb. After a few hours of continuous hauling the pavement showed evidence of inadequate base support, and within a few days was completely broken up in many spots. Fig. 2 shows the nature of the disintegration. In due course the failure was so extensive that the contractor was forced to lay a gravel fill over the broken pavement to keep his trucks in operation.

An extensive survey of the conditions along the trolley bus route was made immediately following the development of trouble in the spring. The pavement, base course and subsoil were sampled at loca-

[1] "Classification and Identification of Soils" by Arthur Casagrande, M.A.S. C.E., Transactions American Society of Civil Engineers, Vol. 113, p. 923.

Fig. 1. Typical pattern of pavement cracks caused by deflection due to inadequate sub-grade support.

tions of extremely bad break-up, at points of only slight evidence of instability, and also where there were no signs of weakness. In all cases the quality of the bituminous pavement as well as the stabilized base course was found to be good. The evidence was conclusive that the trouble was due to the nature of the subgrade soil underlying the base course. Ice segregation due to frost action was found at every test location where the pavement was damaged. The moisture content of the subgrade at these locations varied from 25 to 65 per cent. On the other hand it was found that no damage was produced in the pavement where there had been no ice segregation within a depth of 18 to 20 inches of the surface.

The mechanism of failure along the trolley bus route involved the following sequences of events. An increase occurred in the moisture content of the subgrade over the winter due to frost action. This was followed by the production of high pore pressures, due to the rapid repetition of wheel loads during the spring break-up, with resulting "quicking" action and complete loss of subgrade support.

In the case of the runway failure, high ground water table and frost action were probably contributing factors. However the important point is the fact that trouble developed on the runway when it was subjected for the first time to rapid repetition of wheel loads with the subgrade in a loose and saturated condition.

"Quicking" Action

It could be argued that the problem involved in both cases is entirely a matter of frost action. However, the necessary subgrade moisture conditions could develop in some circumstances without frost action being a factor. It is the "quicking" action which developed in the subgrade soil which is the essential feature common to both cases.

The "quicking action" will develop with such soils in a loose saturated condition by vibration from rapidly moving traffic. The loads tend to shake the particles into a more dense state. This transfers load on to the water phase, resulting in pore pressure building up. If subsequent passages of load occur before the pore pressure can be dissipated, the magnitudes of the pore pressures gradually increase until the soil mass affected finally becomes liquid in nature.

It is submitted that none of the presently available methods for designing or rating either flexible or rigid pavements for highway or runway loadings assesses the susceptibility of such silty subgrade soil to this mechanism of failure. It is pertinent to note that the soil is in a more stable condition than originally, once the pore pressure has completely dissipated following the development of "quicking" action.

The redesign of the trolley bus route provided for a mechanically stabilized pit run gravel base 24 in. to 36 in. thick. The greater thickness was used at locations of exceptionally bad subsoil moisture conditions. This design was based entirely on the fact that the survey showed that no pavement failure developed at locations where no ice segregation occurred within a depth of 18 in. to 20 in. of the surface.

The most common practice on this continent, in dealing with conditions where excessive frost action occurs, is to remove the soil to about the depth of frost penetration and replace it with materials in which ice segration will either not take place or will occur to only a minor degree. It is of interest to note that the survey of the conditions showed that to prevent pavement damage it would not be necessary to remove highly frost susceptible material to the full depth of frost penetration. Similar experience in connection with roads has been reported from Denmark by Godskesen.[2]

Some 20 miles of arterial traffic routes have since been laid in Calgary to this design with the same sub-soil conditions. It has proven entirely satisfactory over a period of two years. The construction with an asphaltic concrete surface on these comparatively thick bases has proven economical as compared to alternative pavement designs, largely because of the ready availability of good quality pit-run gravel in the area.

It should not be assumed that a thickness of pavement and base of 24 in. would necessarily be adequate for highway loadings on all types of silt in which "quicking" action is possible under rapid repetitions of load. A rational design for a pavement with these subsoil conditions will need to include the magnitude and rate of dissipation of the pore pressures induced by the traffic.

Buildings on Loess

In the Kamloops area of British Columbia settlements in building

[2] "Security Against Frost Heave Can Often Be Found in Half the Frostfree Depth" by O. Godskesen, Proceedings of Second International Conference on Soil Mechanics, 1948, Vol. II, p. 274.

foundations of sufficient magnitude to produce the damage shown in Figures 3 and 4 have occurred. A group of 15 buildings at one site all showed evidence of foundation settlement in varying degrees. Some of the settlements accumulated over a period of 5 to 6 years. However, the major part of the movements producing the extreme damage, as indicated in Fig. 3 and 4, occurred within a period of only a few days.

The soil governing the foundation behaviour is an eolian or wind-blown deposit of silt, which is classified as a loess. It occurs in the area to varying depths, to a maximum of about 400 feet. It is frequently interlaid with lenses of gravel and sand that appear to be alluvial deposits. The loess lies naturally on slopes of about 1 to 1, but erodes on vertical faces. The natural slopes are characterized by "cat walks" or a horizontally serrated surface structure at intervals of two to four feet up and down the slope. The typical topography in the area is shown in Fig. 5. The "cat walks" can be identified on some of the hillsides.

Fig. 2 (top). Disintegration of airport runway due to inadequate base support.

Figs. 3 and 4 (centre and bottom). Two views of damage caused by settlement of building foundations in the Kamloops area of British Columbia.

Fig. 6 shows a typical grain-size curve for the soil. An exceptionally uniform grain size is characteristic of the material. The soil is non-plastic, with liquid limit values ranging between 25 and 30, and classifies as type "ML" in the Casagrande classification system. It exists naturally in a very loose state. Its density is only about 70 to 80 lb. per cu. ft. dry weight, while with standard Proctor compaction its dry density can be increased to about 110 lb. per cu. ft. at an optimum moisture content of 15 per cent. At its natural density the moisture content of the material in the Kamloops area is from 5 to 10 per cent. It seems to have a columnar structure, so that its permeability is considerably higher vertically than horizontally.

In the Kamloops area the soil contains from 5 to 6 per cent calcium carbonate, which gives the soil an artificial cohesion of as much as one to two tons per sq. ft. The addition of water to the soil dissolves the calcium carbonate, thus destroying the artificial cohesion. The soil then commences to consolidate under its own weight plus the weight of any superimposed building loads. This is the most significant property of the soil as far as the behaviour of foundations in it are concerned. This property of silt loess deposits has been reported previously by Turnbull[3] in connection with deposits in Nebraska. The soil from the Kamloops area has an even more uniform grain size, a somewhat higher percentage of calcium carbonate, and its natural density is even less than the soil occurring in Nebraska as reported by Turnbull.

The consolidation test results shown in Fig. 7, in the form of pressure-void ratio curves, give an indication of the behaviour of the soil upon being exposed to water for the first time. When wet it con-

[3] "Utility of Loess as a Construction Material" by W. J. Turnbull, Proceedings of Second International Conference on Soil Mechanics (1948), Vol. V, p. 97.

Fig. 5. Typical topography in the Kamloops area showing horizontally serrated surface structure.

solidates along the virgin compression branch shown as line A. At its natural moisture content of about 5 per cent moisture the soil consolidates along a line such as B. The addition of water to the sample however, if the pressure-void ratio conditions are represented by a point to the right of line A, results in rapid settlement until the pressure-void ratio conditions are represented by a point on line A. The settlement indicated by the drop from point "a" to point "b" on curve C represents a settlement of about 1¾ inches per foot of depth of soil.

Sink Holes

The question arises as to how it is possible for this soil to be in existence at shallow depths, without having been exposed to water in its geological history. There are several factors responsible for this. First, the soil occurs in areas of comparatively low annual precipitation. At Kamloops the average annual precipitation is only 8 inches per year. A second factor is that the natural topography develops with steep slopes, as can be seen in Fig. 5, so that the run-off is fast. Third, weathering breaks down the natural structures of the surface soil. It then becomes more dense and forms a comparatively impervious skin on the surface.

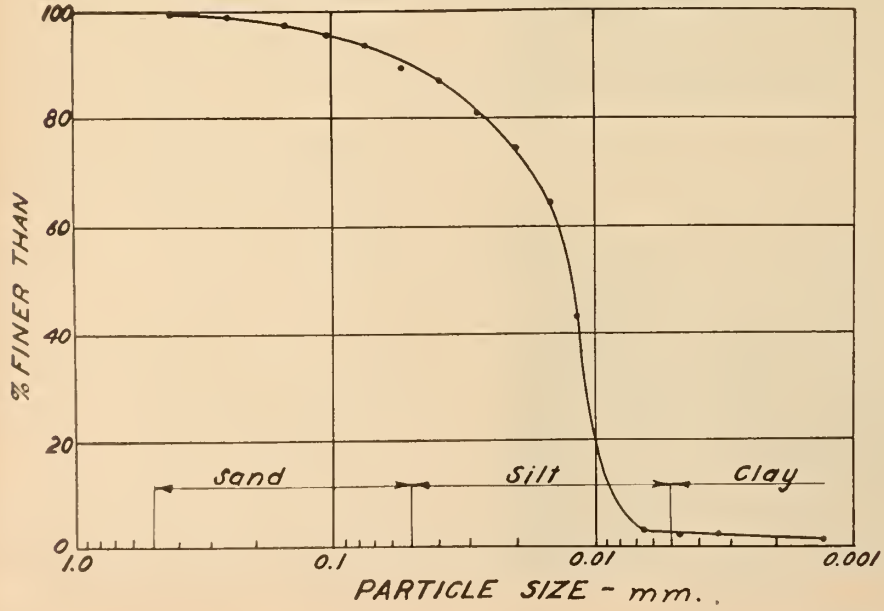
If this skin is punctured along a run-off channel by a mole, for example, by excessively heavy run-off, or by construction operations, the run-off tends to go vertically downwards at such points. This may result in the formation of what are called "sink holes", a small one of which is shown in Fig. 8. The water dissolves the calcium carbonate of the sub-soil which then commences to consolidate. Before equilibrium of the conditions is re-established an area up to several feet in diameter may sink down as much as three to four feet.

In some cases, surface water entering sink holes may reappear at the surface a short distance down the slope. In other cases, in the Kamloops area, major quantities of surface water going into sink holes never appear at the surface in the immediate area. The water seems to go more or less vertically down, to merge with the ground water table in the river valley some 400 feet below.

Sink holes have been well-known to geologists for years. However, the conventional explanation of their formation is that they are due to underground erosion. It is of interest to note that the consolidation of the loess soil following its contact with water is a complete explanation of the formation of sink holes. It is unnecessary to postulate underground erosion. There is no evidence whatsoever in the Kamloops area that underground erosion is a factor in the formation of these sink holes.

Careful investigation has shown that major damage to buildings (Figs. 3 and 4) is in all cases due to excessive amounts of water coming into contact with the soil around the buildings. The damage to the buildings shown in Fig. 3 was the result of a leaking drain pipe to a septic tank. The maxi-

Fig. 6. Typical particle size curve for silt loess in the Kamloops area.



mum settlement resulting was about 2 feet and an area about 75 feet in diameter was affected. The building shown in Fig. 4 was damaged as the result of a sink hole developing just outside the building from spring run-off water that was diverted against the building by a frozen culvert.

Avoid Puncturing Surface

Minor and slowly accumulating settlements in the buildings at this site are the result of changes in the drainage regime of the area, produced incidental to their construction. The building sites were secured by cutting into the side hills and levelling off an area. This resulted in the removal of the relatively impervious skin of top soil, and also in the creation of a flat area around each building from which surface water would tend to lie and seep underground, rather than run off rapidly as in the natural drainage regime. Waterlogged areas seem to gradually develop in these flat spots, with the first evidence of settlement occurring at the outside corners of the building.

It has been suggested that such soils present impossible foundation conditions. However they occur so extensively in Central British Columbia that they cannot be avoided, not only in building work, but also with irrigation structures, highways and railroads. It is obvious that considerations of safe bearing pressure for building foundations are irrelevant as far as predicting foundation behaviour on such soils is concerned.

In general the deeper foundations are placed, the less likelihood there will be of surface water producing settlements below the footings. Piles would be difficult to drive, and jetting of course would produce major settlements of the whole area of the building. Cast in place piles however would have advantages.

Special precautions must be taken to insure that water and sewer lines in the area are tight. Any provisions that can be made for rapid detection of leaking mains will be excellent insurance. The disturbance of the natural drainage regime of the area must be counteracted by waterproofing, and by adequately draining the surface of flat areas adjacent to buildings. Standard Proctor compaction of the natural sub-soil will result in reducing the vertical permeability of the soil to about 1/100 of its value in the soil in its undisturbed state. Paving of and flat areas is also a possibility. The general solution in building work is to protect the soil below and adjacent to the foundations from water.

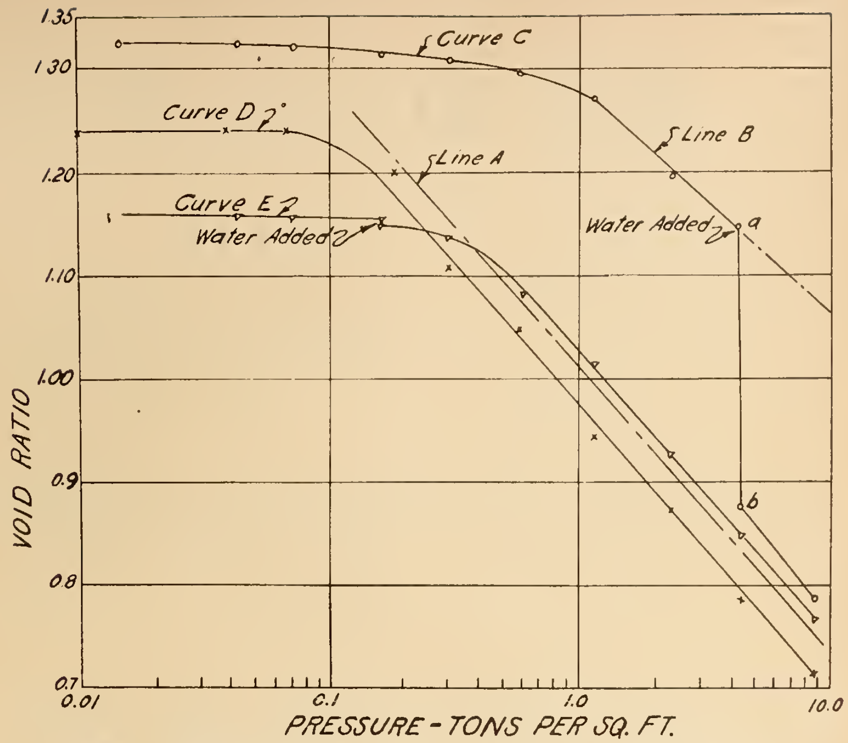


Fig. 7. Consolidation test results for soil in the Kamloops area.

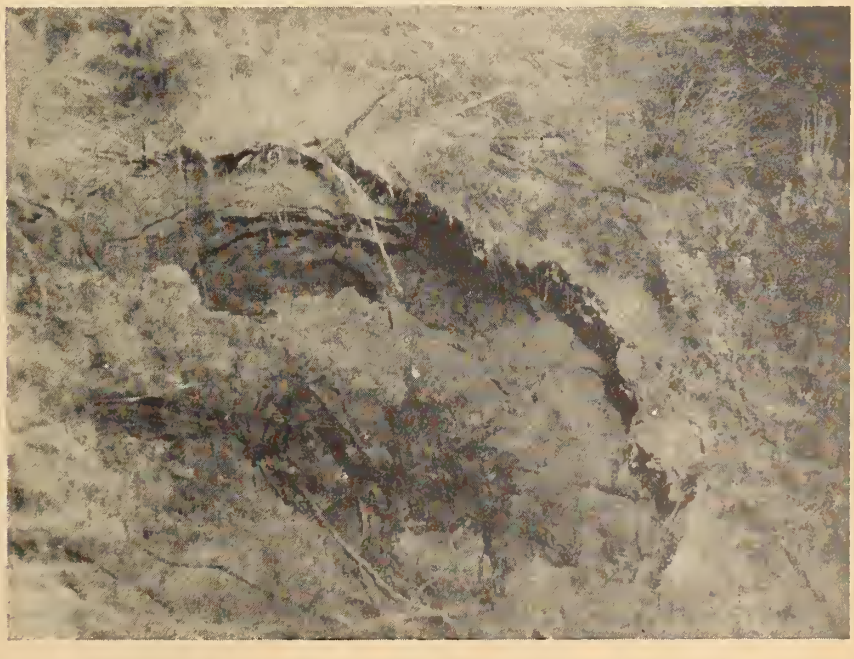
Acknowledgments

The investigation of the pavement failures on the City streets of Calgary was carried out under the direction of the late J. R. Wood, M.A.S.C.E., at that time City Engineer in Calgary, with the writer acting as consultant. The reconstruction was under the direction of J. I. Strong, M.E.I.C., successor to the late Mr. Wood in the office of City Engineer in Calgary.

The runway failures at the Calgary airport were drawn to the

(*Continued on page 782*)

Fig. 8. Typical "sink hole" in soil at Kamloops.



Bituminous Pavements

by

W. A. Clarke,

Executive Assistant to the Chief Engineer,
Department of Highways, Ontario,
Toronto, Ont.

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

Tracing the rapid advances in the art of road building over the past two decades, and the new techniques available today to the highway engineer, the author discusses criteria used for designing the road surface, distinguishing between the two main groups of roads and the requirements for each of them. Various types of bituminous mixes and aggregates employed today are enumerated, and methods of laboratory testing and field inspection are described.

In place of discussing the theory of mixes or dealing with any one particular phase of this subject, this paper has been prepared with a view to showing how Highway Departments, in general, arrive at the choice of a particular type of pavement and its design requirements.

Fifteen or twenty years ago our actual knowledge of road building was limited, due to the fact that the demand for more roads, in a shorter period of building time, had not become a must, nor did we have all the factual data nor the technical research to aid in our road building. Twenty years ago it was possible for an experienced highway engineer to know nearly all there was to be known about highway construction.

Today road building has become highly specialized, as is the case in most branches of engineering. To many, road building was a 'cut and fill' proposition, with some sort of tar surface, as it was, and still is, referred to on occasions. Today road building includes a great deal of research and study; for not only is it necessary to construct, ready for use, in the shortest possible time, a road that will withstand present day traffic. That road must also withstand and combat nature's freaks that take us unawares, frost and water being the two principal ones.

Highway Dollars Have Had To Be Stretched

Highway Departments have built up our existing road systems with definitely limited funds. It has been their problem to distribute these funds over roads under their control so as to meet the most urgent traffic requirements. Provision for public facilities has always lagged behind evident needs. Often a badly-needed widening of an existing surface has been deferred to meet some pressing demands for surfacing earth roads, or to replace low type surfaces with more durable construction.

Any system of highways constructed with public funds, for the free use of the public, must be designed on the basis of compromise, and all highway users have been inconvenienced, at times, by the lack of wide and smooth surfaces. We should, all of us, bear this in mind every time that we happen to drive over one of these narrow or rough roads. That is, you might say, one side of the economic aspect and might be one of the reasons why toll roads are being constructed in the United States.

New Techniques Available

We now have such technical aids as aerial surveying, traffic surveys and, of recent date, origin and destination surveys, all of which assure us of the correct location and need of our roads.

We have soils laboratories, which give to us the assurance of a sound foundation and the control of frost heaving. With the study of soils comes the introduction of drainage control, compaction and the correct use of granular material. It should be observed here that in Ontario we have a wide temperature variation, from 25° to 30° below zero in winter, to as high as 100° in the summer, and our chief worry and concern, in the construction of flexible or bituminous pavements, is the control of frost heaving. Of recent years we have achieved fairly successful results in this respect by the addition of granular material under our pavements. Although heaving does take place, it is uniform, and therefore serious failures have been eliminated.

By the proper application of the aforementioned technical aids, we have arrived at the time when road building is becoming a permanent facility. In the future merely the wearing surface will have to be replaced, and our selection of the type of pavement becomes a design problem, based mainly on economics and traffic requirements.

The Highway Research Board of the Public Roads Administration in Washington, has afforded Canadian highway engineers full benefit of all their splendid work. Canadian engineers have been able to apply and use to great advantage many of their proven methods, with great advantage to Canada.

Carrying Capacity of the Road

Coming to the design of flexible or bituminous pavements, two sets of criteria are used, one for the selection of the type of wearing surface, and a second for establishing the strength of the foundation on which the surface is to be placed. In all design requirements certain basic facts have to be known, and over a period of years a classification of the road system is developed which is to serve not only for present-day needs but for the future, as far as is foreseeable and practicable.

With regard to the selection of the wearing surface, over the same period of years, we have developed different types of bituminous pavements which can be applied and adopted in our road classification requirements. In Ontario, for example, we have at the present time a road classification which varies from divided highways, Class AA, having a carrying capacity of over 20,000 vehicles per day, to Classes D and E, which carry as little as 500 or 250 vehicles per day.

With this classification, of course, limits of curvature, grades, speed, width of shoulders, and right-of-way are set forth. Along with our road classification our load carrying capacity is set by the limits in our Traffic Act, which enables the designer to work from known loadings. In Ontario, the limit is a 16,000 lb.-axle load. with limits for gross loading based on certain combinations found in trailers and semi-trailers. From these facts it is possible to arrive at the type of sub-base, base and wearing course, which will fit the requirements.

Types of Roads

There are really two groups of roads we have to deal with. First, there is the road that requires only a resurfacing, which is usually a few inches of bituminous material placed on an older pavement, such as concrete. Secondly there is the complete renovation of an old road, or a road built in a new location. The first group is usually considered the simpler operation, as the base or foundation has found its proper consolidation and stability, over a period of years of constant pounding from traffic, and the elimination of weak points, from many years of maintenance.

In the second group, we are required to construct a new road, to be used as soon as completed for heavy duty traffic. Thus it means building into this new roadbed, in a matter of one or two years, the same structural strength acquired by an old road over a period of 20 to 30 years. To do this present-day highway engineering has required a high degree of technical specialization.

Concerning the design of the foundation, and in order to meet this demand, it is apparent that the reaction of the subgrade is a major factor in building up pavement carrying capacity. But the subgrade reaction is not the only factor involved; the strengths of the sub-base, base and wearing surface are vital also. Data show that the strength imparting power of these super-imposed courses is largely a function of their thickness, but depends also on their stability, which, in turn, will be a function of density and particle, size and shape.

Foundation design is a highly controversial subject, and is not too clearly defined. We do not yet have a rational method of design for either the foundation or the bituminous pavement itself. Current research and information in this respect has only reached the stage of verifying our choice of pavement, which has demonstrated over a period of years by trial and error that a certain design of pavement and foundation will handle a known traffic type, volume and speed.

Mixes and Aggregates

In Ontario, to fit the requirements and conditions upon which our pavements are built we have two broad types, cold mix and hot mix. Cold mixes may be either plant or road mix, whereas the hot mix is always plant produced. Under the cold mix type, usually a low cost type, retread, road mix mulch and penetration are included, and are used as base courses for high type wearing surfaces, or as wearing surfaces for roads of a low traffic count.

Hot mix bituminous mixtures, of which we have nine types, are predominately used in Ontario. They are referred to as H.L. 1, 2, 3, 4, etc., up to H.L. 9. The H.L. of course, means 'hot laid'. H.L. 1, 2, 3 and 4 are the wearing surfaces, while H.L. 5 to 9 are base courses. Primarily, all of these mixes are a combination of coarse aggregate stone, fine aggregate sand, mineral filler and asphalt. As an example, H.L. 1 is a stone filled sheet asphalt wearing surface having trap rock as the coarse aggregate, and is its particular identification. H.L. 5 is a base course, composed of gravel for its aggregate. The asphalt varies in each type and the usual variation is its penetration. The heavy traffic requires a lower penetration, for example, H.L. 1 is 71-80 while H.L. 5 requires a 150-180 penetration.

The wide variation in the development of these mixtures was necessary for economy. In Ontario we have available, in some sections, a large supply of sand and gravel aggregates, which can be cheaply prepared for dense graded bituminous mixtures. In other sections, we rely on stone from commercial quarries, where our gravel deposits are not sufficient in supply or quality. In addition, we have our granular base, which uses up available supplies. It has been necessary therefore to juggle our supply of aggregate to the best possible advantage.

In the selection of the type of pavement it is also necessary for us to keep in mind the large tourist traffic volume, which reaches its peak during the summer months. The importance of selecting a type of construction that will not seriously interfere with traffic must be considered.

Testing and Inspection

After the selection is made as to the actual type of pavement to be used, and after the subgrade and base course of granular material have been properly compacted, the testing laboratory determines the job mix formulae, and its specially trained personnel inspects the manufacture of the mixtures for each individual contract. Before any project commences, samples of the aggregate to be used are submitted to the Laboratory.

The samples are tested for all requirements. The asphalt is always set at a maximum consistent with absorption of the aggregate and void space in the mix. The densest combination of the aggregate particle is always sought, and care is taken not to overfill the void space with asphalt cement, which might impair stability in the completed mixture and produce a slippery surface. Since mixtures are produced at temperatures from 250° F. to 300° F., special attention is always given to workability in setting the mix. Workability is a most important mix characteristic, for without it a good pavement is impossible.

On each contract a field laboratory is set up, and a Chief Inspector with assistants, is placed in charge of the contract to see that specifications are carried out. The specialist from the headquarters laboratory visits the jobs from time to time, to aid and advise the Chief Inspector. After this preparatory mix design has been established, it is then a matter of running the material through the plant and transporting the material on to the road.

The material is levelled off to the required grade, smoothed by a mechanical finishing machine and compacted with rollers.

Advantages of Bituminous Pavements

The output in modern plants is approximately 90 to 100 tons per hour and the thicknesses are usually $1\frac{1}{2}$ in. wearing surface and 2 to 3 in. of base course. This means that approximately one-half a mile of completed pavement is laid per day.

Bituminous or flexible type pavements are used primarily because they are adaptable to stage construction. The low cost type may be built with local labour, materials and equipment, easily opened and patched. The high type resists formation of ice glaze, embraces great variety of types to fit a wide range of conditions, has no joints and has resilient riding qualities. Experiments are being carried out at the present time with an additive of powdered rubber, which may further add to the life of bituminous pavements. √

WALLACE TURNBULL, M.E.I.C.

Canadian Pioneer in Aeronautics

(*Continued from page 774*)

and Memramcook rivers, where they enter Shepody Bay.

Here, he observed that there were two large natural reservoirs, one of the highest and most regular tides in the world, and a power site centrally located to a wide and hungry market for cheap power. He worked out the whole design in detail, and found that while a full development would provide 200,000 hp., an initial development of say 90,000 hp. would be readily marketable and would cost some $122 per hp. at that time, while energy could be sold at rates varying between a quarter and a tenth of the rates then charged for steam power in the Maritimes.

Turnbull presented a paper on the subject before a general professional meeting of the Engineering Institute of Canada at Saint John, in September, 1919, which was published in the E.I.C. Journal for October of the same year, and which gained widespread attention. The late Samuel Insull of Mid-west Utilities was so impressed with the possibilities of this idea, that in 1929 he called for plans for spending over $50 millions for supplying power to the north-eastern states from tidal power at the Petitcodiac. A start on another tidal project at Passamaquoddy Bay was actually made by the United States Government in 1924 but the project was later abandoned. Today, however, interest is being renewed.

The development of tidal power in the Maritimes receives public attention periodically, and while so far it has not been attempted, the time may well arrive when this far seeing engineer-inventor will reap the credit he deserves for his visions of cheap tidal power.

Here then, is a great Canadian, whose unique makeup combines the dreams of the inventor and the sound judgment and practical common sense of the engineer. Canada needs many more Wallace Turnbulls out of today's greater output of graduates from our Canadian Universities, to take their places beside him in Canada's Roll of Fame.

Mr. Turnbull is now retired from active engineering practice and resides in Rothesay, N.B. His son is D. O. Turnbull, M.E.I.C., chairman of the Saint John Branch of the Institute. √

CONSTRUCTION PROBLEMS IN SILTY SOILS

(*Continued from page 779*)

attention of the writer by officials of the Department of Transport and representatives of the contractors, the Standard Gravel and Surfacing Co. Ltd., of Calgary.

The studies of the soil conditions in the Kamloops area were made by the writer for the Department of National Defence of the Canadian Government, and are reported with the permission of officials of the Department. Mr. S. R. Sinclair of the University of Alberta assisted the writer on these studies.

THE MUNICIPAL ENGINEER and CIVIC DEVELOPMENT

by

C. D. Wight, M.E.I.C.

Member, Ontario Municipal Board,
Toronto, Ont.

A paper presented before the 64th Annual General and Professional Meeting of the Engineering Institute of Canada, and the Annual Summer Meeting of the American Society of Civil Engineers, Toronto, July 1950.

The story of Municipal Engineering is closely related to the growth of this young country. Like other branches of engineering in Canada, it traces its origin to the military engineers and provincial land surveyors, upon whom the country depended for all engineering service in its early years. As the wealth of the young country increased, means of communication improved, industries became established and the general standard of living advanced, the small hamlets of other years grew to become in turn villages, towns and cities.

This growth was accompanied by all the problems arising out of the concentration of large numbers of people in comparatively small areas. These problems were all the more difficult because our municipalities were experiencing this growth for the first time. They could not foresee the full measure of their future or the scientific developments of the past century, from which much of their development has resulted either directly or indirectly.

Municipal engineers can look to the past with pride. Without doubt much is to be desired at the present time, but these shortcomings need not be attributed to the engineering profession. They result rather from the phenomenal growth of this country, the great changes that have taken place in health standards, transportation and industrial development generally and to the financial limitations of our growing municipalities.

In Canada all municipal authority stems from the provinces, and the various provinces have enacted statutes which prescribe standards for the engineering profession and for the registration of engineers. Furthermore various provincial statutes dealing with the municipal matters make reference to the duties of engineers engaged by the municipalities for their purposes. In other words, the status of the municipal engineer is recognized. Today, hundreds, if not thousands of engineers now confine their activities to this branch of engineering, either as permanent employees of their respective municipalities or in a consulting capacity. As would be expected because of the complexity of modern urban problems, the various phases of municipal engineering are now being taught in our Universities from coast to coast.

Scope of a Municipal Engineer's Duties

There is no need for statistics to show the accomplishment of this branch of the profession to date. Municipal engineers are now discharging their duties in all of our municipalities to the satisfaction of the public. They have been responsible for the design and development of our highway system including roadways, sidewalks; the installation of sewerage systems and sewage disposal works; water works systems including treatment plants and pumping stations, and in the erection of miscellaneous structures such as bridges and public buildings. All of these works are accompanied by continuing operational responsibilities.

In addition, the municipal engineer is oftentime called upon to supervise such services as sanitation or garbage collection, snow plowing and removal operations, maintenance of municipal parks and such miscellaneous but yet important tasks as legal surveys, care of municipal property, building inspection, traffic problems and still lesser chores too numerous to mention. In some instances all these works and services are grouped in a single municipal engineering department. Where it is not the case, members of this profession are to be found more often than not in the separate departments or agencies set up for such purpose.

Because of the broad scope of his duties, the municipal engineer is concerned with a substantial part of the capital expenditure of our municipalities. He supervises the expenditure of much of the money raised annually by municipal taxation for the maintenance of services. It is not necessary to emphasize the magnitude of the trust placed in the municipal engineer and his obligations to his employer. It should be added that in certain of our provinces, provincial assistance is given to the municipalities in respect to some of the works under the municipal engineer. In these cases the engineer has corresponding responsibility to the provincial authorities.

In considering the part of the municipal engineer in civic development, mention should be made of the peculiar restrictions that surround the engineer as he endeavours to discharge his responsibilities. He must not intrude into the sphere of those elected to determine policy. A most important part of his duties however, consists of making recommendations which, if adopted, will become the basis of municipal policy. In the presentation of those recommendations and in the normal direction of his duties, he is brought close to those engaged in the process, sometimes controversial, of determining that policy. To be successful, a municipal engineer must realize the extent to which men elected to public office must depend upon officials. Those elected come initially without experience in municipal affairs, and they look to the engineer for guidance in many things. They should not look in vain. The engineer who is patient with elected representatives, will find that together they can accomplish much for the Community.

The engineer must be prepared to rely upon his own record of integrity to protect him from any petty criticism that may come his way. In such moments he will find great comfort in the knowledge that the general public is always appreciative of conscientious effort, and is as a rule fair and generous in its judgment.

Future Problems for City Engineers

Recent years have witnessed great changes in municipal services, and their extension to meet the demands of a public, which has become more dependent upon municipal government as urban units have increased in size. This trend has undoubtedly been influenced by an appreciation of the services already rendered, and a natural willingness on the part of the public to be relieved of individual responsibilities. It springs from the development of strong community pride, with an accompanying desire to establish the highest standards of municipal services. The situation has probably also been influenced by an increase in the ratio of tenant occupied units to total housing units in many of our communities.

The concentration of population on this continent in urban communities has gone far beyond the predictions of fifty years ago. When it will end is any person's guess, but in any event it has brought many new problems for the engineer to face. For example, he has to seek out and develop new sources of water supply. Sewage disposal and the elimination of river pollution has become more important than ever before. Great bridges and tunnels have to be located and built, as do new roads free of intersectional interference.

Building codes have to be devised which will insure not only structural safety, but safety from fire. Uses of lands and buildings have to be regulated. With the development of aviation, airports have to be located and constructed. Consideration has to be given in respect of new and improved railway terminals for both passengers and freight. New methods of public transit have to be devised. The problem of municipal government is further complicated by reason of the fact that the increase in urban concentrations ignores municipal boundaries.

Today most of our municipalities have accumulated a considerable backlog of projects which were deferred during the war years, and still other projects arising out of the rapid expansion of our cities in recent years. In the aggregate these amount to hundreds of millions of dollars. There is a broader public appreciation of the desirability of eliminating river pollution, improving public water supply, educational facilities, parks, playgrounds, sanitary services, etc.

At the same time it should be noted that in all our municipalities there is a desire, if not a demand, that the tax rates of past years be retained as far as possible, notwithstanding advances in the cost of labour and materials and an ever-increasing demand for services. Dependence is placed upon economy of administration and revenue from new assessments as the principal means of meeting the situation. Too much emphasis cannot be placed upon the need of careful planning and the exercise of discretion in making recommendations that will involve expenditures, so that the financial welfare of our communities will not be endangered. It would appear as if many of our municipalities, in the future, will have to be content with good efficient establishments — not the best that money can buy.

Greater Opportunities for Public Service

In addition to all of their regular duties, municipal engineers are today facing what may well be their greatest opportunity for public service. The expansion of our cities far beyond original conceptions, and the need of providing for and controlling the development of these enlarged communities, have aroused a universal appreciation of the need of city and regional planning. Its purpose is not only to correct unfortunate conditions that have resulted from the haphazard growth of other years, but also to make adequate provision for the future so that conditions deplored today will not recur.

Numerous municipalities have taken advantage of provincial legislation permitting them to establish planning boards for their communities. Improved control has been established over new subdivisions, and the problem of land use is being faced with a new vigour and determination. In most of our larger communities definite progress has been made in the preparation of master plans to govern future municipal development.

It was natural that municipalities faced with these new planning problems turn more often than not to their municipal engineers, equipped as they were with a large fund of local information and technical knowledge. It is now generally realized that planning, to be effective, must be based upon the utilitarian needs of the community. The engineer's knowledge of traffic problems; railway and industrial requirements; the economics of the design of sewers and other public works, etc., is invaluable in planning the modern community. Any plan that overlooks these considerations will in the long run be expensive and may even fail to achieve the desired results.

To successfully discharge his numerous duties a municipal engineer must not be only a technician, but a planner and administrator. Above all he must be a diplomat, for he is constantly dealing with human forces. Municipal engineers generally have been faithful and progressive public servants, discharging their duties with zeal, with a constancy of purpose and with a modesty of deportment worthy of their great profession. They realize the magnitude of the problems before us and they cherish the opportunity which will be theirs, of participating in the solution of these problems.

Liverpool's New Marine V.H.F. Radio System

From a paper prepared by officers of British Telecommunications Research Ltd., and Automatic Telephone & Electric Ltd., Liverpool, England.

On June 1st, a new Marine Radio System was formally handed over to the Marine Committee of the Mersey Docks and Harbour Board. The inaugural ceremony took place on board S.S. "*Galatea*", the Board's own yacht, which had steamed to a position 12 miles out in Liverpool Bay. After the equipment had been handed over at Crosby Light, the opportunity was taken to demonstrate every phase of its working. The "*Galatea*" steamed down the Crosby Channel and entered the Gladstone Dock, where the passengers disembarked and inspected the equipment in the Port Radar Station.

The passage of the "*Galatea*" afforded a practical demonstration of the greatly improved communication facilities being extended to ships of all tonnages using the Port's harbour and dock amenities. For the background to these facilities it is necessary briefly to recount the circumstances which led originally to their earlier adoption in a much less refined form.

During the war years, convoys of as many as 60 vessels would arrive on one tide, and the problem which had always faced Port Authorities in the past, particularly those whose harbours are tidal, of regulating vessels into the docks became very acute. The existing methods of communication — aldis lamps, semaphore, whistles and tug boats, proved inadequate, and it was decided that the only satisfactory solution was radio telephony. Radio sets, however, were in those days unobtainable in the open market. The Port Authority, however, approached the Ministry of Transport. The War Office came to their aid by loaning them a number of army sets. These proved extremely satisfactory in the radio conditions which then prevailed, and of great value to those responsible for the docking of vessels in the Port.

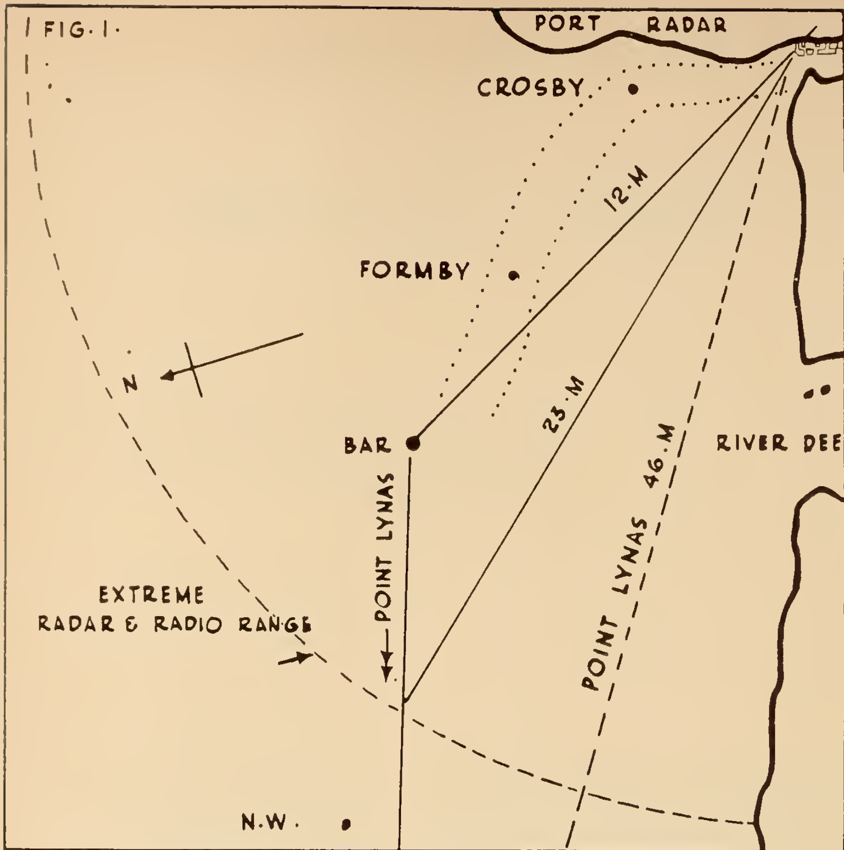
> **The V.H.F. Harbour Radio Equipment described in this paper is the first installation of its kind in the world to be used for the purpose of ship to shore communication for guiding vessels to their docks.**

The opening of the new Liverpool Radar Station in the post-war years and the much wider scope it afforded for assisting vessels approaching the river entrance, showed that sets of this type had considerable limitations. It also showed that, operating on frequencies of between 7 and 9 megacycles, they were subject to a great deal of "jamming" from commercial stations, some of which were located as remotely as South Africa and North America. In any case, by international agreement at the Atlantic City World Radio Conference held in 1947, the use of this frequency band for harbour communications was to be discouraged and frequencies in the band of between 156 and 174 megacycles were allocated.

A war-time exigency had become in the eyes of the Mersey Docks and Harbour Board a peace-time necessity and a rigorous specification was drafted for the guidance of those British radio manufacturers who were in a position to develop suitable equipment to operate in the permissible frequency band and to offer it in open competition.

The main requirements stipulated were that satisfactory communications should be maintained at ranges up to 25 miles; that the mobile sets should be readily portable, not exceeding 20 lb. in weight, and that they should give a choice of sufficient channels to enable pilots to communicate with the radar station and the principal dock entrances.

After exhaustive trials, the contract for 150 portable transmitter-receivers and 10 Shore Stations was awarded to British Telecommunications Research Ltd., with the express object of undertaking research and development of modern communications equipment, to augment the range of products of the parent companies and their many Subsidiaries. Of the latter, the Radio Gramophone Development Co. Ltd. undertook the manufacture of the equipment which the Contract specified, and also contributed to the design of the portable set.



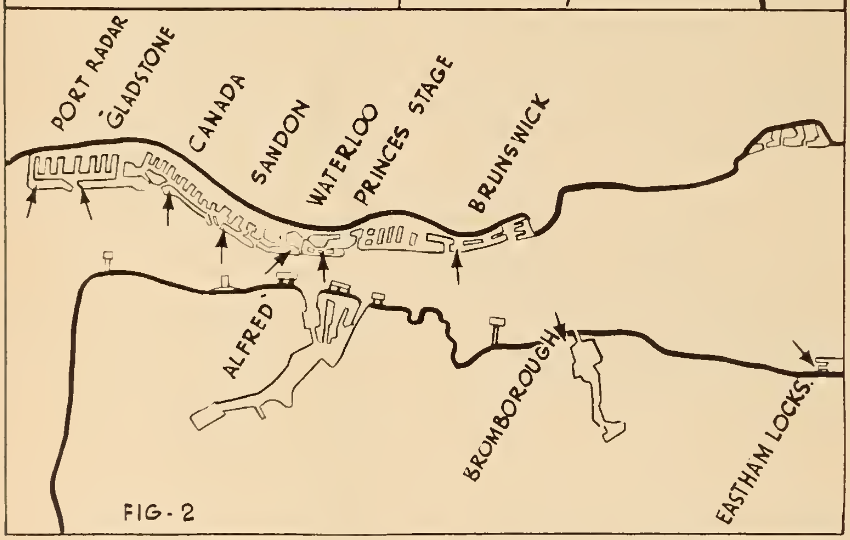


Fig. 1. Approach channel to the River Mersey, together with communication distances and radar range in respeet to Port Radar.

Fig. 2. Position of docks in the River Mersey, showing points at whieh radar equipment is housed.

Requirements

It had been decided that the equipment should be amplitude-modulated, and that both transmitters and receivers should be crystal controlled. To meet the various requirements of the specification mentioned, it was necessary to make use of six radio-frequency channels, within the internationally agreed band which had been licensed by the British Post Office for harbour communications in the United Kingdom.

These channels were accordingly allocated, two for navigational aid and harbour supervision and four for communications in respect of docking. The land transmission frequencies are from 163.1 to 163.6 megacycles and the mobile transmission frequencies from 158.6 to 159.1 megacycles. The channels are separated 100 kilocycles apart, and the "go" and "return" frequencies are spaced 4.5 megacycles apart.

The two frequencies used for navigational and harbour supervision are channel 1 and channel 2. The shore station equipment for these channels is located at Port Radar. The other four frequencies viz channels 3-6 are shared between 9 Dock Stations, each of which has individual shore station equipment. The division is so arranged that docks the farthest distances apart share channels, and a code calling system is used, employing a 1000 c/s note, which permits the portable sets to call the required shore station.

As stated, it was considered of vital importance that the range of the equipment should be up to 25 miles, though, in point of fact, this in practice applies only to channel 1 and is catered for by the shore station aerial at Port Radar, which is 100 feet above sea level. Communication on channel 2 is only required over a distance of 12 miles and the second aerial at Port Radar has been designed accordingly. Communication on the dock station channels has not to exceed 8 miles and suitable aerials have been erected for this range.

The third major requirement stipulated to the designers was that the portable set should not exceed 20 lb. in weight. It was largely this factor which ruled out duplex working in favour of two frequency simplex. The former would have possessed advantages, but would have involved extra equipment. Having to work both transmitter and receiver together would have entailed larger capacity and correspondingly heavier batteries.

The new V.H.F. Marine Radio and earlier installed radar equipment operate as a co-ordinated system for the protection and assistance of shipping in the port communications area. This area is roughly a quarter segment of a circle to the sea-ward side, with a radius of 23 sea miles from Port Radar at the mouth of the river, and riverwards the whole of the Dock Estate from Port Radar to Eastham Locks, which are at the entrance to the Manchester Ship Canal.

At four-hourly intervals day and night the radar equipment is switched on, and the positions of all vessels in the seaward direction, both under way and at anchor, are transmitted over Channel 1 for the benefit of any Ship's Master who may wish to plot the information. This is then followed by similar information being given over Channel 2 to vessels which may be needing it in the river area. Following this disposition statement local weather conditions are transmitted over both channels, together with any local navigation warnings.

At all times between these regular services, communications may be established over both channels with vessels entering or departing from the Port. The portable sets are taken aboard ships by the Pilots at their boarding stations which, inward bound, are off Point Lynas, or at the Bar Light Ship. As soon as inward-bound ships arrive within the Port communications area they call up the operation room at Port Radar over Channel 1 and give their name, draught and expected time of arrival at the mouth of the river or at the Princes Landing Stage, as may be appropriate. This information is passed by land-line to the departments concerned. When the vessels come within range of the dock station equipment, the Pilot can then communicate direct with the Dock Master for information as to the particular berth the ship is to occupy.

Under adverse weather conditions the combined radio and radar equipment operates to enable vessels to enter and traverse the Crosby Channel and proceed to anchorages in the river or directly into dock as may be required. Likewise, vessels leaving port may seek and obtain information which will give them safe passage to the Irish Sea. In circumstances of particular heavy traffic on Channel 1, vessels within the shorter range of Channel 2 may be requested to use this channel to free the longer range channel for communications with vessels further away from the shore station.

Technical Design

The major problem, as it was first considered in the Mersey Docks and Harbour Board scheme, was to obtain communication over a distance of 23 sea miles on Channel 1 at the frequency employed. This difficulty was further increased by the size and weight limitations of the pilot's hand portable equipment, restricting the transmission power to not more than ¼ watt and the receiver sensitivity to approximately 15 microvolts. Added to this, the cost of building a high tower to carry the shore station aerial had to be kept within reasonable bounds.

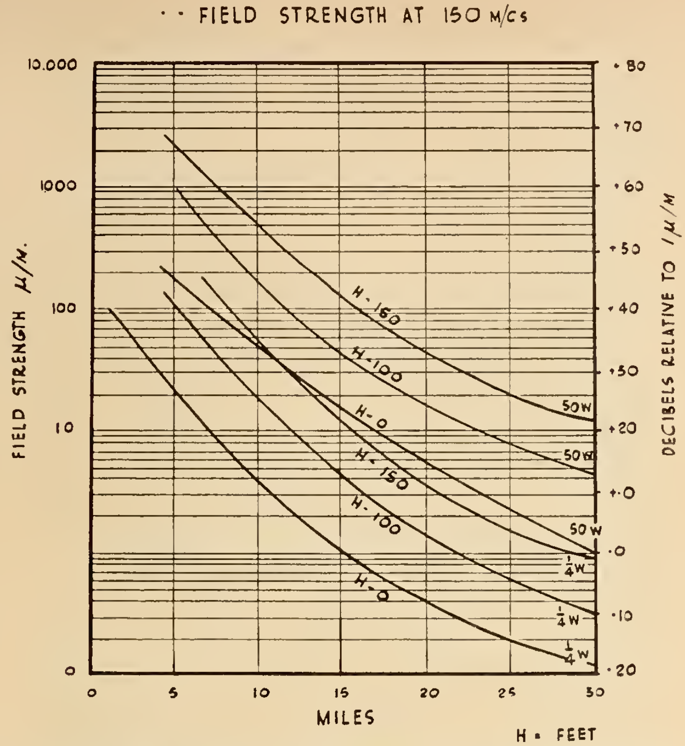


Fig. 3. Field strength using single dipoles at 150 Mc/s over sea for aerial powers of 50 watts and ¼ watt at various heights of aerial.

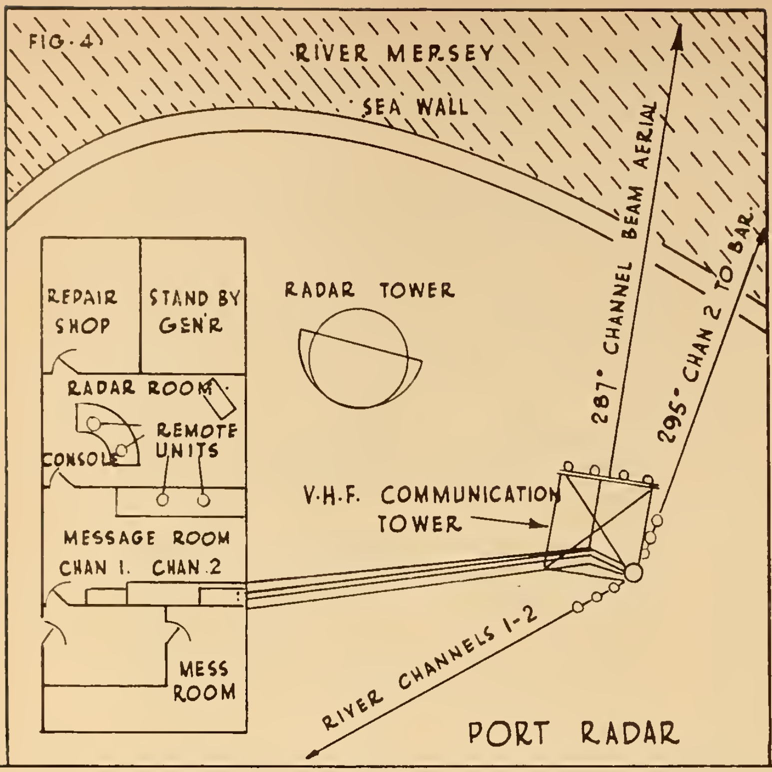
Preliminary calculations were made to determine the approximate field strength which could be expected over a distance of 23 sea miles at the land station. Further preliminary calculations were made to determine the required power of the shore station equipment to obtain communication over the same range with a portable receiver having the sensitivity previously mentioned.

For this purpose, reference was made to a paper by T. L. Eckersley (Short Wave Reflection and Deflection, Journal I.E.E., Vol. 8, page 286, 1937). The author employed in his calculations 150 Mc/s over sea, and by fixing the conditions stated below, it was possible to produce a graph which in practice was found very close to practical results (Fig. 3). The conditions of calculation were as follows:-

1. Shore station aerial height 100 ft. above sea level (aerial + height of sea wall).
2. Aerial height of portable set above sea level — zero (as this was a variable quantity, it was fixed at sea level).
3. Aerial power of portable equipment ¼ watt.
4. Maximum sensitivity at the shore receiver for good signal to noise 2 Microvolts.
5. Single dipole used for reference.

These calculations showed that for an aerial power of ¼ watt the signal strength at the land station aerial would be in the order of 0.8 microvolts per metre, or 0.32 microvolts signal. This level of signal is well down into the noise region, and below a manageable signal strength of the shore station. To this, aerial feeder losses must be added, and to facilitate calculations, these losses were fixed at 3 db.

This indicated that a high gain beam aerial should be employed with as wide a beam width as practicable. It had been ascertained that a signal of 3 microvolts was required at the receiver terminals. Figure 3 shows that an aerial gain of some 20 db. is required not including feeder losses. Consideration was then given to the transmitter power required at the shore station, utilizing an aerial with a gain of 20 db. to produce the required field strength at the portable equipment.



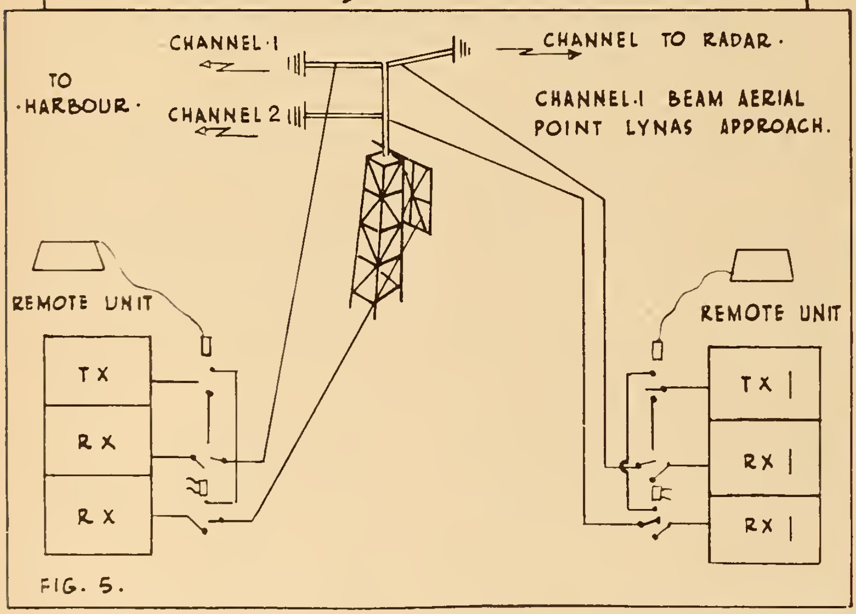


Fig. 4. Plan view of Port Radar, showing the distribution of equipment and aerial bearings.

Fig. 5. Schematic plan of aerial switching at Port Radar.

As a 15 microvolt signal was considered reasonable for a good signal to noise ratio, it will be found that the transmitter power required is approximately 35 watts. In practice, however, somewhat higher aerial powers at the land station were obtainable than were originally thought possible (i.e. 45 watts). The portable set's sensitivity was also improved (i.e. 10 microvolts for 10 db. signal to noise). This produced a slight unbalance in signal levels biased in favour of shore to ship, but this was considered to be a slight advantage when operating in bad weather and high winds.

It was decided that the aerial to be employed should be a 32 element centre fed beam with a meshed metal reflector, which came as near as practicable to giving the required gain of 18 db., with a theoretical beam width of ± 15°. The overall size of this aerial is approximately 30 ft. long and 12 ft. wide. It weighs some 1,000 lb. This aerial mounted on an 80 ft. high tower situated approximately 50 ft. from Port Radar control room, is shown in Figure 4.

Channel 2 at Port Radar, which requires an operational range of 14 sea miles, employs a Yagi type aerial with one driven element and four directors, giving a forward gain of 5 or 6 db. This aerial is mounted on a metal pole extending 20 ft. above the beam aerial on the same tower. At this height (i.e. 100 ft. + sea wall) it is visual distance to the Bar Light Ship, thus eliminating the requirement for a high gain aerial array.

The next point which had to be considered was communication coverage using directional aerials.

Fig. 6. Channel 1 shore station equipment used at Port Radar for communicating with ship's pilots over a distance of 25 miles. Legend: A - spare transmitter; B - transmitter; C - receiver; D - receiver; E - spare receiver; F - power unit; G - spare power unit.

As communication is required on both the sea-ward approaches and the river, it necessitates the use of four aerials, two looking sea-ward on Channels 1 and 6, and two looking river-ward on the same channels.

Two receivers are employed per channel, and are connected to their respective aerials. This arrangement permits 'listening out' on both channels and in both directions simultaneously. One transmitter unit only is employed per channel, and the operator, by the movement of a switch, can select direction of transmission. Switching and aerial arrangements are shown in Figure 5.

Mechanical Design

Land Station Equipment

Emphasis was laid earlier on the major requirements of the installation, but coupled with these were a number of other factors which had to be taken into consideration when the apparatus was being designed. The Dock Board were anxious that

(a) Any long delay in service due to a fault occurring in the shore equipment should be avoided;

(b) Non-technical personnel in the various offices should not have access to the equipment;

(c) The operator should have the minimum of controls.

These requirements were met by fitting the equipment in cupboards with lockable doors, and the various units are arranged to withdraw on telescopic runners for inspection. Each unit, with the exception of the transmitter power unit, is divided into two or more sub-units, which allows a semi-skilled engineer to service the unit quickly by substitution. Spare units for this purpose are stored at the maintenance depot.

The equipment is operated from a remote unit similar to the standard GPO desk set, with the inclusion of the "press to talk" key in the handset.

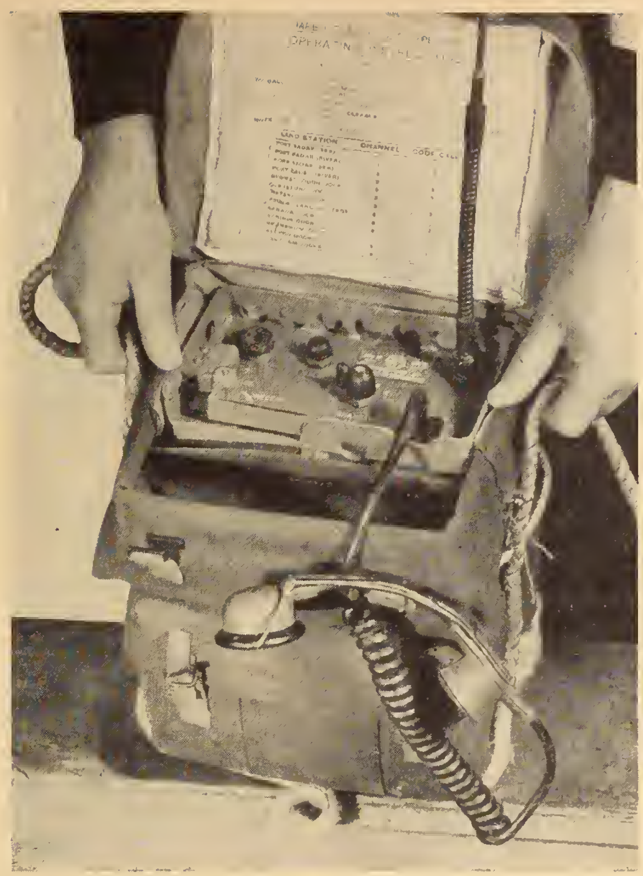


Fig. 7. Six-channel portable set used by ships' pilots to communicate with Port Radar and any one of nine dock stations.

The Portable Set

As designed, the equipment is housed in a hermetically sealed case, rain and water proof, and fitted to the top of the case are an "on/off" switch combined with the transmitter-receiver switch spring loaded so that it cannot be left on when not in use, a six-way channel switch, a signal press-button and the aerial plug. Together with non-spill chargeable accumulators and collapsible aerial the whole of the equipment is protected by a padded canvas case fitted with rope loops and weighs a fraction less than 20 lb. √

MANAGEMENT DEVELOPMENTS in GREAT BRITAIN

by

Lt.-Col. Lyndal Urwick

President, British Institute of Management.

Abstract of an address presented before the 64th Annual General and Professional Meeting of The Engineering Institute of Canada, and the Annual Summer Meeting of the American Society of Civil Engineers, July, 1950, at Toronto, Ont.

It is my privilege to convey to the Engineering Institute of Canada, the American Society of Civil Engineers, and the Canadian National Management Council, the cordial greetings of their friends of the British Institute of Management.

Modern management is rooted in engineering. The triumvirate of thinkers and practical men from whose work it originated, Taylor, Gantt, and Gilbreth, were all of them distinguished members of the American Society of Mechanical Engineers. Had they not been trained as engineers, they would never have developed the philosophy to which they gave the title "Scientific Management". Had they only remained engineers, that philosophy would never have issued into the world-wide movement for industrial betterment which it has since become.

Up to the First World War, positive concern for the study of management and its application was patchy and feeble. Pressure for production in World War I led to the formation of a committee on Health of Munition Workers. By war's end, many activities had been started to encourage the development of various aspects of management. But during the depression of the early "twenties" they were largely forgotten. And though in succeeding years a number of voluntary associations were formed to study special aspects of the subject, there was nothing corresponding to the Chief Executives' practical interest which is necessary in every function of management. There was no body with the weight and authority to precipitate among British industrialists that mental revolution which is scientific management.

This, with certain exceptions, remained the British situation throughout the period between the two World Wars. From the Sixth International Management Congress in London in 1935 however, there emerged the British Management Council as a co-ordinating agency for the various specialized institutions. But while there had been growth, unity and weight were lacking.

The production requirements of the Second World War again emphasized the urgent need for a higher standard of management. The government was particularly interested in the need for a better knowledge of personnel management and improved immediate supervision. With the help of the existing institutions, courses were organized in both these subjects. The Ministry of Labour established a section which gave a preliminary training to many thousands of supervisors and potential supervisors on T.W.I. lines. The government also greatly strengthened its own machinery for introducing modern concepts of management into the departments.

In 1947, the first council of the newly constituted British Institute of Management was nominated by the President of the Board of Trade. The electorate are leading industrialists who are founder members of the Institute.

Now Great Britain is still, in many respects, a free country. Obviously the formation of a central body of this kind with government backing was bound to cause an outburst of alarm and despondency among the smaller specialized institutions. It was most undesirable that it should attempt to carry out its mission of co-ordinating their activities by any display of force. It has, therefore, taken some time to get going. But today it has concluded working agreements with four or five of the principal specialized institutions. Many of these have taken offices in the same building and are sharing common services. The Institute has a growing list of valuable publications. It organizes two large-scale management conferences annually.

But the Council recognizes that its main job is to stimulate other people to do things. In particular a larger proportion of the quarter of a million people engaged in supervisory duties in British business must be brought to realize that management is an intelligent occupation, and must be roused to enthusiasm for study and self-development. It aims to promote the formation of local management associations in every town of any importance in Britain.

Parallel with this development, two other moves have taken place with special reference to education for management. A Committee appointed by the late Ellen Wilkinson, Minister for Education, recommended a common intermediate examination in management studies with different final examinations for different institutions, but with a 25 per cent common element, and a final examination in general management. This has been implemented. Secondly, a national administrative staff college has been established near Henley for promising younger executives in the 28-40 age group, drawn both from private industry and the Civil Service, local government, nationalized industries, and the armed services.

There has already been definite accomplishment. Britain now has a national management institute of weight and substance, which has the support of both industry and commerce. I congratulate you here in Canada on the progress being made by the Canadian Management Council. Let us all go forward together in the great search for social insight which is management.

NEW TABER BEET SUGAR FACTORY

by

F. H. Ballou, M.E.I.C.

Chief Engineer,
Canadian Sugar Factories Ltd.,
Vancouver, B.C.

A paper presented before the Lethbridge Branch of The Engineering Institute of Canada, April 15, 1950.

Sugar refining is one of Canada's oldest industries. Back in the days immediately following Confederation, sugar production was valued at some $4 millions annually, but was produced almost entirely from imported raw materials. Early in this century the development of irrigation in southern Alberta stimulated the production of sugar beets, and a refinery was built at Raymond by the Knight Sugar Co. With the extension of irrigated areas in southern Alberta in the "twenties", a second refinery was built at Picture Butte in 1936.

This year a third refinery at Taber will commence operation. These three refineries will have a combined capacity for producing some 150 million pounds of refined sugar annually, which is roughly 12 per cent of Canada's entire sugar consumption, or enough to supply Alberta, Saskatchewan and 50 per cent of Manitoba. These three refineries will together provide a market for some 37,000 acres of sugar beets in Alberta grown under irrigation, bringing a gross return to farmers of close to $5 millions annually.

The new Taber Refinery will have an ultimate slicing capacity of 2000 tons of beets every 24 hours. It is provided with a pulp drying plant, in contrast to the Raymond and Picture Butte refineries, which produce wet pulp only. The ultimate rated production capacities of the new plant are as follows:

Tons of beets sliced per year	200,000 tons
Bags of sugar produced (100 lbs. each)	600,000 bags
Dried pulp produced, based on 30 per cent molasses pulp	12,000 tons
Molasses produced, including that used in dried pulp	9,000 tons

To take care of the storing of these products, storage is provided as follows:

Bulk sugar bins: 100-lb. bags	300,000 bags
Sugar warehouse for bagged sugar	40,000 bags
Bulk pulp and bagged pulp warehouse	4,200 tons
Molasses storage tanks—2.	2,000 tons
Fuel oil storage (in case of natural gas failure)	5,350 bbls.

A brief description of some of the equipment required to produce these products will be of interest.

Boiler House and Power Plant

Power is supplied by two cross flow integral furnace boilers, burning natural gas; and one smaller boiler for heating during the non-operating period. These boilers each generate 70 to 90 M. lbs. of steam per hour at 410 p.s.i., at a temperature of 625° F., or about 175° F. superheat. During operation the plant will generate its own electric power, by means of a 2000 kw. steam turbine.

All the steam from the boilers will be used in the turbines, except that portion reduced in pressure for process work. The exhaust steam from the turbine, together with the addition of reduced live steam will be used for boiling the juice in the evaporators. First, second, and third vapor will be used for boiling sugar, juice heaters, diffuser, etc. The exhaust will be maintained at a pressure of 30 lb. gauge, by the addition of live steam. The water rate of the turbine under these conditions will be about 26 lb. per kilowatt hour.

Beet Sugar Machinery

The new Taber Refinery is equipped with all of the latest most up to date beet sugar machinery of the most efficient design. An outstanding unit is the wheel-type diffuser, which operates with one man instead of 5 or 6, and with lower sugar losses and reduced draft. The operation of the beet slicers is controlled by a weightometer. If, for instance, the controller is set for a slicing rate of 2000 tons per 24 hours, by means of relays the weightometer actuates a scoop in the fluid clutch between the motor and reduction gear driving the beet slicers. As the scoop picks up oil, the slicers speed up. When oil is released, the slicers slow down, thus maintaining the slicing rate desired. This weightometer also actuates an air controlled valve, which maintains the desired amount of water entering the diffuser. The weight of water is thus proportioned to the weight of beets. The rotolouvre sugar drier installed produces a sparkling sugar crystal, as compared with the old equipment.

Pulp Drier

The wet screened pulp from the continuous diffuser is first pressed to reduce the moisture content from 95 per cent to 80 per cent. This pressed pulp is fed by means of a scroll to the pulp drier. This machine is a revolving drum 48 ft. long by 10 ft. 6 in. diameter, with induced draft fans and cyclone separators on the discharge end. Hot gases produced by burning natural gas pass through the drum with the pulp. The moisture in the pressed pulp is reduced here from 80 per cent to 10 per cent or less. In this condition the dried pulp weighs about 15 lb. per cu. ft., and is either sacked in 50-lb. paper or 100 lb. burlap bags, or stored in bulk.

Water Supply

The Taber Irrigation District reservoir is the source of water for the refinery requirements. The pump house is located about 400 feet from the lake, and is fed through a canal. 2800 feet of 16 in. I.D. transite pipe conducts the water from the pump discharge to the buildings. 125 feet of 16 in. steel pipe is used to the main water tank, at elevation 175 in the sugar end above the pan floor. The elevation of the ground floor is 100.

Water flow is controlled by an automatic air-operated controller, to maintain a proper level of water in the tank at all times and prevent any overflow. The pump house contains 3 main water pumps of 2000 g.p.m. each, only two of which will operate at one time. Pumps are direct connected to 100 hp. 1750 r.p.m. electric motors. These pumps can be controlled from the power house. Lights in the power house indicate which pumps are running and which are shut down.

Waste Water Pump House

Due to the low elevation of the factory site, it was found advisable to pump the waste water. The pump house is located three quarters of a mile from the factory. The waste water flows by gravity through a 24 in. tile to a small concrete reservoir in the pump house. Three 8 in. pumps force the water through a 16 in. transite pipe to the top of the hill. From this point the water flows by gravity through 24 in. tile to a coulee draining into the Belly River. So much quicksand was encountered in test holes that firm bids could not be obtained on a gravity line from plant to coulee. The decision to pump proved to be a wise choice. The maximum depth of cut was thus reduced from 22 feet to 12 feet, and water-bearing quicksand avoided.

The 3 pumps each have a capacity of 2500 g.p.m., and are direct-connected to 60 hp., 1150 r.p.m. motors. One 200 g.p.m. pump is installed for inter-campaign use. These pumps can also be controlled from the power plant. Only two of the three pumps will oper-

(*Continued on page 812*)

Air view of Factory site, looking west.

FROM MONTH TO MONTH

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

Technical Divisions Within the Institute

For some time there have been discussions about the possibility of organizing branches into technical divisions or groups through which increased activities of a technical nature could be developed. Past-president Armstrong presented this proposal to the executives of all branches during the course of his tour of the branches. Always there was a lively exchange of ideas and while there was no complete unanimity on the idea, it was apparent that most branches were interested. It is likely the subject will be up for further consideration during the present presidential year.

Not all members are aware that for several years the Winnipeg branch has been operating most successfully, an electrical section. Also at Ottawa there is a very successful aeronautical division. The Montreal branch has made a start on quite an ambitious proposal. The branch now meets two nights a week. Although there was no difference last year in the papers for the two nights, it is proposed that shortly one night will be devoted to papers of a specialized technical nature and the other to a more general programme. At the time of writing the executive is canvassing the membership to discover the fields in which specialization would be most popular.

In the minds of many, this technical division or section idea is essential to the proper growth of the branches and the Institute. It is agreed that not all branches will have the same need of it, nor will those branches which do organize along these lines require the same divisions or the same number of divisions. It may be that one division will be all that is required by several branches, although the signs are that two or three are more likely to be the answer.

Not the least beneficial of the results that will follow this expansion of activity is the opportunity that will be afforded to many more members to participate in committee work. The experience and training that comes from committee work is one of the best things this Institute can offer to a young engineer. In the larger branches particularly there are many more members prepared to do committee work than can be accommodated under the present setup. Technical divisions would seem to be at least one way in which such voluntary services could be used to excellent advantage.

Under " Correspondence " in this issue is a letter from Dr. A. G. Christie, M.E.I.C., who for many years and until recently was professor of mechanical engineering at Johns Hopkins University. Incidentally Dr. Christie was born in Canada and is a graduate of the University of Toronto. He is a past-president of the American Society of Mechanical Engineers. His letter is so pointed in relationship to the subject being discussed here that one might think it had been prepared " by request ". Such is not the case. The letter sprang solely from Dr. Christie's interest in the Institute, and his desire to help. No one is better qualified on this subject. The Institute is indeed fortunate to have such expert advice right now when the subject is " hot ". Do yourself the favour of reading this letter now, on page 795.

Cover Picture

The cover picture this month shows the presses and head box of No. 8 machine at the mill of the Powell River Co., Powell River, B.C.

This modern newsprint machine was installed in 1948. It exemplifies the most up-to-date Canadian practice in paper making machinery and has been designed for operation at speeds up to 2000 feet per minute.

Ontario Hydro's Tribute to Prominent Engineers

The Hydro-Electric Power Commission of Ontario is setting a precedent that, it is to be hoped, may develop into a widely accepted custom in Canada. It is the practice of naming plants or integral parts of the plants after prominent engineers who have been associated with their design or construction.

In establishing such a practice, the Commission is to be congratulated for pioneering in the recognition of the services rendered by the engineering profession. No one will dispute the importance of the engineer's contribution to the advance of civilization. They, and others who are not engineers, may be pardoned if they have sometimes wondered why outstanding structures are seldom named for those who conceived or built them.

The most recent occasion on which this practice has been followed was at the dedication ceremony for the new H.E.P.C. steam generating plant at Windsor, Ontario, on May 20th, 1950, performed by Robert H. Saunders, chairman of the Commission. This plant was appropriately named "The J. Clark Keith Steam Plant", after the general manager of the Windsor Utilities Commission, who is also a member of the Engineering Institute of Canada.

In naming this plant after Clark Keith, Hydro has paid a fine tribute to a devoted public servant. Mr. Keith would have asked no better monument than that created by a life of service, yet the new plant will be a concrete monument to him.

This, however, was not the first occasion on which the Ontario Hydro has paid such tribute to members of their engineering staff. When the Aguasabon plant was opened, the lake formed by the Aguasabon dam was named "Hays Lake" after the late C. L. Hays who was general superintendent on this project.

The Commission has also named the Toronto Steam Generating Station after its present general manager and chief engineer, Mr. R. L. Hearn, and it is now known as the "Richard L. Hearn Generating Station, Toronto." Another such occasion was the naming of the lake formed by the dam at Des Joachims, which has been called "Holden Lake" after Dr. Otto Holden, assistant general manager—engineering, of The Hydro-Electric Power Commission of Ontario.

It is the intention of the Ontario Hydro to continue this practice with respect to other projects and structures as they are completed. In so doing, the Hydro is setting a fine example of encouragement to members of their staff, in the recognition of service well and truly performed, that might well be followed by many other public utilities and similar organizations throughout Canada.

Commonwealth Conference

In the July issue of the *Journal* (page 616) the general secretary reported on his visit to South Africa with President Vance to attend the Conference of Commonwealth Engineering Institutions. The photo above, taken in one of the conference rooms at Kelvin House, Johannesburg, S.A., has come to hand just recently.

Reading clockwise around the table from the left foreground, the delegates are: J. P. Leslie, vice-president, The South African Institution of Civil Engineers; S. F. Gimkey, president, The South African Institution of Engineers; J. A. F. Michell, president, The South African Institute of Electrical Engineers; E. S. Moullin, president, The Institution of Electrical Engineers; W. K. Brasher, secretary, The Institution of Electrical Engineers; L. Austin Wright, general secretary, The Engineering Institute of Canada; James A. Vance, president, The Engineering Institute of Canada; V. A. M. Robertson, president, The Institution of Civil Engineers; E. Graham Clark, secretary, The Institution of Civil Engineers; S. F. Dorey, president, The Institution of Mechanical Engineers; A. J. Adams, secretary, The Associated Scientific and Technical Societies of South Africa; Sir Henry Guy, secretary, The Institution of Mechanical Engineers; G. Bradford, vice-president, The South African Institution of Engineers; A. W. Lineker, vice-president, The South African Institute of Electrical Engineers; S. G. Scoular, president, The New Zealand Institution of Engineers; A. F. Bruyns-Haylett, president, The South African Institution of Civil Engineers; W. D. Chapman, past-president, The Institution of Engineers, Australia; C. H. D. Harper, secretary, The Institution of Engineers, Australia. (The gentleman standing is unidentified).

Correspondence

Technical Divisions

July 18, 1950

Dear Dr. Wright:

On January 24 last you sent me a tear sheet on "What's Wrong With Canada?" and asked for comments. I was very busy all winter on consulting work and did not have time to give this question any thought. However lately I have been able to give some consideration to your question.

The situation as I visualize it, centers around the recent college graduate. He is preparing to enter his chosen profession, full of PV and "rarin'-to-go". He is keen on literature bearing on his chosen branch and also on research and development in that branch. Naturally his search for this information turns to the publications of the large American societies and often times he joins these in order to avail himself of this material.

The question arises, can E.I.C. provide him with some of the material that he desires? Before attempting to answer this let me give you a little history on the American Society of Mechanical Engineers.

I joined A.S.M.E. about 1907 when it was a small Society with general meetings such as E.I.C. holds. I was in the West for some years and did not take an active part in A.S.M.E. affairs until I came to Baltimore in 1914. In one way and another I got into Committee and other work and began to grasp some weak spots in the Society. About 1920 I joined a group of younger men who urged the formation of a Power Division in the Society and later a Fuel Division and Management Division. The response was beyond expectation. Each section undertook to provide papers for meetings, to promote research and to encourage discussion. The older groups in the Society were not in sympathy with these developments and as a result new societies were formed by groups who should have formed sections of A.S.M.E. such as the Society of Automotive Engineers, the Society of Metals, the Heating and Ventilating Engineers, the Tool Engineers, and lately, the Lubrication Engineers. It has always been my belief that these should have been divisions of A.S.M.E. which would co-ordinate all these activities.

I have also observed that these Divisions give many members an opportunity to take a part in the Society's activities which not only keeps the Society alive, but satisfies the personal "ego" of those who take over the Division activities. All of this stimulates healthy growth and activities in the Society.

In your case, power or electrical engineers for example, have few opportunities to present and discuss their problems before E.I.C. Suppose you were to try the idea of Groups or Divisions and allow these to conduct separate discussions at your meetings. I am sure that this would rouse new interest and would attract the younger men who would enter this activity with enthusiasm.

You will probably say that E.I.C. is too small for Divisions and that your finances cannot stand it. However, it is surprising what interest can be aroused by a small group of enthusiasts on a given subject. We operated some Divisions of A.S.M.E. on almost no money.

An opportunity for members to stimulate interest in their specialty and to participate in Society activities would do much to increase interest in E.I.C.

Think this over and let me know your reaction.

A. G. Christie,

Professor Emeritus of Mechanical Engineering, Johns Hopkins University, Baltimore, Maryland.

Winnipeg Flood

Editor's note: Many members who attended the 1949 Annual Meeting in Quebec City will remember Dick Titus, the 6-ft. 5-in. student delegate from Nova Scotia Technical College. Your editor hopes that "Tiny's" tolerance is as great as his physical size because the Journal has doublecrossed him in printing the following letter almost exactly as it came from Tiny's pen.

Tiny's innate modesty would probably have precluded any detailed notice of his contribution to the alleviation of the flood disaster in Winnipeg if someone on Headquarters staff had not seen a passing reference to a "frogman" from Halifax — Titus by name — in a clipping from a Winnipeg newspaper. A letter was immediately directed to our student delegate of that name stating that if he was the "frogman" of the Winnipeg flood there must surely have been much in his activities to interest readers of the Journal.

He was asked to spare no details because his remarks could be edited if necessary. The resulting letter was so interesting that we have published it in full with only very minor changes.

Dear Mr. Editor:

Thank you for your letter of June 13th requesting some information on my activities in the recent Winnipeg flood. I will attempt to tell you in a rather personal way what I did and you can edit my remarks in a professional way if you want to put something in the Journal.

The best place to start is at the beginning I suppose so that you will get the whole picture. In the summer of 1949 I took the first course in underwater swimming ever offered in Canada and, because the course was offered in Halifax, I was able to take it while still attending N.S. Tech. Thus I became the first and to this date, the only Canadian-trained frogman. The only two others were trained in England. In February of this year I was appointed officer-in-charge of underwater training for the Royal Canadian Navy. This was all worked in conjunction with my university course, so you can see I was quite busy.

On May 7th I received a signal from headquarters to proceed immediately with my assistant and our gear to Winnipeg to participate in operation "Redramp". Ten hours after receipt of the signal the R.C.A.F. had deposited us by means of a Lancaster in Winnipeg. Our purposes in "Redramp" were: (1) the actual saving of life, (2) the maintenance of public utilities, and (3) the general rendering of assistance in any way to the R.C.E.'s in carrying out underwater surveys and underwater demolitions. In Winnipeg we were joined by another Frogman who had previously commanded the unit and had since left the branch and gone back to the air branch. We were divided into 3 teams, each team being in an amphibious army "Duck" which had communication by way of a naval command wave. The first ten days were very hectic as we were on the move practically 24 hours a day.

Before I go into any detail as to actual operations I had better explain what a "Frogman" is, as compared to a standard diver. As you no doubt know a standard diver wears a suit weighing 180 lb., and is fed by means of a hand pump from the surface. In contrast, a frogman wears a suit weighing approximately 20 lb. and is sustained by means of compressed oxygen which he carries either on his back or front in small bottles. When a search is required, the Frogman wears light weight rubber flippers and swims along the bottom until he finds the object of his search and if it requires much work on the bottom he can surface and put on a set of heavy boots, which increases his weight sufficiently to keep him on the bottom and he can thus work with ease. In theory this is actually the case. Of course there are different applications of this theory and different suits are worn, but the above theory will illustrate the point.

Now as regards actual operations, one difficulty in Winnipeg was the fact that people who lived adjacent to the dykes were supposed to plug the sewers in their cellars, and many failed to do this. As a result the river backed up in the cellars and overflowed in back of the dykes, thus presenting a danger. One of the hardest jobs in the operation was diving in these numerous cellars to plug the drains. You can imagine the trash accumulated in the average cellar floating around or resting on the bottom. I bumped my head many times on floating chairs, cans, etc.

Another thing which kept us busy was the maintenance of public utilities. I remember one day diving in a manhole on the corner of Portage and Main, (one of the busiest corners in Canada I am given to understand). There was no water on the street, but the manhole was flooded. It was a hydro manhole and contained over 50 ducts carrying hydro lines. As it was necessary for workmen to work on these lines to keep the power lines open, it was necessary for us to plug all the ducts so that the manhole could be pumped out. It was a bit unusual to be diving in a manhole at a busy intersection in the middle of the prairies and quite different to the open-water work to which I was accustomed in sea water.

I have mentioned hydro, but considerable work was also done on gas lines, and also on water supply lines. The work on gas mains consisted of searching flooded streets and turning valves, etc. to divert the flow or to reroute the lines. We also did considerable work around pumping stations to keep the water supply open. May 15th was a day I will long remember, since it was the day I almost "had my chips". I was diving to try and salvage 9,000 feet of fire hose which had been abandoned when a dyke gave way and which the fire chief required in case of fire. I won't go into the gory details but it is sufficient to say that my air line from my oxygen flasks to my face piece was fouled, and I was in a position where I couldn't inhale or exhale for a considerable period of time which was longer than I like to remember. I was literally tied to the bottom and the hose, but managed to free myself. I was taken to the Navy Sick Bay, but was able to resume diving the next day.

One night I was ordered to proceed with a Red Cross relief party and railway officials to St. Norbert to effect the rescue of a relief train stranded there. We left Winnipeg at 2 o'clock in the morning and arrived at approximately 9 in the same morning. I have no idea of the distance but think it is only about 15 miles or so. The whole trip was a nightmare and the "DUCK" was swept off the road several times. I estimated the current at one section at 20 knots and believe this is a conservative estimate. When we reached the train we found approximately 500 people crowded in seven colonist cars with sickness on the rampage and the situation pretty desperate. There was one Red Cross nurse on the train and she had isolated the sick in one car and I believe this had prevented a serious epidemic, since the people had been on the train almost a week. I realized that it was too dangerous to try to effect a rescue from St. Norbert since I thought that no other "Duck" could get through, since our trip was pure luck. So, after consultation with railway officials we arranged for the train to drop all cattle cars and proceed to University Siding, from which I thought it possible to effect an evacuation by "Duck" of which seven were available. Everything went according to plan, except that my "Duck" was unable to participate in the eventual evacuation since it took quite a bad beating getting through. I took the sick with me on the way in from university siding until we rendezvoused with ambulances.

I remember one day going into the legislative buildings, which were Flood Control Headquarters, and running into Mr. Ira P. McNab of Halifax, who hardly recognized me, I was so dirty, unshaven, etc. He said, "I thought you were supposed to graduate from Tech tomorrow," and seemed very surprised to see me, as I was to see him. I missed my graduation, iron ring ceremony, and all the other things for which I had worked so hard, but it was more than satisfying to know that I was helping a little bit in the great calamity. The next day I was in a sewer doing a job when I came to the surface I asked my attendant what time it was and when he told me I realized that had I been in Halifax I would probably be marching up to get my degree. I told him to congratulate me and he of course asked me "what for"? I said "I'm just graduating from university". He thought I was foolish and sent me down again.

I guess I've said about all there is to say, except that I was very glad to get home.

If you do publish anything about this in the Journal, I wish you would make some mention of the wonderful work done by the Red Cross. You can't imagine the work which they did. It was simply magnificent. They were everywhere with their hot drinks, sandwiches, etc., and did more than anyone could possibly imagine. The people of Winnipeg were marvellous and when you see children, old men and women and even the blind working round the clock to help each other you get some idea of what makes this country of ours grow and become great. When I say work, I'm not referring to any glamorous task but real manual labour such as filling and carrying sandbags to build dykes.

I've said everything in my own way here for you to get the picture. I've given you the facts in the hope you'll put them together in a presentable manner.

My kindest personal regards, and I wish I could be present at the convention in Toronto.

Yours very truly,

"Tiny" Titus

News of Other Societies

The **American Welding Society** (33 West 39th Street, New York, 18, N.Y.) has announced the thirty-first annual meeting of the Society, at Hotel Sherman, Chicago, Ill., the week of October 22, 1950.

The **Community Planning Association of Canada** (56 Lyon Street, Ottawa) has scheduled the National Conference on Planning, and the fourth annual meeting, for October 6-7, 1950, at the Chateau Laurier, Ottawa.

Meetings on the calendar of the **Institute of the Aeronautical Sciences** (2 East 64th Street, New York, 21, N.Y.) include, the fourteenth Wright Brothers Lecture at the U.S. Chamber of Commerce Auditorium, Washington, December 16, 1950; and the nineteenth annual meeting at Hotel Astor, New York City, January 29-31 and February 1, 1951.

The twenty-third annual meeting of the **Federation of Sewage Works Associations** will take place at the Hotel Statler, Washington, D.C., October 9-12, 1950.

The fall meeting of the **American Society of Civil Engineers** (33 West 39th Street, New York, 18) will be at Chicago, Ill., October 11 to 13, 1950.

The **American Institute of Electrical Engineers** will hold the mid-west meeting at Oklahoma City, October 23-27, 1950.

E.I.C. Membership Directory, 1950

Errata

Since the distribution of the Directory to the membership headquarters has received notification of errors and omissions.

In connection with the omission of members admitted to the Institute after September 15, 1949, it should be noted that the closing date for the alphabetical listing was July 15, 1949, and for the geographical listing September 15, 1949.

Other omissions and errors are corrected as follows:

Anderson, O. V. Should read Tor. Hydro Elec. System, not H.E.P.C. of Ont.

Borrowman, M. L. Should read Man. '34, not Queen's.

Brickenden, Frederick M. Should read with Nat. Health & Welfare Dept., not private practice.

Cameron, K. M. Should real McGill '02, not Laval.

Chappell, Col. Frank. Should read Chappell, not Chappel.

Christie, C. V. Should read Prof. of Elec. Engrg., not head of Dept.

Colas, Emile, McGill '46, B.C.L., McGill '49. Barrister & Solicitor, Montreal. Mail: 4575 Marcil Ave. S.'45. J.'47.

Crossley, W. E. should read Crossley, not Crossler.

Daemen, George Rudolph. Delete Thomson Elec. Wks. Ltd., not employed by this company at any time.

Dansereau, J. Lucien. Should read J. Lucien, not Jean A. L.

Douglas-Tourner, P. W. Should read Douglas-Tourner, not Tourner. P. W. D.

Dunsmore, R. L. See list of past vice-presidents, p. IX, should be bold face type, not light face.

Dupuis, Rene. Should read 107 Craig St. W., not 159.

Elliot, D. G. Should read Elliot, not Elliott.

Findlater, R. H. Should read Heriot-Watt, not Herriot Watt.

Flitton, R. C. Should read R. C., not F.C.

Gibbs, Maxwell. Should read 1289 S. La Brea Ave., Los Angeles 35, not 1927 West 6th St.

Gratton, Jean. F'd. Supt., Franki Compressed Pile Co. of Can., Montreal. Mail: 4537 Parthenais St. S.'44.

Gray-Donald, E. D. Should read M.'39, not M.'49.

Haridge, Peter A. Should read Queen's '46, not '47.

Hayden, S R., Alta. '47, '49.

Henry, Wesley R. Should read Carnegie Tech. '42, not Alta.

Henstridge, Charles Ogilvie Cleghorn. Should read Henstridge, not Heinstridge.

Hiscocks, R. D. Should read Tor. '38, not '39, and Chf. Tech. Engr., not Officer.

Hughes, Philip B. Should read S. '27. AM.'36. M.'40.

Hughes, R. B. Chalmers, B.C. '44.

Hyman, H. Davison. Should read H. Davison, not H. Davidson.

Jeffreys, C. J., London '23. Consltg. Engr., 1115 Sherbrooke St. W., Montreal. AM.'39, M.'40. Delete Chf. Engr., Stadler Hurter & Co.

Kerry, A. J. See geo. section under England, p. 179, should read Woodstock, not Wootton.

Larnder, I. T. Should read Larnder, not Lardner.

Lawson, G. W. Should read 420 Crescent St., not 520.

Lye, G. R. K. Should read Prod. Engr., not Proj.

Melvin John Gowen. Should read Gowen, not Gowan.

Mitchell, H. Graham. Should read Man. '49, not Sask.

Moore, Charles M. See geo. section under Lethbridge, Seven Persons, p. 165, should read C. M., not C. H.

Morse, John. Chalmers should be light face type, not bold face.

Musgrave, Arthur S. G. Should read G., not C.

McCrory, J. A. Should read Penn. State, not Penn.

Mackenzie, C. J. See Honorary Members, p.XI, and alphabetical listing, p. 99, should read M.'20, not M.'40.

McKerron, Donald. Should read McKerron, not McKerrow.

Maclachlan, Wills. Should read Consultant, Maple, Ont., not H.E.P.C. of Ont., Toronto.

Normandin, A. B. Should read Ecole Poly., '07, not '39.

Ouimet, J. Alphonse. Should read Chf. Engr. & Co-ordinator.

Papineau, G. J. Should read G. J., not B. J.

Pardoe, W. S. Should read Merion Sta., not Marion.

Parry, T. M. See list of officers of branches, p. VI, under Calgary, Sec.-Treas. should read T. M. Parry, not S. G. Naisch.

Pauley, Stanley Frank. Should read Man. '49, not '47.

Pequegnat, Marcel. Should read Pequegnat, not Peguegnat.

Pichette, J. J. See geo. listing under Saint Maurice Valley, Three Rivers, p. 176, insert J. J. Pichette after E. Park.

Rees, H. S. See geo. listing under Ottawa, p.172, insert H. S. Rees after D. B. Rees.

Rindress, Horace Grant, McGill '48.

Robb, Charles A. Should read Prof. of Mech. Engrg. & Chmn. of the Dept., McGill Univ.

Robertson, Hugh. Should read 790 Eglinton Ave. W., not 1790.

Roddick, J. O. Should read Roddick, not Roddisk.

Ryan, E. A. Should read Rm. 1020, not 100.

Sherman, N. C. Should read N. C. Sherman Ltd., not Sheridan.

Singer, I. Should read Singer, not Siner.

Smythies, R. E. Should read Instow, not Inshow, and in geo. listing under British West Indies, p. 179, should read Barbados, not St. Peter.

Thomson, Lesslie R. Should rèad Lesslie, not Leslie.

Tremblay, S. N. Should read 35 McGill St., not Rm. 111, Confederation Bldg., 1253 McGill College Ave.

Ulmann, Hans. Should read Ulmann, not Ulhann.

Vorres, Alexander A. Should read Vorres, not Vvorres.

Wardle, Edward B. Should read Dartmouth, not Dartsmouth.

Weaver, H. L. Should read Chf. Dsgnr., not Engr.

Whelen, Morland P. Should read Tor. Hydro Elec. System, not H.E.P.C. of Ont.

White, C. S. Should read Mayfield Ave., not Bayfield.

In the geo. listing of **Sault Ste. Marie Branch,** p. 167, the town of Espanola, showing the following members, should be inserted after Creighton Mine: Members, J. F. McCallum, H. T. Ralph; Junior, H. D. Paavila; Students, T. Kottick, P. Petcoff.

On p. 171 **Mattawa** is listed under Ottawa as well as Sault Ste. Marie. It should appear under Sault Ste. Marie only.

On p. 169 **Bowmanville** is listed under the Toronto branch. It should appear under Peterborough.

N.B.—It should be noted that Espanola and Mattawa now form part of the Sudbury branch.

Personals

Notes of the Personal Activities of Members of the Institute

J. M. Wardle, M.E.I.C., director of the Public Projects Branch of the Department of Resources and Development, at Ottawa, is the person most largely responsible for the handling of federal action on the Trans-Canada Highway, a division of the Public Projects Branch.

Mr. Wardle joined the Federal Government in Ottawa in 1913 and has remained in its service.

His present work on "special projects" for the Department covers many things of major importance in the federal field, or joint projects with the provincial governments. It includes power development in the N.W.T., highways, and conservation work.

C. James Gardner, M.E.I.C., of Ottawa, is management consultant for the Civil Service Commission. He was previously manager of Jessop Steel Company Limited of Toronto and Montreal.

He graduated from London University, England, receiving the degree of M.Sc. in 1940 and before going to Jessop Steel Company in 1947 was with the Department of Trade and Commerce, Ottawa, and with Hamilton Bridge Company Limited, Hamilton.

O. J. Koreen, M.E.I.C., has been elected chairman of the Lakehead Branch of the Institute.

Mr. Koreen in from Sweden, where he graduated from Lulea Technical School in 1912. He served a machine shop and draughting apprenticeship in Sweden, and in Canada, from 1913 to 1915 he was an apprentice in a shipyard in Port Arthur, Ont. He worked from 1917 to 1919 on detailing of ship sections. He then joined the Port Arthur Shipbuilding Company Limited, in his present position as chief draughtsman and assistant to the naval architect.

C. N. Murray, M.E.I.C., has been elected chairman of the Cape Breton Branch of the Institute.

Mr. Murray is superintendent of blast furnaces of Dominion Steel and Coal Corporation, Sydney.

He was born in Sydney and studied at Acadia University and Nova Scotia Technical College, graduating in 1935 from the latter with a degree in mechanical engineering.

He had worked for the Sydney and Louisbourg Railway from 1925 to 1935, and then for a year he was with Alexander Murray & Company. He joined Dominion Steel & Coal Company as an instrument clerk in 1936, and was successively general foreman of blast furnaces (1938), assistant superintendent of blast furnaces (1942), prior to the appointment to his present position in 1943.

H. E. Brandon, M.E.I.C., structural engineer on the staff of the Hydro Electric Power Commission of Ontario, retired on August 1st, 1950, after thirty-one years of service.

Mr. Brandon, after graduating in 1907 from Toronto University with the degree of B.A.Sc., worked with the Manitoba Bridge and Iron Works and the Vulcan Iron Works in Winnipeg until 1915. He then served with the Canadian Expeditionary Force in World War I with the rank of lieutenant until 1919.

During the greater part of his services with the Commission he was in charge of structural and mechanical engineering as applied to generating, transforming and distributing stations.

He is a past councillor of the Institute, a past chairman of the Toronto Branch, and a member of the Association of Professional Engineers of Ontario.

O. J. Koreen, M.E.I.C.

M. J. Spratt, M.E.I.C., chief engineer of Saskatchewan Pool Elevators Limited at Regina, Sask., was recently appointed to command the 9th Field Engineer Regiment (Reserve Force) with the rank of lieutenant-colonel. **Major E. J. Durnin,** M.E.I.C., construction engineer for the Saskatchewan Power Commission is second in command of the Regiment, and **Captain R. A. Swanson,** M.E.I.C., Canadian Pacific Railway divisional engineer at Regina, is the adjutant. **Major J. C. Traynor,** M.E.I.C., chief surveyor of land titles for Saskatchewan, commands the 14th Squadron (Regina).

H. E. Brandon, M.E.I.C.

The regiment recently attended summer camp at Chilliwack, B.C., and was successful in winning the Gzowski cup for the most proficient regiment of the four Western regiments competing. While the Regiment is not yet up to peace-time strength, having raised only three squadrons to date, it is hoped to form an additional two squadrons within the next year or so.

P. G. W. Walker M.E.I.C., is now employed as townsite manager with the Longlac Pulp and Paper Company at Terrace Bay, Ont.

Mr. Walker had been in Kapuskasing, Ont., a structural design engineer with the Spruce Falls Power and Paper Company since early in 1949, and was previously assistant city engineer at St. Thomas, Ont.

Mr. Walker graduated in civil engineering in 1940, from Cambridge University, England.

C. A. Morrison, M.E.I.C., has been appointed assistant to the president of Canadian General Electric Company.

Mr. Morrison has had very broad managerial experience with the Company from coast-to-coast. His most recent appointments have been as district manager in Halifax and, since 1947, at Vancouver.

He graduated in 1927 from the University of Toronto in electrical engineering. After a period of service with the Hydro-Electric Power Commission of Ontario, and with the department of

C. A. Morrison, M.E.I.C.

engineering physics at the University of Toronto, Mr. Morrison joined C.G.E. in 1930.

He entered the Company's lighting service department, became lighting service engineer, Montreal, in 1931, and was appointed manager of the lamp division, Montreal, three years later.

Kenneth Billingsley, Jr.E.I.C., has joined the staff of Mathews Conveyor Company in Port Hope, Ont. He graduated from University of Saskatchewan in mechanical engineering in 1948 and has since then been employed by the Hudsons' Bay Mining and Smelting Company, at Flin Flon, Man.

P. A. Livingston, Jr.E.I.C., is in the Toronto design office of the Abitibi Power and Paper Company Limited. He was previously with H. G. Acres & Co., Niagara Falls, Ont.

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

C. J. LeBlanc, S.E.I.C., is with Northern Electric Co. Ltd., Montreal, as a junior engineer. He graduated this year from Nova Scotia Technical College in electrical engineering.

Jean Claude Lanoie, S.E.I.C., of Montreal, now attending the Ecole Polytechnique; **George W. Jull,** S.E.I.C., of Calgary, attending the University of Alberta; **Jean Paul Bonneau,** S.E.I.C., of Quebec City, attending the Ecole Polytechnique, Montreal; and **B. R. Bourke,** S.E.I.C., of Antigonish, N.S., attending McGill University, have been awarded scholarships of the R.C.E. Memorial Scholarships Committee this year.

These scholarships are awarded annually by the R.C.E. Committee, to applicants who are final year students in applied engineering at the major universities in Canada and who are also members of the C.O.T.C.

Conrad Goldman, S.E.I.C., has joined the staff of Ross Productions Company, in Montreal. He graduated in 1949 from McGill University in chemical engineering.

Cecil R. Vivian, S.E.I.C., is working with the Newfoundland Light & Power Company at St. Johns, Nfld., as a civil engineer. He graduated this year from N.S. Technical College in civil engineering.

G. W. MacDonald, S.E.I.C., is working with the English Electric Company at St. Catharines, Ont. He graduated this year from University of Manitoba in electrical engineering.

E. L. Weiss, S.E.I.C., graduate in mechanical engineering of University of Manitoba, this year, is working for Dow Chemical of Canada, in Sarnia, Ont.

George Andronidis, S.E.I.C., who graduated this year from McGill University in electrical engineering, is employed by Garner Denver Company, Quincy, Ill.

Visitors to Headquarters

W. G. Woxholt, Rand Water Board, Johannesburg, South Africa, July 27.

E. G. Allwright, Affil.E.I.C., Summerside, P.E.I., August 14.

N. B. Eagles M.E.I.C., Moncton, N.B., August 14.

Sir Peirson Frank, Westminster, London, England, August 16.

Awarded Leonard Medal

P. E. Cavanagh, M.C.I.M.

P. E. Cavanagh, assistant director of the Department of Engineering and Metallurgy, Ontario Research Foundation, and **Owen Matthews,** mill superintendent and metallurgist with Cochenour Willans Gold Mines, McKenzie Island, Ont., have been awarded the Leonard Medal of the Institute and of the Canadian Institute of Mining and Metallurgy.

Mr. Cavanagh graduated from University of Toronto in metallurgical engineering in 1937, and was employed in the metallurgy and open hearth departments of the Steel Company of Canada. He worked with Allen B. DuMont Laboratories at Passaic, N.J., as chief metallurgist until 1946, when he joined the Ontario Research Foundation. He is from Winnipeg, Man.

Mr. Cavanagh's prize winning paper is entitled "Economics of Ferrous Smelting in Canada".

Mr. Matthews is from Edinburgh, Scotland, where he received his education. He came to Canada immediately after World War I, in which he served in the Royal Scots Highlanders and the Royal Naval Transports. He worked in the Manitoba Civil Service before entering the mining industry. He was associated as mill superintendent with several gold mining companies before joining Cochenour Willans Gold Mines in 1937. There he has been responsible for research and for the solution of metallurgical difficulties.

Mr. Matthews' prize winning paper treated of "Fluo-solids Roasting of Arsenopyrite Concentrates at Cochenour Willans".

Owen Matthews, M.C.I.M.

NEWS of the BRANCHES

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

Lakehead

G. S. HALTER, Jr.E.I.C.,
Secretary-Treasurer

The annual meeting of the Branch was held in the Port Arthur Golf and Country Club on Tuesday evening, June 20th, with 72 members and guests present. Mr. H. M. Olsson, branch chairman presided.

Representatives of Lakehead dental, law and medical societies, were present as guests and brought greetings from their respective groups. An interesting highlight of one of the talks was the story of the work done by an engineer named Hannah on original design work and laying out the basic theories in the making of false teeth. These theories are used and taught in the dental schools even today. The guests of honour for the evening were Mr. E. V. Buchanan, M.E.I.C., president of the Association of Professional Engineers of Ontario, and Mr. T. M. Medland, executive-director of the Association.

Mr. J. M. Fleming introduced Mr. Buchanan, who brought greetings from the London Branch of the E.I.C. Speaking on the subject of **Independence,** Mr. Buchanan stated that independent thinking of engineers has raised the standard of living in Canada to unthought-of heights, and would continue to do so.

The engineer's training in Canadian universities makes him very able to adapt himself to various situations, Mr. Buchanan said. He stated that Canadian engineers today are doing a very good job although they are often too modest. They are well thought of and a good number earn in excess of $20,000.00 per year.

Mr. D. Hunter then introduced Colonel Medland, who told of the Association's public relations programme in which the Niagara Publicity Company was employed. A number of records have been made in which John Fisher tells stories of the Canadian engineer. Mr. Medland stated that there were 3,500 engineering graduates this year in Canada. He thought that the industrial know-how of the democratic countries, brought about by engineers, was the thing most feared in the Communist orbit.

A question period ensued with both guest speakers taking part. The proposed co-operative agreement between the Association of Professional Engineers of Ontario and the Engineering Institute was discussed.

Mr. S. E. Flook moved a vote of thanks to the guest speakers, and the committee chairmen presented their annual reports. The new chairman, Mr. O. J. Koreen took over the chair from Mr. Olsson, who thanked the executive for their fine co-operation and wished them every success for the coming year.

Mr. Koreen stated that he thought it a great honour to become branch chairman and that he should try to do the job to the best of his ability. He introduced the new executive as follows: A. J. Mickelson, vice-chairman; G. S. Halter, secretary-treasurer; Fort William members, F. E. Ayres, A. D. Norton, E. T. Charnock; Port Arthur members, H. A. Oaks, J. H. Hargrave, K. A. McCaffrey; non-resident members, D.Hunter, M. S. Fotheringham. Mr. Fleming moved a vote of thanks, on behalf of the gathering, to the outgoing executive.

Obituaries

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

Arthur William Connor, S.E.I.C., of Toronto, Ont., died on July 9, 1950. He had retired in 1947 from active work.

Born at Renfrew, Ont., in 1870, he studied at University of Toronto, graduating in 1895 with a degree in civil engineering. During the next ten years he worked for the Hamilton Bridge Company on detailing and designing; for the Central Bridge Company in Peterborough, Ont., and for Canada Foundry Company, Ltd., Toronto.

He was a consulting and supervising structural engineer in Toronto from 1905 until his retirement. Among the projects under his supervision as consulting structural engineer were viaducts and crossings on the Temiscaming and Northern Railway; a section of the Bloor Street Viaduct for the city of Toronto; three bridges for the Ontario Government; many steel and concrete bridges in Wellington County, Ontario; and many buildings. He acted for some years as bridge and roadway engineer for six Ontario counties and many townships.

Mr. Connor joined the Institute in 1899 as an Associate Member transferring to Member in 1922.

Archibald J. Macdonald, M.E.I.C., of Halifax, N.S., died on July 12, 1950, after a brief illness.

Mr. Macdonald was an engineer at Halifax for the Federal Department of Public Works since 1946. He was born at Black Avon, in Nova Scotia. He studied at St. Francis Xavier University, receiving a B.A. degree in 1896 and a B.Sc. degree in 1902. He worked for the Dominion Steel and Coal Corporation for a time, and was in mining and railway work for some years in the Maritimes. He joined the provincial department of highways about 1926, and was stationed at Halifax and at Yarmouth as an inspecting engineer. In 1937 he joined the Dominion Department of Public Works at Halifax. He was transferred to Sydney, N.S., for a time, but returned to Halifax, in 1946.

He was a member of the Association of Professional Engineers of Nova Scotia. He joined the Institute as an Associate Member in 1907, transferring to Member in 1940, and attaining life membership in the Institute in 1938.

Hyman A. Goldman, M.E.I.C., of Montreal, died on July 20, 1950, after a long illness.

Mr. Goldman was well known in financial and insurance fields in Montreal. Born in the Ukraine in 1886, he came to Canada at an early age. He studied engineering at the University of Valparaiso, graduating as a civil engineer in 1912.

His early engineering work was with Canadian Pacific Railway and American railroads. In 1916 he went to the Toronto Harbour Commission as an assistant engineer. He joined the Shawinigan Water and Power Company in 1927 and remained with that organization for a number of years. In recent years he was a member of the Montreal Life Insurance Company.

He joined the Institute in 1915 as a Junior, transferring to Associate Member in 1918, and to Member in 1940.

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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, is needed for process development or production work by a chemical and synthetic resin manufacturing firm situated in the Province of Quebec. Some experience in chemical production or synthetic resin manufacture would be advantageous. Apply to File No. 1535-V.

CHEMICAL ENGINEER required in Montreal for research and development work in inorganic chemistry. Apply to File No. 1540-V.

CIVIL

CIVIL ENGINEER, recent graduate, required for municipal duties by a town in Montreal area. Apply to File No. 1548-V.

MECHANICAL

MECHANICAL ENGINEER required by large chemical company in Province of Quebec. Applicants should be bilingual and have preferably one or two years experience in refrigeration, steam and brine. Reply giving full details of qualifications and experience. Apply to File No. 1534-V.

TWO YOUNG MECHANICAL ENGINEERS required in Ontario. Recent graduates would be considered. Excellent opportunities to gain experience and good prospect for promotion. Apply to File No. 1537-V.

YOUNG MECHANICAL ENGINEER required by a large firm in Montreal. Applicant should have some industrial experience. Duties include sales and service work. Apply to File No. 1538-V.

JUNIOR MECHANICAL ENGINEER required by large engineering firm in Montreal. Recent graduate or one or two years experience. Apply to File No. 1542-V.

MECHANICAL DRAUGHTSMAN with engineering status preferred, thoroughly acquainted with the design and shop detailing of dust collecting systems, including layout and proportioning of ducts and selection of equipment, required in Ontario. Field experience would be advantageous. Apply giving full particulars of experience to File No. 1544-V.

TWO JUNIOR MECHANICAL ENGINEERS OR DRAUGHTSMEN required by firm in Ontario. Applicants would be required to work on design and installation drawings for pulp and paper machinery, piping etc. Engineers should have at least one year's experience on machinery, and equipment, design and layout, not necessarily in the pulp and paper industry. Draughtsmen should have 2-5 years draughting experience. Salaries $250.00 to $350.00. Apply to File No. 1547-V.

MISCELLANEOUS

AN ENGINEER (Electrical and Power) and an engineer (Construction Design) up to $5,700 for the department of National Defence (R.C.A.F. at Ottawa). Details and application forms at Civil Service Commission Offices, National Employment Service Offices and Post Offices. Apply to File No. 1532-V.

ENGINEERING DEPARTMENT, of two machine newsprint mill requires the services of a design engineer and draughtsman. Applicant should be between 30 and 40 years of age, hold a degree in mechanical engineering from a Canadian University and have at least 10 years experience in design work. Paper mill experience not absolutely essential but would be desirable. In reply send complete details, references and recent photo. Apply to File No. 1533-V.

MECHANICAL OR ELECTRICAL ENGINEER required by large firm in Montreal. Duties include co-ordination of construction activities with special reference to electrical and mechanical equipment. When construction completed applicant would be plant engineer. Plant experience necessary. Salary according to qualifications. Apply to File No. 1539-V.

TWO QUALIFIED TIME MOTION STUDY ENGINEERS required by paper company located in the Province of Quebec. Applicants should have at least 3 years actual experience in time-motion study, layout, man-machine loading and job description. One of the selected applicants must be fluently bilingual. Apply to File No. 1545-V.

LECTURER IN CIVIL ENGINEERING for University in Central Ontario required. Applicant will be obliged to give lectures in mechanics of materials and elementary structural theory to the second year and to assist with the work in the materials laboratory. Term end of September to end of April. Salary $350.00. Apply to File No. 1546-V.

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

ENGINEER REQUIRED by construction company, in Montreal with about 3 or more years of general construction experience. Permanent position. Applicant must be able to accept responsibilities and be able to meet clients, architects etc. Work combines both outdoor and indoor services. A knowledge of French would be helpful. Salary range $300.00 per month. Apply to File No. 1551-V.

NATIONAL RESEARCH COUNCIL REQUIRES organic and physical chemists, to assist in the synthesis of organic compounds containing isotopic tracers, also the investigation of catalyst activity in the oxidation of ethylene. Chemical Engineers, to assist in plant operation. At least honour in B.Sc. preferably M.Sc. in chemistry or chemical engineering required. Initial salary $2400.00 to $2640.00 depending on qualifications and experience. Apply to File No. 1552-V.

ASSISTANT DYKING COMMISSIONER required by Department of Lands, Victario, B.C., to assist in administration and management of dyking and drainage districts in Fraser Valley. Must be Civil engineer graduate, eligible for full registration in B.C. At least 3 years practical experience as registered engineer in responsible charge of engineering projects, preferably related to dyking and drainage. British subjects, not over 45 years, except ex-service men, who are given preference. Salary $5376.00 rising to $5976.00 per annum. Apply to File No. 1553-V.

A LARGE ORGANIZATION is offering the position of Scientific Editor at a salary up to $3660.00. Applicants should have a degree in science or engineering; they should have some knowledge of editing, and the writing and compiling of scientific research manuscripts. Further information may be obtained by writing Box No. 1274 Station B., Ottawa, Ontario. File No. 1554-V.

SALES ENGINEER required by firm located in Montreal. Territory includes Montreal and Area. Applicant should be preferably mechanical engineer with some sales experience. Salary $3600.00 per year. Apply to File No. 1555-V.

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

CHEMICAL

CHEMICAL ENGINEER required in Montreal to act as project engineer. Applicant should have a minimum of 3 to 5 years experience in installation work and plant engineering, involving estimating layout, process equipment design, requisitioning and job cost control. Apply to File No. 1530-V.

CIVIL

GRADUATE CIVIL ENGINEER required in Ontario, preferably with experience in reinforced concrete and structural design. If possible paper mill experience or experience with a consulting engineering firm. Applicant must be single. Salary $300.00 to $350.00 depending on qualifications and experience. Apply to File No. 1474-V.

CIVIL ENGINEER with about 5 years experience in concrete building design, detailing and estimating of reinforcing bars. Location Western Canada. Applicant would be obliged to take control of this department. Salary would be commensurate with experience offered. Apply to File No. 1517-V.

ELECTRICAL

ELECTRICAL ENGINEER required in Province of Quebec with a minimum of 4 or 5 years experience in supervising an electricians crew in an industrial plant. Applicant must have a proven record of success in industrial electrical maintenance. Salary open. Preference will be given to a man with pulp and paper experience. Apply to File No. 1497-V.

GRADUATE ELECTRICAL ENGINEER, required by firm located in Ontario. Applicant must be capable of both sales and development work. Development work would involve the preparation of schematic and actual wiring diagrams and field service work. Apply to File No. 1500-V.

ELECTRICAL ENGINEER with approximately 10 years experience in industrial electrical maintenance and design to act as electrical superintendent in large pulp and paper mills, located in Ottawa Valley. Reply stating age, qualifications and experience to File No. 1504-V.

GRADUATE ELECTRICAL ENGINEER with at least 10 years experience in distribution field work and planning. Applicant would design, make economy studies of distribution extensions and reconstruction of the system in Brazil. Age 35-45 years. Apply to File No. 1525-V.

ELECTRICAL ENGINEER required in the Maritimes to take charge of the electrical maintenance and construction. Mill is completely electrified and power generated by means of a steam turbo generator. Apply to File No. 1526-V.

MECHANICAL

MECHANICAL ENGINEER required in Montreal by steel fabricating plant for shop supervision and sales. Salary $300.00 to $400.00. Apply to File No. 1478-V.

THREE MECHANICAL ENGINEERS required with a minimum of one year's experience in the petroleum, heavy chemical, or pulp and paper industry, by chemical company located in Ontario. Apply to File No. 1481-V.

CHIEF MECHANICAL ENGINEER with extensive design and applications, required to supervise an engineering department for design and development of hoisting machinery and construction equipment, pumps, transmission equipment and general engineering products; develop product applications with customers. Applicants with Canadian experience and associates in this field preferred. Apply to File No. 1508-V.

MECHANICAL ENGINEER required in Montreal by large firm. Applicant should have about 4 or 5 years pulp and paper experience, preferably in the actual making of paper. Apply to File No. 1512-V.

YOUNG MECHANICAL ENGINEER required by firm located in Montreal for their Ontario branch. Applicant should have 2 or 3 years experience in project work and plant maintenance. Apply to File No. 1515-V.

TWO MECHANICAL DRAUGHTSMEN required by firm located in Ontario. Applicants should be familiar with the design of jigs, fixtures, dies, etc., also the design of special purpose tools for use in mass or multiple production. A knowledge of hydraulics would be advantageous. Apply to File No. 1521-V.

MECHANICAL ENGINEER required by large mining company to act as plant engineer located in Ontario. Applicant should have at least 10 years experience. Reply giving full details of previous experience and salary desired to File No. 1522-V.

MICELLANEOUS

MECHANICAL OR CIVIL ENGINEER, required for Toronto office of firm located in Montreal with 3 to 5 years industrial experience to include background of welding knowledge. Work includes process development and promotion in welding field. Salary open. Apply to File No. 1415-V.

PLANT ENGINEER required by paper industry located in Province of Quebec. Applicant must have some experience in plant maintenance and be preferably bilingual. Apply to File No. 1476-V.

TOOL ENGINEER, required for supervisory position in large automotive plant. Mechanical preferred. Age 30-45, with 10 years practical experience in machine tool, gauge and die design and automotive body assembly methods. Must have general knowledge of motion study, processing and cost estimating, pattern making and foundry practice, welding, inspection, and tool room methods. Man required with organizing ability, good judgment and proven supervisory qualities. Apply to File No. 1482-V.

POWER ENGINEER (Mechanical preferred), required for large oil refinery in Montreal. Age 35 or over. About 10 years experience in the design, construction, operation and maintenance of both steam generating and electric power plants and distribution systems. Applicant must have to a high degree, qualities of initiative and co-operation. Salary open. Submit qualifications with recent photo. Apply to File No. 1485-V.

EXPERIENCED CONSTRUCTION ENGINEER, 45 to 50 years of age, capable of handling district supervisory responsibilities and contacts. Excellent opportunity for the right man. Our organization is aware of this advertisement. Apply to File No. 1492-V.

MECHANICAL OR ELECTRICAL ENGINEER with mechanical design experience for engineering office of large industrial plant in Montreal. Must have several years design and development experience. State full experience, age, etc., in first letter. Apply to File No. 1493-V.

GRADUATE MECHANICAL OR CHEMICAL ENGINEER, up to 35 years of age, for well established company handling widely known automatic control equipment, valves, gauges, etc., for the process industries and steam plants. Ontario only, working out of Toronto. Instrumentation experience in sales or plant necessary. Excellent prospects. Apply to File No. 1495-V.

ELECTRICAL ENGINEER REQUIRED

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

CITY ENGINEER REQUIRED IN WESTERN CANADA

Work includes the operation of the pumping and filtration plant, sewage disposal plant, incinerator and cleansing branch, asphalt plant, and the construction by the department of street paving, concrete curbs and sidewalks and sewer and water mains and the building inspection department. Preference will be given to applicants possessing a wide engineering experience especially in municipal engineering. Applicants should state age, qualifications, salary required, and previous experience with details of duties involved and accompanied by copies of testimonials. Apply to File No. 1562-V.

EXPERIENCED DESIGN ENGINEER required by a large Western Canadian steel fabricating shop. Must be experienced in design of boiler and pressure vessels, material handling equipment, structural steel. Apply to File No. 1502-V.

PROFESSOR sought by Electrical Department of a Canadian University, for class room and laboratory assignments in Electronics and general electrical engineering. Requirements are practical experience in research and design in the Electronics field and aptitudes for teaching. Preference will be given to bilingual candidates. Attractive salary and working conditions. Apply to File No. 1503-V.

A CHIEF for the department of resources and development at Ottawa. Details and application forms at Civil Service Commission offices, National Employment Service Office and Post Office. Salary $5,700.00 to $6,300.00. Apply to File No. 1505-V.

SENIOR DESIGN ENGINEER required in Ottawa, with a degree in mechanical or chemical engineering. Applicant should have a minimum of 5 years experience in mechanical design particularly with reference to chemical plant equipment and process. Apply to File No. 1507-V.

THE DEPARTMENT OF PUBLIC WORKS, Province of Alberta, requires the services of a director of town and rural planning, commencing October 1st, 1950. Duties: Administrative and advisory work: supervision and direction of technical and clerical staff of the Provincial Planning Branch; supervision of technical staff of the Edmonton District Planning Commission; to serve with the Provincial Parks Board as member of consultant. Qualifications: University graduation in architecture or civil engineering. At least four years experience in a responsible technical and/or administrative capacity under a public planning authority. Age 45 years. Apply to File No. 1508-V.

A CITY ENGINEER is required in Southern Alberta, applicants to state age, marital status, technical education, submitting detailed statements of experience, salary expected and photo. The applicant must be a registered professional engineer of Alberta. Apply to File No. 1509-V.

ASSISTANT to the city manager required in Southern Alberta. Applicant should state age, marital status, technical

ENGINEERS WANTED

for

PROCESS and PROJECT STUDIES

Location principally Montreal, although other locations also involved.

SENIOR ASSISTANTS

FIVE TO TEN YEARS' EXPERIENCE

Chemical, civil, electrical and mechanical engineers

•

JUNIOR ASSISTANTS

UP TO FIVE YEARS' EXPERIENCE

Chemical, civil, electrical and mechanical engineers

•

WORKS STAFF VACANCIES

Technical and Production Staff Opportunities are also Available to Chemical, Civil, Electrical and Mechanical Engineers, Experienced Men Preferred but not Essential.

Apply in writing giving full details to

STAFF UNIT

CANADIAN INDUSTRIES LIMITED

P.O. Box 10, Montreal, Que.

cant's age, university and experience. The salary offered is $1500.00 to $2000.00 for the session depending on qualifi cations.

PROVINCE OF ALBERTA requires the services of a director of town and rural planning, commencing October 1, 1950. Duties include administrative and advisory work, supervision and direction of technical and clerical staff of the Provincial planning branch, supervision of technical staff of the Edmonton district planning commission, to serve with the Provincial parks board as member or consultant. University graduate in architecture or civil engineering with under-graduate or graduate specialization in urban and/or regional planning. Age 45 years maximum. Salary $4260.00 to $5000.00 per annum plus cost of living bonus. Apply to File No. 1528-V.

McGILL UNIVERSITY requires graduate mechanical engineers for sessional appointment as instructors and demonstrators for 7 months from 1st October, 1950, in the department of mechanical engineering. Apply to File No. 1529-V giving all qualifications and salary required.

PRESSURE VESSEL, safety and fire protection engineer required in Montreal. Electrical or mechanical engineer with experience in electrical engineering. Recent graduate or up to 3 years plant experience. Knowledge or special training in pressure vessel inspection, safety engineering in fire protection an asset. Apply to File No. 1530-V.

Situations Wanted

MECHANICAL ENGINEER (Sask. 1947). Age 23, marriel, family 1. At present employed near Montreal desires position, with good future, in Western Canada. Five years varied experience including sound background in maintenance engineering. Interested in plant or shop design, engineering and development or sales and service. Willing to undergo training period with Eastern company with good prospect of eventual employment in Western Canada. Apply to File No. 60-W.

CHEMICAL ENGINEERING GRADUATE, S.E.I.C., Jr.C.I.C., B.E. (Chem.) N.S. Tech. '49, age 24, single. Experience: summer work in aluminum, petroleum, rubber and steel industries; 1 year in pulp and paper industry. Desires permanent position and will consider any reasonable offer, either sales where background can be used to best advantage. Available immediately. Prefer to locate in Eastern Canada or U.S. Apply to File No. 775-W.

ELECTRICAL ENGINEER, S.E.I.C. McGill University 1950 (Power Option). Four years service with R.C.A.F. as radar mechanic and technical officer. Experience during summer; inspector of high-speed production lines in Canadian factory and Civil Service inspector of watthour meters. Desire work in power education, salary expected and submit a photo. Preference will be given to an electrical or mechanical engineer. Apply to File No. 1509-V.

CIVIL AND MECHANICAL ENGINEERS, required by pulp and paper mill in Ontario. Applicants should be experienced in pulp and paper industry. Salaries open. Apply to File No. 1514-V.

TWO STRUCTURAL STEEL CHECKER-DETAILERS required by Pacific Division, Dominion Bridge Company Limited, Vancouver, B.C., must be thoroughly experienced. Full details in first letter. Reply by mail to Mr. R. J. Dryden, P.O. Box 160, Vancouver, B.C. File No. 1518-V.

SALES ENGINEER required, recent graduate in electrical engineering, for Province of Quebec. Applicant should have definite sales aptitude and be able to converse in French. Car provided. Short training period in plant located in Ontario. Apply to File No. 1519-V.

CANADIAN SUBSIDIARY of a world renowned British engineering company located in Toronto, requires engineer to prepare quotations. Eventual prospects unlimited. Wide engineering knowledge and experience in filtration, fan engineering, compressors, prime movers, etc. an asset. Write giving fullest details, salary required, when available, and if car owner. Apply to File No. 1520-V.

JUNIOR SALES ENGINEER required for Toronto office of large electrical manufacturing company. Products range from generation equipment to domestic appliances. Candidates must be able to prepare own schemes and quotations and generally deal with technical correspondence. Apply to File No. 1523-V.

A CANADIAN UNIVERSITY wishes to receive applications from engineering graduates preferably civil, mechanical or electrical, under thirty years of age to teach engineering problems and drawings. Applications should be sent to File No. 1527-V, Engineering Institute of Canada and should give appli-

A LARGE SCIENTIFIC ORGANIZATION

is offering the position of Scientific Editor at a salary up to $3660.00. Applicants should have a degree in Science or Engineering: they should have some knowledge of editing, and the writing and compiling of scientific research manuscripts. Further information may be obtained by writing P.O. Box 1874, Station B, Ottawa, Ontario.

or communications fields. Age 30, single. Location preference Montreal or southern Ontario. Available immediately. Apply to File No. 821-W.

CIVIL ENGINEER, 23 years, McGill 1950. Have had one summer on road construction and two on hydro-electric development. Now employed but seeks change. Desires position in industry or construction anywhere in Canada. Apply to File No. 1234-W.

MECHANICAL ENGINEER, Jr.E.I.C., graduate of the University of Saskatchewan, 1948, age 24, married. Desires a position that will give experience in mechanical design or product development. Two years experience in domestic oil burner testing and in general engineering. Presently employed but available on reasonable notice. Willing to undertake any required training, will work anywhere in Canada or U.S. Apply to File No. 1453-W.

MECHANICAL ENGINEER, P.Eng. of Ontario, M.E.I.C., M.A.S.M.E., age 39. Graduated from Queen's University B.Sc. (mechanical) 1934; Rensselaer Polytechnic Institute M.M.E. (Hydraulics) 1936. Ten years experience with general contractor estimating, field work and supervision. Three years paper mill experience. Engineer officer during World War II with R.C.N.V.R. Some experience in concrete, steel and timber design. Presently employed but desires position with consulting engineer preferably in hydraulic or reinforced concrete design. Also interested in city engineering. Available on a month's notice. Apply to File No. 1898-W.

DETAILER-CHECKER in structural steel, reinforced concrete. Available for immediate employment on hourly, per diem, or month basis. Permanent position as structural engineer desired. (M.E.I.C. P.Eng.). Location and starting salary are secondary factors only. Apply to File No. 1935-W.

HEATING AND VENTILATING ENGINEER, P.Eng., M.E.I.C. Many years experience in heating, ventilating and plumbing design. Available this fall for short term employment or consultation. Location preferred Eastern Ontario. Apply to File No. 2091-W.

GRADUATE ELECTRICAL ENGINEER, McGill 1950. Age 23, single, bilingual. Presently employed but desires position with good future in Montreal. Diversified experience in telephone line, road and building construction. Available on short notice. Apply to File No. 3166-W.

ELECTRICAL ENGINEER, S.E.I.C., B.S.A. Laval 1950, P.Eng. Age. 23, bilingual, single. Summer experience: 3 army base workshops RCEME for maintenance, repair, testing electrical and mechanical equipment. Interested in maintenance, sales, manufacturing, design, heating, lighting, ventilating, refrigeration, power field, electrical distribution, available 1 week notice. Apply to File No. 3276-W.

CHEMICAL ENGINEER, B.Sc. 1950. S.C.I.C., S.E.I.C. Age 25, single, bilingual. Interested in production and sales. Available immediately. No location preference. Apply to File No. 3280-W.

CIVIL ENGINEER, B.E., S.E.I.C. Graduated from Nova Scotia Technical College May 11, 1950; age 33; married. Four years surveying experience with the Government of St. Lucia, B.W.I., as a licensed land surveyor, experience in all types of surveying, land, road, airfield, swamps, sub-divisions, land reclamation etc. Three summers with town planner and surveyor in Halifax, one summer with N.S. Tech. in campus layout for buildings, road and sewer line installation. A good knowledge of French. Apply to File No. 3288-W.

MECHANICAL ENGINEER, A.S.M.E. fifteen years experience, desires employment on part or full time basis, on improving plant layout stressing handling and flow of material, and/or equipment development design. Apply to File No. 3295-W.

CHEMICAL ENGINEER, M.E.I.C., P.Eng., (Alberta). B.Sc. Alberta '46. Age 34, married. Pregraduation experience covers: teaching school, 3 summers surveying and draughting, one summer in hard rock mining and metal processing. Since graduating, 4 years as assistant manager in an industrial plant in complete charge of production and plant maintenance. Good knowledge of electrical equipment, plant layout and design, and processing; some experience in steam generation and power. Desires permanent employment with reliable firm preferably in the west. Available on reasonable notice. Apply to File No. 3297-W.

CHARTERED ELECTRICAL ENGINEER, B.Sc. (Engineering) at University of London (1936), A.M.I.E.E., age 35, married. Has wide experience of E.H.T. switchgear research with foremost Empire manuactufers (3 years), steam power plant operation as junior shift engineer (1 year), and generation, transmission and distribution of power in rapidly expanding urban and rural area as technical assistant (9 years). Duties included installation, commissioning and maintenance of equipment for 110 KV and lower voltages, E.H.T. operational and standby duties, specification and design of E.H.T. substations and equipment. Desires similar employment. Immediately available. Apply to File No. 3298-W.

GRADUATE IN ELECTRICAL ENGINEERING, University of Saskatchewan, May 1950. Married, age 26. 3 years service in the R.C.A.F., as a navigator. Experience includes: 2 summers of general city surveying in connection with construction, and draughting of completed work. 1 summer survey work on placing and construction of irrigation canals. Approximately 1 year as electrician's helper. 8 months as a machinist's apprentice. Would like to obtain work giving experience in power line apparatus and switchegear with the eventual goal being either production supervision or sales engineering. Apply to File No. 3301-W.

CHEMICAL ENGINEER, S.E.I.C. (Alberta '49). At present employed in Southern Ontario. Desires position in Western Canada. Two years experience in chemical plant operations. Available for personal interview in early August. Apply to File No. 3303-W.

METALLURGICAL ENGINEER, M.E.I.C., P.Eng. of Ontario. McGill '39. Age 32. Married. 4 years steel mill production and sales. Four years Canadian Army Overseas (R.C.E.M.E.) 2½ years sales engineer non-ferrous alloys. Sound business background. Interested in broadening experience in metallurgy and business administration. Preferably permanent position with large, well-established organization. Available on reasonable notice to present employer. Apply to File No. 3308-W.

CHEMICAL ENGINEER, Jr.E.I.C., P.Eng., Queen's 1944, age 30, single. Experienced in technical and control work in pulp, fine and coated paper manufacture, and in synthetic fibre field. Specialized training in statistical quality control, work simplification, human relations in management. Some experience as production foreman and in conference leading and public speaking. Seeking broader experience and more congenial job relations. Willing to undertake any work for which experience and training would qualify. Present salary over $4,000.00 per year. Apply to File No. 3314-W.

CIVIL ENGINEER desires part time employment, evenings and weekends. Design, detailing and draughting in reinforced concrete and steel. Apply to File No. 3315-W.

CIVIL ENGINEER, S.E.I.C. Fluent French and English, desires part time employment, evenings and Saturdays. Surveying, draughting, estimating etc. Apply to File No. 3317-W.

ELECTRICAL ENGINEER, S.E.I.C., graduated from U.N.B., May 1950, desires permanent employment. Veteran, single, age 26. Three years experience as wireless mechanic, R.C.A.F.; summer experience in dielectric heating as applied to the wood working industry, Forest Products Laboratory of Canada, Ottawa. Interested in employment in electronics field, will also consider power or appliance production. Location in Eastern Canada preferred. Available on three weeks notice. Apply to File No. 3318-W.

CHARTERED MECHANICAL ENGINEER, A.M.I.Mech. E., seeks position of interest. Monetary considerations of first importance. Wide, varied experience covering mining and steelworks, aeronautical research, design of logging, pulp and paper mill machinery. Five years in British Civil Service. Excellent references. Apply to File No. 3319-W.

ELECTRICAL ENGINEER, M.E.I.C. graduated 1942, age 37, married, no children, 3 years experience in erection of industrial plants and 8 years in design and construction of transformer substations and switchgear in Canada and Europe. Desires position with responsibility in electrical power field. Available in one month notice. Location no object. Apply to File No. 3321-W.

ELECTRICAL ENGINEER, Laval '49, experienced in sales, draughting, repair of motors, wiring of ships, electrical and mechanical design of electric motors; desires a position, perferably in sales. Apply to File No. 3323-W.

CHEMICAL ENGINEER, age 21, graduate McGill University 1950. Western Canadian now in Montreal would like position in Winnipeg or vicinity. Available immediately. Apply to File No. 3327-W.

ELECTRICAL ENGINEER, Queen's 1949, S.E.I.C. Seek change to the design, draughting or production engineering in the electrical or electronic field. Experience includes, prewar: watthour meters, industrial control and switchgear apparatus; post war: electronic development in research laboratory. Age 32, married, no dependents. Will consider any location offering opportunity of advancement. Apply to File No. 3328-W.

ELECTRICAL ENGINEER, S.E.I.C. Graduated in May 1950 from University of Manitoba. Age 25 and single. Two years experience with R.C.A.F. electrical and radio equipment. Two summers experience in electrical power distribution field. Also experience in aircraft mechanical overhaul field. Desires position in power or communication field. Available immediately. Apply to File No. 3329-W.

CIVIL ENGINEER (MAN.) 1948 Jr.E.I.C. with experience in topographical surveying, airport runway construction, and hydrology, desires position in hydraulics or with construction firm. Apply to File No. 3336-W.

ELECTRONIC ENGINEER, P.Eng. N.S., P.Eng. Quebec. M.E.I.C., A.M.I.E.E. Exective ability in technical field. Wide experience in design, installation and maintenance radar, communication and electronic instruments. Broad experience in production, plant layout, staff management and control. At present production manager and engineer in charge of plant aircraft installation and maintenance departments. Married. Available on reasonable notice. Apply to File No. 3339-W.

CIVIL ENGINEER, B.Sc., Jr.E.I.C., P.Eng. (Quebec) age 25, married, with car. 3 years experience including design, detailing, and estimating concrete and structural steel with architects, steel fabricators, concrete fabricators and engineers and contractors also liaison work with customers, architects and contractors. Desires relocation offering opportunity for design and liaison work with responsibility. Western provinces preferred. Available within three weeks of notification. Apply to File No. 3340-W.

ELECTRICAL ENGINEER, S.E.I.C., Manitoba, 1950. Married veteran, age 29, temporarily employed in electronic development, desires more permanent position, preferably in industry or communications. Experience includes four years in the wireless trade R.C.A.F. and four summers' work on electrical substation installation. Will work anywhere in or beyond Canada. Apply to File No. 3341-W.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

CLASSICAL MECHANICS:

Herbert Goldstein. New York, Addison-Wesley Press, 1950. 399 pp., illus., figs., cloth. $6.50.

In the mind of the author of this book, classical mechanics should be an indispensable part of the physicist's education, first, in serving as an introduction to the various branches of modern physics, and secondly, in affording the student an opportunity to master a number of the mathematical techniques necessary for quantum mechanics. This work is an attempt to fulfill those requirements. Formulations, which are of importance for modern physics, have received emphasis and mathematical techniques usually associated with quantum mechanics have been introduced wherever they result in increased elegance and compactness.

Special relativity and velocity-dependent potentials have also been included, considered by the author a necessary adjunct to the curriculum of the physics student.

The treatment of the mechanics of continuous systems and fields is introduced in Chapter II, but is limited to an elementary description of the Lagrangian and Hamiltonian formulation of fields. An intermediate course in mechanics is assumed by the writer of his readers, and the usual undergraduate course in advanced calculus and vector analysis.

References are included with each chapter for elaboration of material introduced, and for treatment of points not discussed. An additional 4-page bibliography at the end of the book plus an index of symbols and general index add further to the usefulness of "Classical Mechanics". E. K.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Advanced Surveying; 2nd ed.:
William Horace Rayner. New York, Van Nostrand, 1950. 369 pp., illus., cloth.

Analysis and Design of Experiments. Analysis of Variance and Analysis of Variance Designs:
H. B. Mann. New York, Dover, c1949. 198 pp., cloth.

Annuaire Statistique — Statistical Yearbook, Quebec 1949:
Province of Quebec, Department of Trade and Commerce, 1950. 591 pp., cloth.

Author's Guide for Preparing Manuscript and Handling Proof:
New York, Wiley, c1950. 79 pp., illus., cloth.

Classified Handbook of Members and their Manufactures; 21st ed.:
British Engineers' Association. London, The Association, 1950. 655 pp., cloth.

Descriptive Geometry. Essential Principles and Applications for Students in Engineering and Architecture; 3rd ed.:
Floyd A. Smutz and Randolph F. Gingrich. Toronto, Van Nostrand, (Can.) 1950. 142 pp., illus., cloth.

Diamond Tool Patents III, Truing of Grinding Wheels:
W. Jacobsohn. London, Industrial Diamond Information Bureau, 1948. 87 pp., illus., paper.

Diamond Tool Patents IIIs, Truing of Grinding Wheels, Supplement 1949:
W. Jacobsohn. London, Industrial Diamond Information Bureau, 1949. 45 pp., illus., paper.

Electrical and Radio Dictionary, Including Symbols, Formulas, Diagrams and Tables, 4th ed.:
Carl H. Dunlap and others. Toronto, General Pub. Co., c1950. 133 pp., cloth.

Electrical Communication; 3rd ed.:
Arthur Lemuel Albert. New York, Wiley, 1950. 593 pp., illus., cloth.

LIBRARY REGULATIONS

Hours

	Oct.-Apr.	May-Sept.
Mon.-Fri.	9– 6	9– 5
Thurs. (Oct.-Mar.)	9– 8	9– 5
Sat. (closed Jy.-Sept.)	9–12	9–12

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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.

Electromagnetic Fields. Theory and Applications. Volume 1 — Mapping Fields:
Ernst Weber. New York, Wiley, c1950. 590 pp., illus., cloth.

Electromagnetic Theory:
Oliver Heaviside. New York, Dover, c1950. 386 pp., cloth.

Elements of Heat Transfer and Insulation: 2nd ed.:
M. Jakob and G. A. Hawkins. New York, Wiley, 1950. 230 pp., illus., cloth.

Engineering Industries Association Classified Directory; 3rd ed.:
Engineering Industries Association. London, The Association, 1950. 424 pp., cloth.

Fundamentals of Powerplants for Aircraft:
Joseph Liston. Cincinnati, Ohio, Tri-State Offset Co., New York, Haagens, 1950. illus., cloth.

Hammond's Complete World Atlas:
New York, C. S. Hammond & Co., Toronto, Saunders, c1950. 376 pp., illus., cloth.

Heat and Temperature Measurement:
Robert L. Weber. New York, Prentice-Hall, 1950. 422 pp., illus., cloth.

Helical Springs:
J. R. Finniecome. Manchester, Emmott, 1949. 60 pp., illus. (Mechanical World Monograph No. 56).

How to Plan Pensions; a Guide book for Business and Industry:
Carroll W. Boyce. New York, McGraw-Hill, 1950. 479 pp., cloth.

Industrial Instrumentation:
Donald P. Eckman. New York, Wiley, c1950. 396 pp., illus., cloth.

Influences on Concrete:
A. Kleinlogel. New York, Frederick Ungar, 1941. 281 pp., illus., cloth.

Integrated Power System as the Basic Mechanism for Power Supply:
Philip Sporn. Toronto, McGraw-Hill. 1950. 157 pp., illus., cloth.

Introduction to Industrial Metallurgy:
L. Aitchison. London, MacDonald and Evans, 1949. 456 pp., illus., cloth.

Jet Propulsion: Turboprops:
Volney C. Finch. Millbrae, California, National Press, 1950. 256 pp., illus., cloth.

Kent's Mechanical Engineers' Handbook. Vol. I. Design and Production, Ed. by C. Carmichael. Vol. 2. Power, Ed. by J. K. Salisbury:
New York, Wiley, 1950. illus., leather.

Metal Cutting Tool Handbook:
New York, Metal Cutting Tool Institute, 1949. 647 pp., illus., cloth.

Patent Tactics and Law; 3rd ed.:
Roger Sherman Hoar. New York, Ronald Press, c1950. 352 pp., cloth.

Physical Mechanics. An Intermediate Text for Students of the Physical Sciences; 2nd ed.:
Robert Bruce Lindsay. Toronto, Van Nostrand, c1933. 436 pp., illus., cloth. (University Physics Series.)

Physics. Fundamental Principles for Students of Science and Engineering. 2 Volumes:
George Shortley and Dudley Williams. New York, Prentice-Hall, 1950. illus., cloth.

Pocket Encyclopedia of Atomic Energy:
F. Gaynor, editor. New York, Philosophical Library, 1950. 204 pp., illus., cloth.

Practical Management and Works Relations:
A. C. Whitehead. Manchester, Emmott, 1949. 139 pp., paper. (Mechanical World Monographs No. 54.)

Principles of Nuclear Chemistry:
Russell R. Williams. Toronto, Van Nostrand, 1950. 307 pp., illus., cloth.

Sales Engineering; 2nd ed.:
B. Lester. New York, Wiley, 1950. 226 pp., illus., cloth.

Standard Specifications for Highway Materials and Methods of Sampling and Testing, 2 Volumes:
Washington, American Association of State Highway Officials, 1950. 231 pp., illus., cloth.

Technology of Aluminium and its Light Alloys:
Alfred von Zeerleder. Slough, Bucks, High Duty Alloys Ltd., c1948. 451 pp., illus., cloth.

TECHNICAL BULLETINS, ETC.

American Society for Testing Materials. Special Technical Publications:
No. 100—Report on the Strength of Wrought Steels at Elevated Temperatures, R. F. Miller and J. J. Heger.

British Intelligence Objectives Sub-Committee. Surveys Report:
No. 25—The German Coal Tar and Benzole Industries during the Period 1939-1945, A. L. Deadman and G. H. Fuidge.

British Society of Research in Agricultural Engineering. Reports:
No. RT 1/49034—Prototype Land-Rover. No. RT 2/49057—Fordson Major Tractor with County Full Tracks, Equipped with Vaporizing Oil Engine. No. RT 3/48054—Templewood Prototype "6½ CWT./HR." Grass Meal Plant. No. RT 5/49011—Wilmot "Alvin Blanch" Grain Drier. No. RT 6/49063—Fordson Major Tractor Powered by Perkins P.6 Engine. No. RT 7/48071—Marconi Moisture Meter Type TF933. No. RT 8/49069—I.C.I. Mark 3 Drier (Used as Grass Drier). No. RT 9/49064—Massey-Harris 744D Tractor (Prototype). No. RT 10/50007—Ferguson Tractor Model TED.20 Mark II Running on Vapourising Oil. No. RT 11/500015—Worn Steel Deep Digger Shares Reconditioned and Modified by L. H. Tite Esq. Causeway Green, Birmingham (Multipoint Shares). No. RT 12/48065—Rick Lifter. No. RT 13/49042—Taylor Pike Lifter. No. RT 14/49023—Packman Potato Planter. No. RT 15/48038—Multiplanter with Ritchie Easy-Feed Attachment. No. RT 16/48060—Skidmaster Pneumatic Tyre Girdle Fitted to a Fordson Major Tractor. No. RT 17/50002—Salopian Sweeplift Crop Collector. No. RT 18/49067—Angus Single-Row Potato Digger. No. RT 19/50024—J.F.W. Dusting Unit for Colwood Tractor. No. RT 20/49045—Slade-Curran Grass Drier. RT 21/50013—"Ayrshire Elevator". RT 22/49040—The Claas Universal Seed Drill. No. RT 23/49017—John Salmon Beet Harvester. No. RT 24/49056—Letz 540 Fodder Chopper and Silo Filler. No. RT 25/49030—The Bloor Farmyard Manure Spreader. No. RT 26/50018—The Scarcliffe 2-Row Potato Planter. No. RT 27/50028—Minns Sugar Beet Harvester Model SL2. No. RT 4/49053—Branbridge Power Take-off Guard.
No. C.S. 3/1124—Crop Drier Engineering Development, J. Woodforde and W. F. Williamson.

British Standards Institution. Standards:
No. 811: 1950—Cycle Threads. No. 1651: 1950—Industrial Safety—Gloves.

Canada. Geological Survey. Bulletins:
No. 15—Actinicamax from the Upper Cretaceous of Manitoba, J. A. Jeletzky. Sciophyllum, a New Rugose Coral from the Canadian Arctic, P. Harker and D. J. McLaren.

...Memoirs:
No. 255—Callum Creek, Langford Creek, and Gap Map-Areas, Alberta.

Engineering Institute of Canada. Technical Papers:
No. 2—A Revised Manning Flow Formula, Thomas Blench.

Imperial Oil Limited. Addresses:
Developments and Prospects in Canadian Oil, John F. Fairlie.

Institution of Structural Engineers. Civil Engineering Codes of Practice:
No. 2—Earth Retaining Structures.

Statens Offentliga. Utredningar:
No. 64: 1949—Statliga Betongbestammelser. Del 1. Materialdelen (Foreskrifter Betraffande Material Arbetsutforande Och Tillatna Spanningar).

Steel Founders' Society of America, Cleveland, Ohio. Steel Casting Reports:
No. 1—Mechanical Properties of Low Alloy Cast Steels. No. 2—Hardenability of Cast Steels. No. 3—S—Curves for Cast Steels. No. 4—Low Temperature Impact Properties on Cast Steels—1.

U.S. Highway Research Board. Bulletins:
No. 24—Section 2—Appendix C Basic Zoning Ordinance Data by Local Units. No. 25—Controlled Access Expressways in Urban Areas, A Symposium.

British Welding Research Association. Memoranda:
No. T.22—Memorandum on Faults in Arc Welds in Mild and Low Alloy Steels.

PAMPHLETS, ETC.

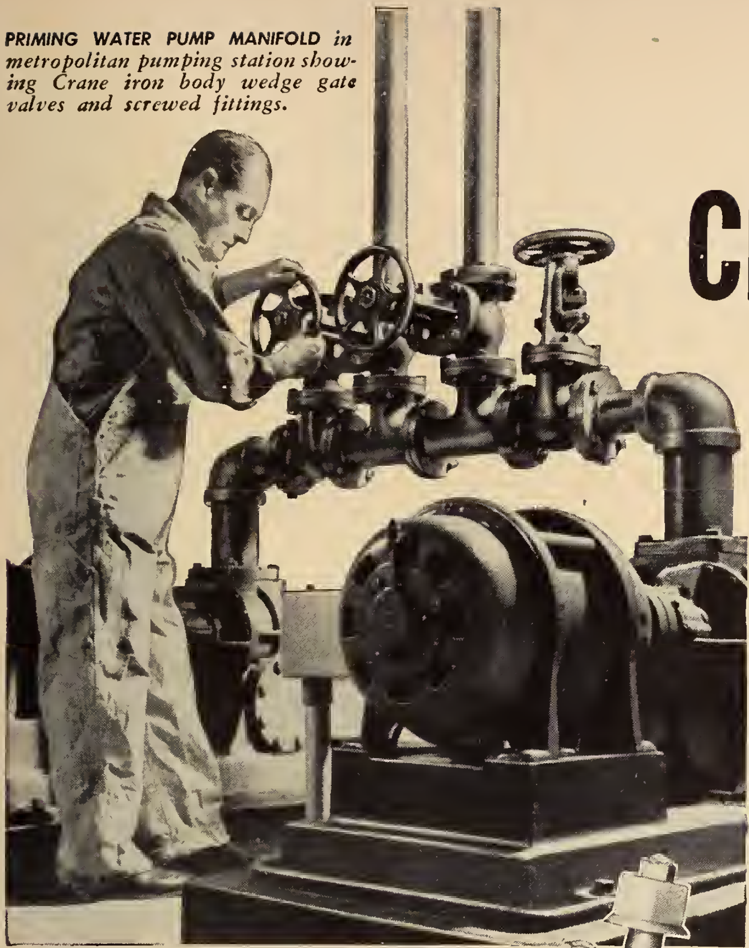
Coal. A Concise Authoritative Survey in Usable Form:
Harold J. Rose. Pittsburgh, Interscience Encyclopedia, Inc., 1949.

Die Umlaufradergetriebe:
Helmar Strauch. Munich, Carl Hanser Verlag, 1950.

Fortschritte im Stahlbeton Durch Hochwertige Werkstoffe und Neue Forschungen:
Rudolf Saliger. Vienna, Franz Deuticke, 1950.

New Depreciation System. Revised July 1950.
Montreal, CCH Canadian Limited, 1950.

Small Industrial Plants Can Abate Smoke and Dust . . .:
William S. Major. Pittsburgh, Bituminous Coal Research, Inc., 1950.



PRIMING WATER PUMP MANIFOLD *in metropolitan pumping station showing Crane iron body wedge gate valves and screwed fittings.*

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In city, suburb, or town . . . in water supply or sewage disposal plant . . . men responsible for Canada's public water services continue to rely on Crane. And with good reason. They know Crane's well established reputation for supplying municipalities with the correct flow control equipment.

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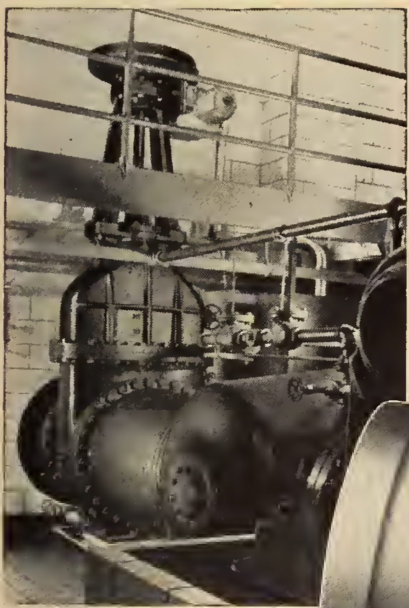
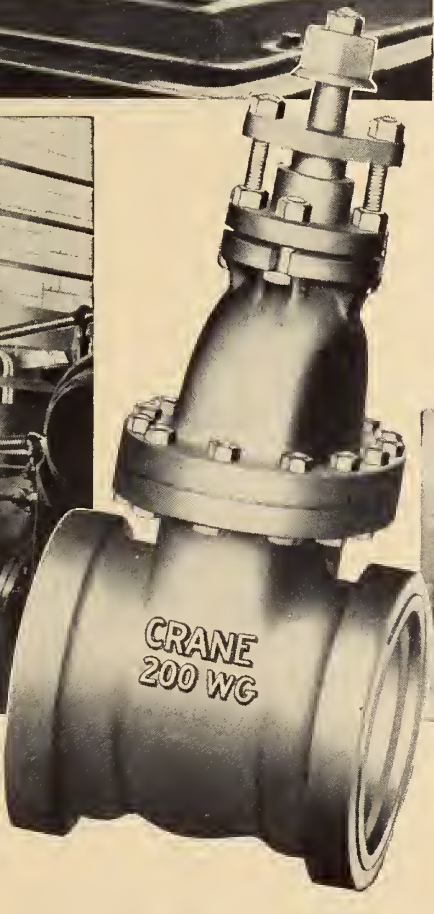
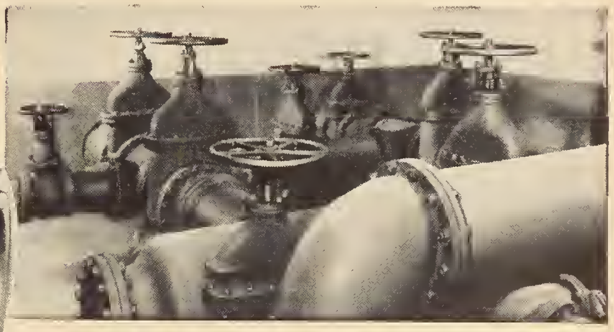


MOTOR-OPERATED *36-in. Crane gate valve on pump discharge in a large water system. Crane supplies all types of remote controls for valves.*



Typical of the Crane line of sturdy, well proportioned Iron Body Wedge Gate Valves is this No. 462 — Non-Rising Stem, Hub Ends — Brass Seats, Brass Stem.



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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:

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

B.S. 219: 1949—Soft Solders. 2/–.

This Standard includes five antimonial and five non-antimonial solders, while the war emergency edition restricted the total number of grades to five. Slight alterations have been made to the composition of some of the solders covered in the previous edition. The difficulties of defining the limits of some impurities have been recognized and the methods of specifying these impurities have been modified.

B.S. 602: 1949—Lead Pipes (For other than Chemical Purposes) 2/6.

Based on experience gained since the 1939 edition, this new edition increases the metallic content and reduces the antimony and tin contents of service and distributing pipes and gas and condensation pipes. There are new requirements on grain size, and a newly-specified tolerance on wall thickness.

B.S. 649: 1949—Reciprocating Internal combustion Engines. 2/–.

This Standard is concerned with marine auxiliary and land service engines. Includes comprehensive statements on the derating of Diesel engines under various conditions of operation.

B.S. 750: 1950—Underground Fire Hydrants and Dimensions of Surface Box Openings. 2/–.

Object of the standard is to overcome difficulties due to lack of uniformity in certain important features of fire hydrants. Relates to sluice valve and screw-down underground hydrants, and also to dimensions of the openings of surface boxes.

B.S. 857: 1949—Safety Glass for Land Transport. 2/6.

This revision of the 1939 Standard includes both curved and flat safety glass and covers heat-treated safety glass in the thickness range 5/32 in. to ⅜ in. and laminated glass of thicknesses from 3/16 in. to ¼ in.

B.S. 888: 1949—Slip (or Block) Gauges and their Accessories. 3/–.

This revision of the 1940 standard makes provision for slip gauges of the "reference" grade of accuracy in addition to the three grades, namely, workshop, inspection and calibration, to which the previous standard referred. It applies also to measuring jaws, scribing point and centre point holders and base.

B.S. 971: 1950—Commentary on British Standard Wrought En Series. 10/6.

Particular emphasis is placed on the so-called mass effect, and a commentary, with detailed results obtained in individual investigations covering the full range of En steels, gives useful information on the effects of ruling section and heat treatment on mechanical properties.

B.S. 1123: 1950—Valves, gauges and other safety fittings for air receivers and compressed air installations. 2/–.

This standard provides for safety fittings for air receivers for maximum permissible working pressures not exceeding 1000 lb. per sq. in. It gives requirements in regard to the installation, the fittings, and the construction of parts.

B.S. 1471: 1949—Wrought Aluminium and Aluminium Alloy—Tubes. 4/–.

B.S. 1473: 1949—Wrought Aluminium and Aluminium Alloy—Wire for Rivets. 5/–.

B.S. 1474: 1949—Wrought Aluminium and Aluminium Alloy — Welding Wire. 5/–.

B.S. 1475: 1949—Wrought Aluminium and Aluminium Alloy for general purpose. 5/–.

B.S. 1476: 1950—Wrought Aluminium and Aluminium Alloy, bars, rods and sections. 4/–.

These five Standards are arranged in two sections, the first giving clauses relating to chemical composition, condition, and mechanical properties of the materials, and the second covering the general requirements applicable to all the materials. A feature of these new standards is the addition of an appendix giving some notes on heat treatment as a general guide to users.

B.S. 1490: 1949—Aluminium and Aluminium Alloy Ingots and Castings. 7/6.

Covers aluminium of 99% purity and 20 different alloys each in the form of ingots and castings. Details are also given in regard to the certification of compliance, independent tests, test samples and inspection.

B.S. 1500: 1949—Fusion-Welded Pressure Vessels for Use in the Chemical and Allied Industries. 25/–.

The present edition of this standard is to be regarded as provisional and includes 7 sections as follows: Definitions; range of materials covered; aspects of design; construction details; inspection; protective devices; miscellaneous.

B.S. 1531: 1949—Nickel and Nickel Alloy Solid Drawn Tubes for General Purposes. 2/–.

The new standard covers malleable nickel, nickel-copper and nickel-chromium-iron tubes for general purposes. Standard lays down chemical composition and mechanical properties, tests, tolerances.

B.S. 1560: 1949—Steel Pipe Flanged Fittings for the Petroleum industry. 12/6.

Gives details for the design and construction of flanges and flanged fittings and provides detailed tables giving all the dimensions required. Appendices give details for marking as well as Pressure-temperature rating tables and material specifications.

B.S. 1610-Part 1: 1950—Verification of Testing Machines. 2/–.

Section A of this standard deals with methods of load verification by standardized weights, proving levers, elastic devices, test samples and combination of linear measurements and load. Section B deals with tensile and compression machines.

B.S. 1616: 1950—Aluminium Electrodes for Metal-Arc Welding. 2/–.

This standard specifies three types of material: pure aluminium, 5 per cent silicon alloy and 5 per cent magnesium alloy. The quality of the electrodes is specified in terms of chemical composition of the core wire.

B.S. 1617: 1949—Mild Steel Castings of High Magnetic Permeability. 2/–.

The standard covers two grades of castings for which chemical compositions and mechanical tests are set out. Recommended values for the magnetic properties are included should magnetic testing be required.

B.S. 1633: 1950—Steel for Land Boilers, receivers and Other Pressure Vessels. 2/–.

This new standard covers the requirements for steel plates, sections, bars and rivet bars for service temperatures not exceeding 900°F. and includes special requirements for steel for use above 700°F.

ELECTRICAL RESEARCH ASSOCIATION. TECHNICAL REPORTS.

Thorncroft Manor, Dorking Road, Leatherhead, Surrey, The Association, 1950:

E.R.A. L/T186—Impact Testing—Critical Resume. W. Lethersich. 12/–.

This is a review of the literature on impact testing, to assist progress in devising a proof test for plastic materials, similar to that for steel. A bibliography of 230 references is appended.

E.R.A. L/T213—Measurement of the Coefficient of Friction of Solid Rods by a Resonance Method. W. Lethersich. 6/–.

A theory is given and an expression derived relating amplitude of vibration to frequency for a rod subjected to alternating mechanical stress. An expression has also been derived which enables the volume viscosity to be determined should experiments show the existence of volume viscosity.

E.R.A. Q/T108—Design of a Capacitive Voltage Transformer. E. Billig. 12/–.

This report contains a mathematical analysis of the performance of a capacitor-transformer as used for supplying small power loads from a source at high voltage. The present report also indicates the possible adaptation as a voltage transformer.

ENGINEERS' COUNCIL FOR PROFESSIONAL DEVELOPMENT. SELECTED BIBLIOGRAPHIES ON CIVIL ENGINEERING SUBJECTS:

Section II—Aeronautical Engineering, and Section III—Civil Engineering.

These bibliographies replace the lists of engineering subjects which first appeared in 1937.

ALEXANDER GIBB, The Story of an Engineer:

Godfrey Harrison. London, Geoffrey Bles. Toronto, S. J. R. Saunders, 1950. 222 pp., illus., plates, maps, diagr. 5½ x 8½ in., cloth, $4.50.

Opening with introductory information on Alexander Gibb's four preceding generations of engineers on his paternal side, this book then proceeds with a most interesting account of this famous engineer's life, both personal and porfessional. From Rugby to University College, London, to an articled pupil under Wolfe Barry, we follow him. From Scotland to Wales, to London, and from then afield to India, Rangoon, Singapore, Australia, New Zealand, Europe and North and South America. The happy and successful fusion of history, engineering, and personal detail provide absorbing material for either the technical or non-technical reader.

DYEING WITH COAL-TAR DYESTUFFS: THE PRINCIPLES INVOLVED AND THE METHODS EMPLOYED:

C. M. Whittaker and C. C. Whittock, 5th ed. London, Bailliere, Tindall & Cox; Macmillan Company, Toronto, 1949. 375 pp., illus., plates, charts, diagr., 5½ x 8½ in., cloth. $4.00.

Originally produced 30 years ago, this invaluable book on coal-tar dyeing is now completely revised and brought up to date, in its fifth edition. Written primarily for students, it includes a short résumé of dyestuff developments and trends in modern dyeing. Discussion of theories and machinery follow, and then chapters on the dyeing of individual fabrics. The book concludes with information on textile auxiliary products, evaluation of dyes, and their identification on the fibre. A short bibliography and good author and subject index further enhance the usefulness of this book.

FACTORY CANTEENS, THEIR PLANNING AND EQUIPMENT:

H. M. Harman. Manchester, Emmott, 1949. 47 pp., illus., paper. 2/6. (Mechanical World Monograph No. 55.)

Cleanliness, convenience, speed and general consideration both of the people eating meals in the canteen or cafeteria under review, and of those preparing and disposing of the meals are the prime consideration in this excellent little illustrated manual published as a Mechanical World Monograph. It should prove valuable to anyone having to do with the equipment, decoration, or personnel end of the office or factory cafeteria.

HANDBOOK FOR WELDED STRUCTURAL STEELWORK:

Institute of Welding. London, The Institute, 1950. 234 pp., illus., plates, diagrs., tables. 5½ x 8½ in., cloth, 10/–.

This edition of the Handbook is the corrected and revised 1949 issue of the 1946 4th edition. Additions to the tables of technical data include 9 B.S. releases, namely: Beams and channels, Equal and unequal angles, Values of moduli of sections, Solid round columns, Compound struts, Safe making stresses for mild steel columns and struts, Bending moments and reactions for continuous beams, Fixed end moments for single span beams, and Valves of bending moments and reactions for portal frames. Excellent photographs of welded construction are a valuable addition at the end of the volume.

LEXIQUE TECHNIQUE ANGLAIS-FRANCAIS; MACHINES - OUTILS, MINES, MOTEURS A COMBUSTION INTERNE, AVIATION, ELECTRICITE, T.S.F., CONSTRUCTION NAVALES, METALLURGIE, COMMERCE, 3rd ed.:

Guy Malgorn. Paris, Gauthier-Villars, 1950. 332 pp., paper., 1500 fr.

As can be readily gathered from its subtitle, this book gives accurate translations for words of all branches of technology, be it Machine Tools, Mines, Internal Combustion Engines, Aviation, Electricity, Radio, Naval Construction, Metallurgy, or Commerce. It will be useful to the translator and to the research worker. The author has been careful to keep abreast of recent developments in boom fields such as Aviation, Electronics and Oil.

L'INDUSTRIE DU GAZ D'ECLAIRAGE; UTILISATION RATIONNELLE DE LA HOUILLE:

Leon Causse et André Goix. Paris, Armand Colin, 1950. 189 pp., illus., paper, 180 fr.

The authors propose the burning of illuminating gas, as the most rational and economical method of using coal. Their work is limited to coal gas, and deals in so many chapters of the general characteristics of this gas, gas producing coals, manufacture of gas, utilisation, distribution and economics.

TECHNIQUE DU CHAUFFAGE ELECTRIQUE, SES APPLICATIONS DOMESTIQUES ET INDUSTRIELLES, Tome I: THEORIES ET CALCULS:

Charles Frerot. Paris. Gauthier-Villars, 1950. 503 pp., illus., paper. 2300 fr.

This work deals with Electric Heating, and covers its Domestic and Industrial Applications. The first part points out the present trends for electric heating in France as compared to other countries, while the second part is theoretical and explains relations between forms of energy. The third and fourth chapters are concerned with metallic and liquid resistances, while the fifth is reserved to heat accumulation.

TRAITE THEORIQUE ET PRATIQUE DES ENGRENAGES. TOME 2: ETUDE COMPLETE DU MATERIEL.

G. Henriot. Paris, Dunod, 1950. 335 pp., illus., cloth. 2300 fr.

This book on gears is sponsored by the Société d'Etudes de l'Industrie de l'Engrenage, of which Mr. Henriot is the assistant director. Like the first volume, the present work is dedicated to a wide public, and, although devoted mostly to cutting machines, it explores the whole field of the gear industry. The principles of construction of the machines, their movements, and their field of action, are described clearly, and at length. The book is divided in three parts, according to the three major operations of cutting machines: Cutting, Rectifying and Shaving.

WELDING DESIGN AND PROCESSES:

B. Richard Hilton. London, Chapman, 1950. 342 pp., illus., cloth. 36s.

This work is concerned principally with the design of welded structures suitable for arc welding construction, a process by which the largest proportion of all welded work is carried out. The approach to the various aspects of welding design that are dealt with, has been kept as simple as practicable, and, wherever possible, the fundamental features have been stressed. Effort has been made to comply with existing and accepted standards, and, in this respect, the nomenclature adopted is consistent with British Standard Specifications.

CORRECTION

INDUSTRIAL CHEMISTRY OF THE FATS AND WAXES, 3rd ed.:

T. P. Hilditch. Toronto, MacMillan, 1949. 604 pp., cloth, $5.00.

We would like to draw to the attention of the Journal readers that the Canadian distributor for the above book is Macmillan Company of Canada, Toronto. Macmillans are the Canadian agents for Messrs Bailliere, Tindall & Cox of London. This information was erroneously omitted in our August Journal Book Notes.

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.

AIR CONDITIONING AND REFRIGERATION.

By B. H. Jennings and S. R. Lewis. 3rd. ed. International Textbook Co., Scranton, Pa., 1949. 606 pp., illus., diagrs., charts, maps, tables, 9¼ x 6 in., cloth, $6.50.

This comprehensive text deals with the subject matter from the viewpoint of basic principles rather than from an empirical one. Detailed design information for systems and equipment is given, including necessary calculations. In the new edition the chief revision has been in the sections on psychrometry, heat transfer coefficients, duct computation, combustion equipment, and warm-air and steam heating. The heat pump and radiant heating are new topics included.

DESIGN OF DIRECT CURRENT MACHINES.

By L. Greenwood. Macdonald & Co., (Publishers) Ltd., Ludgate Hill, London, E.C. 4, 1949, 222 pp., illus., diagrs., charts, tables, 8¾ x 5½ in., cloth, 25s.

Written for senior students and junior designers, the book embodies the procedure and methods used in the professional designing of electrical machines. Metric units are used. A completely calculated design is given both in the text and on a typical commercial design sheet. A chapter on mechanical construction is included, and an appendix covers the design of centrifugal fans.

ELASTOMERS AND PLASTOMERS, Their Chemistry, Physics and Technology.

Volume I, General Theory. Edited by R. Houwink.

Elsevier Publishing Co., New York, Amsterdam, London, Brussels, 1950. 495 pp., illus., diagrs., charts, tables, 10¼ x 7 in., cloth, $7.00.

This book is a collection of articles on the general theory underlying the chemistry, physics and technology of elastomers and plastomers. Economic aspects, organic chemistry, reaction kinetics, molecular constitution, mechanical properties, structure, electrophysics, mechanical production and shaping, polymer-liquid interactions, and plasticizers are the several topics dealt with. Extensive lists of references occur throughout the text.

ESTIMATING MANUAL FOR HEATING AND PIPING SYSTEMS.

By H. A. Erickson. Plumbing and Heating Journal (Scott-Choate Publishing Co.), 45 W. 45th St., New York, 1949. 112 pp., diagrs., charts, tables, 7¾ x 5 in., linen, $3.00.

This manual provides, in tabular form, practical labour data for those who are concerned with estimating the cost of assembling, fabricating and installing the material required for the construction of heating and piping systems in the building industry. It includes tables of time periods for various job operations.

HYDROLOGY, THE FUNDAMENTAL BASIS OF HYDRAULIC ENGINEERING.

By D. W. Mead. 2 ed. rev. & enl. by Mead and Hunt, Inc., McGraw-Hill Book Co., New York and London, 1950. 728 pp., illus., diagrs., charts, maps, tables, 9¼ x 6¼ in., cloth, $7.50.

Completely revised since its first publication in 1919, this standard text now also provides sections covering recent developments, such as: a discussion of the Bergeron analysis of meteorological phenomena in terms of air masses, a new approach to evaporation theory and methods of measurement, the new techniques and possible consequences of producing artificial rainfall, methods of weighing precipitation records, the application of the theory of probability to hydrologic data, and the application of statistical theory to flood frequency.

INDUSTRIAL ELECTROCHEMISTRY.

By C. L. Mantell. 3rd ed. McGraw-Hill Book Co., New York, Toronto, London, 1950. 781 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $8.50.

This book points out and emphasizes the technological importance of electrochemical processes, stresses their practical aspects, and adheres to the engineering viewpoint. It covers theory, the various types of processes, their applications and products, and equipment and methods in each. A large amount of technical and operating data gathered in the field are included. Extensive revisions and additions are made in this edition to bring the material up to date and to take account of the tremendous expansion in the electrochemical and process industries.

INTRODUCTION TO THE TRANSFER OF HEAT AND MASS.

By E. R. C. Eckert with an appendix on property values by R. M. Drake, Jr. McGraw-Hill Co., New York, Toronto, London, 1950. 284 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.00.

Based on a text originally published in German, this book provides an understanding of the physical processes and laws connected with heat and mass transfer. Evaporation and condensation of water vapour are used as the basis for the treatment of heat transfer. The concept of the boundary layer as the place where most heat transfer occurs is stressed. Many heat transfer problems are solved mathematically. Such new topics as regenerative heat exchangers, heat transfer at high velocities, and studies with the Zehnder-Mach interferometer are included.

SCHOLARSHIPS, FELLOWSHIPS AND LOANS.

By S. N. Feingold. Bellman Publishing Co., 83 Newbury St., Boston 16, Mass., 1949. 254 pp., 9¾ x 6¾ in., cloth, $6.00.

The information given in this new reference book is listed alphabetically by administering agency with address, name of grant, qualifications, funds available, special fields of interest and information, and where to apply for information. In an introductory section the author discusses career planning and aids. The latter part of the book contains a bibliography, a subject index, and indexes of the administering agencies and names of grants.

SEMI-CONDUCTEURS ELECTRONIQUES ET COMPLEXES DERIVES, Théories—Applications.

By S. Teszner, preface by L. de Broglie. Gauthier-Villars, 55 Quai des Grands-Augustins, Paris, France, 1950. 96 pp., illus., diagrs., charts, tables, 11½ x 8¼ in., paper, 1,000 frs.

Part I of this study gives a general survey of the electronic theory of semiconductivity, and analyses and interprets the various phenomena connected with or exhibited by the materials having this property. Part II discusses applications in the form of oxide rectifiers, crystal detectors, and similarly derived equipment, as well as devices based on the properties of non-linear resistance and the variation of resistance with temperature.

SEWERAGE AND SEWAGE TREATMENT.

By W. A. Hardenbergh. 3rd ed. International Textbook Co., Scranton, Pa., 1950. 467 pp., illus., diagrs., charts, tables, 9¼ x 6¼ in., linen, $6.50.

Written from the viewpoint of the practicing engineer, this book considers the treatment of sewage and industrial wastes to meet present-day standards of stream sanitation. The design and operation of sewer systems and treatment plants are covered in detail, and the waste products of various industries are discussed. Major revisions in this edition have been made in the material on industrial wastes, trickling filters, and the activated sludge process.

STEAM TURBINES AND THEIR CYCLES.

By J. K. Salisbury. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1950. 645 pp., illus., diagrs., charts, tables, 9¼ x 6 in., linen, $9.00.

Of particular interest to those concerned with the application of steam turbines in power plants, this book provides a detailed treatment of the following topics; basic thermodynamics and the fundamentals of steam turbine design; the regenerative cycle and the calculation of heat balances; cycle evaluation methods, including the simple and accurate calculation of losses in the feedwater-heating cycle; data and methods for determining steam rates and heat rates of steam turbines of any size. The appendix includes many useful tables, and a selected list of references.

NEW TABER BEET SUGAR FACTORY

(Continued from page 792)

ate at the same time. In case of trouble, the concrete sump at the pump house will overflow to a small earth reservoir. As the water level drops to normal in the sump, the water in the earth reservoir flows back to the pump house by gravity. The earth reservoir has a capacity sufficient for about 1 hour and 20 minutes operation with the pumps shut down.

Beet Pump House

Due to the topography of the site, it was necessary to pump the beets together with the flume water into the factory. At the Raymond and Picture Butte refineries, the beet storage ground is at an elevation which permits gravity fluming into the plant. The beet pump has a capacity of 5000 g.p.m. with a 20 in. suction and discharge. It is driven by a 25 hp. motor through V-belts, and elevates the beets 12 feet.

Bulk Storage of Pulp

The method of handling dried pulp is of interest. The dried pulp is delivered to the packing house elevator by a scroll conveyor from the drier building, elevated to the top of the packing department and discharged into either one or both bins, or to the conveyor belt to bulk storage. One bin supplies the machine which packs 4—100 lb. burlap bags or 5—50 lb. paper bags per minute. The other bin supplies bulk pulp to the purchaser's truck while it stands on the scale.

A scoopmobile is provided to pick up pulp from the bulk pile and deliver it to the elevator which supplies either of the two bins. At night the elevator will discharge all pulp onto the belt conveyor running the length of the bulk warehouse, where the pulp is stored after the small bins are filled.

Acknowledgments

The plant was designed by the Sugar Division of the Stearns-Roger Mfg. Co. of Denver, Colorado. The contract for erection of the buildings was awarded to the Dominion Construction Co. of Vancouver. Supervision of construction, as well as the purchase and installation of the machinery and equipment, was carried out by the engineering staff of Canadian Sugar Factories Ltd. of Vancouver, with cooperation from the Company's General Office at Raymond, Alberta, and with the Author as Chief Engineer.

ANY CORROSION PROBLEMS?

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The following question and answer is typical of problems presente

Question: What galvanic corrosion effect would salt water have on Monel shaft running through bronze stuffing box?

Answer: Monel and bronze occupy relatively low positions in the galvanic series of metals. Both are fairly noble, and more important, their position in the series lies close together. This means there will be small tendency for galvanic action between these two metals. Any small galvanic influence which did develop would be such that the corrosion of Monel would be decreased and the corrosion of bronze would be increased. Unless the proportionate area of bronze to Monel were very small, the increas in the corrosion rate for bronze would not be of great significance. To sum it up, the normal low corrosion rates for Monel and bronze in salt water would prevail with galvanic corrosion not being a significant factor.

What is *your* particular corrosion problem?

Our Corrosion Engineering Section will be pleased to make available to you the results of years of plant experience. An inquiry will receive our prompt attention.

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Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

Pipeline Control System.—A remote control pipeline system, in which four automatic pumping stations nearly 1,000 miles away are controlled by a dispatcher high in a New York skyscraper, was placed in operation recently by the Shell Oil Company. The new control system, developed by General Electric, Shell Oil, and American T. & T. Co. engineers, is believed to be the first of its kind in the world. It is controlled by dialing various series of numbers on a dial-equipped teletype machine. The new system enables the dispatcher in New York to start or stop pumps and to open and close valves in any or all of the four new pumping stations in New Douglas, Effingham, and Dennison, Ill.; and North Salem, Ind. He can also take instrument readings from his desk by dialing another set of numbers. The stations will boost the capacity of Shell's pipeline between its Illinois refinery and Columbus, Ohio.

Wood Treatment.—A new chemical for controlling sap stains and mould organisms in freshly-sawn lumber has been placed on the Canadian market by the chemicals department of Canadian Industries Limited.

Marketed under the name "Melsan" the combined fungicide and bactericide is a free-flowing powder that will quickly dissolve in water except for a small portion of inert ingredients. It is an improvement on a somewhat older product known as "Lignasan". The active ingredients consist of ethyl mercury phosphate and sodium pentachlorophenate.

Melsan in water solution may be used by dipping or spraying. It may be applied in warm or cold solutions. Complete information may be obtained from any office or representative of the chemical division of Canadian Industries Ltd.

Tensile Testing. — A group of new type tensile testing machine jaws has been announced by Instron Engineering Corpn., Quincy, Mass. Three important features of the new Instron jaws combine to give the greatly increased gripping efficiency which lowers the required jaw pressure and minimizes jaw breaks —a resilient follow-up action, self-alignment of the gripping faces, positive restraint of motion of the gripping surface in the direction of pull. Jaw faces are available in choice of sizes and face characteristics such as serrated, rubber-coated, etc. Model BJ has a load capacity of 5,000 grams, model CJ a load capacity of 100 pounds, and model DJ a load capacity of 1,000 pounds. For complete details communicate with the manufacturer at 2 Hancock St., Quincy 71, Mass.

Aluminum Mine Cage.—To improve the standards of safety in Canadian mines, the Ontario Department of Mines passed legislation reducing the load limits of mine ropes. Many mines were confronted with the question of installing larger ropes which necessitated changes in hoists or reducing loads by cutting down the weight of the mine cages.

Dome Mines decided on the latter course and Dominion Bridge Co., designers and builders of the original steel cage for this organization, were asked to redesign and build a new cage weighing 3,000 lbs. less than the older cage. This was accomplished by using aluminum in its construction. The bail with its guides and wear plates, the doors and the floor of the new cage were fabricated of steel whilst the cage walls were made from 65 S-T alloy, 11 ga. with ¼-in. plate under the bail at the load points. The four corner angles, which were bent at each end, were made of 65 S-W alloy. Rivet stock was 55 S-F cold headed to pan heads, then heat treated to 55 S-W condition by others. Rivets were driven hot, to reduce the possibility of bending or damaging the thin aluminum plates. A heating furnace was improvised by enclosing a steel box in a furnace, fired by a gas burner, thus forming a furnace of the muffle type in which the rivets were heated to 950/1,050 deg. F. A very close tolerance was maintained on the driving time—15 seconds only being allowed between removal of the rivets from the furnace and the time they were fully driven—so as to derive from the alloy the maximum strength obtainable. The mine cage is 14 ft. 6 in. high (excluding the bail), 12 ft. long and 5 ft. deep. The completed cage weighs 8,050 lb. which is well below the required weight.

B.C. Cellulose Plant.—The new $27,000,000.00 high-alpha cellulose plant of Columbia Cellulose Co. Ltd., near Prince Rupert, B.C., is expected to go into production during the first quarter of 1951.

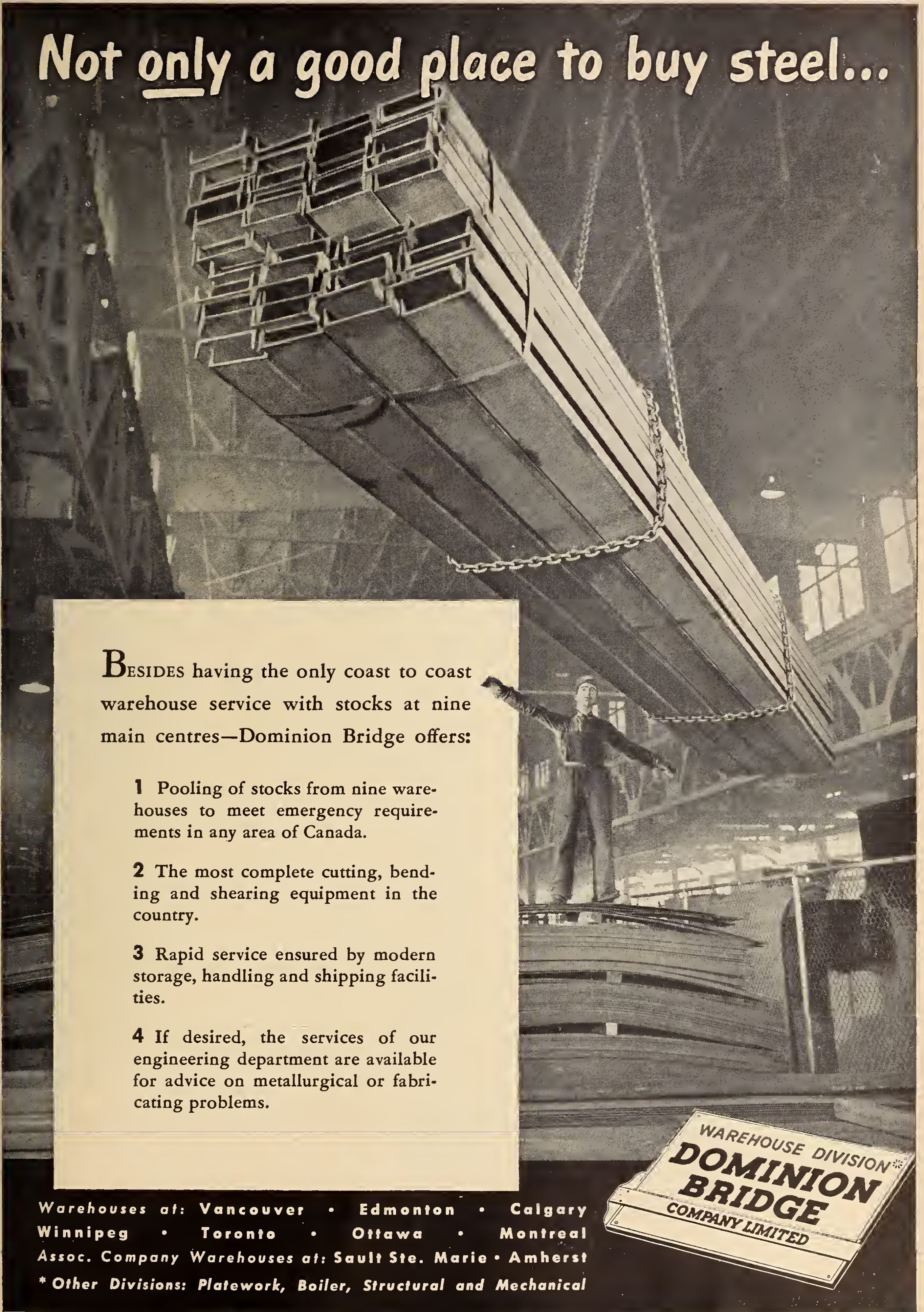
G.E. Circuit Breakers. — Fourteen General Electric 230 kv. circuit breakers play a vital part in the new Des Joachims development of the Hydro-Electric Power Commission of Ontario. Twelve of these 3-tank units were ready for operation when the station was officially opened recently. Two more will go into service within the next few months. Rated interrupting capacity of these breakers is 5,000,000 kva. The units were built at the Peterborough works of C.G.E.

New Measuring Tape.—A new, lightweight, rolatape for accurate one-man measurement, vertically, horizontally or around curves has been announced by Rolatape Inc., Santa Monica, Calif. The new unit has been designed for safe and accurate measurements of from a few inches to unlimited lengths by a single individual. An automatic counter clocks measurements in feet and in cycles of 100 feet. In operation an audible click is made for every two feet measured and a bell rings at the 100-foot mark. When rolled up the diameter of the tape is less than 8 inches.

Dust Collectors. — Vokes (Canada) Limited, Hermant Building, 21 Dundas Square, Toronto, are introducing to the Canadian market a new type of dust collector which has already met with great success in Great Britain.

Because of its modern design this dry fabric filter plant gives much greater efficiencies than older types of filter, according to information issued by the manufacturer. The new Vokes' collector is based on an assembly of slightly elliptical wire mesh frames over which the filter medium in the form of a number of fabric envelopes is stretched. Inside the frames is carried the cleaning mechanism, and as the "dirty" or dust-collecting area of the filter is on the outside, the mechanical parts function under clean conditions. The patented elliptical cross-sectional shape of the assembly ensures that the envelopes remain in close contact with the frames

(Continued on page 836)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BESIDES having the only coast to coast warehouse service with stocks at nine main centres—Dominion Bridge offers:
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COMPANY LIMITED

THE C-E SPREADER

A stoker designed to— 1. burn a wide variety of coals—including the poorer grades. 2. operate efficiently and dependably. 3. handle load swings quickly and easily.

The C-E Spreader Stoker is a "natural" for the conditions that exist these days. As an old-time operator said recently, "The best coals — you can't get 'em, but if you could, you can't afford 'em." How right he is . . . and apparently no improvement in the situation is in sight.

What to do about it? Install a stoker that will handle satisfactorily the coals that are economically available in your present day markets — and that sounds like a specification for the C-E Spreader Stoker.

C-E Spreaders are delivering that kind of service all over the country— all over the world in fact — United States, Alaska, South America, Russia, China, — and that *really* means all kinds of coal.

As for efficiency—the following is a quotation from a recent report on an installation comprising three large C-E Sectional Header Boilers fired by C-E Spreader Stokers. "Over a period of years, the efficiency of all three boilers has exceeded the guaranteed efficiency by at least two points and the maintenance costs have been extremely low."

About load swings — during a recent test on a C-E Spreader-equipped C-E Steam Generator designed to deliver 115,000 lb of steam per hr at 230 psi, the rate of steam output was jumped from 60,000 to 128,000 lb per hr in 45 seconds. Steam pressure dropped only 5 lb and had returned to normal within 10 minutes.

So if freedom of choice in the coal market, operating efficiency, low maintenance and ability to handle load swings easily are important factors in your plant — the C-E Spreader is *your* stoker. A-955

COMBUSTION
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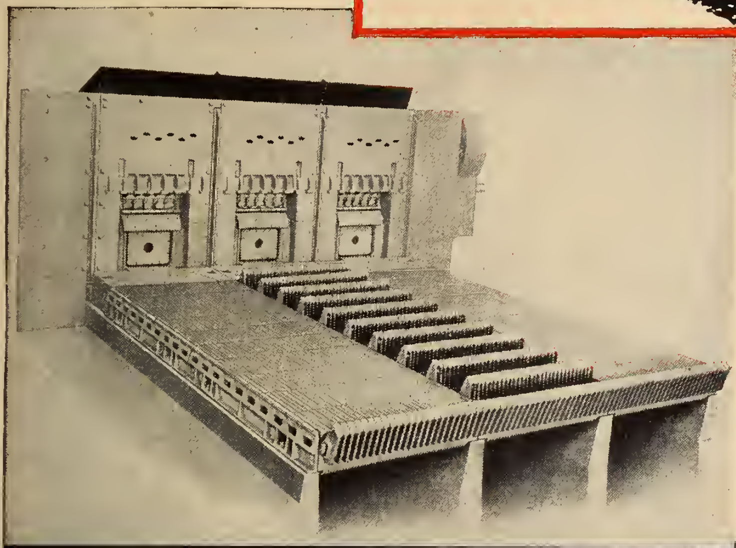
C-E-C PRODUCTS FOR THE INDUSTRY INCLUDE STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT

STOKER burns cheaper coals— EFFICIENTLY

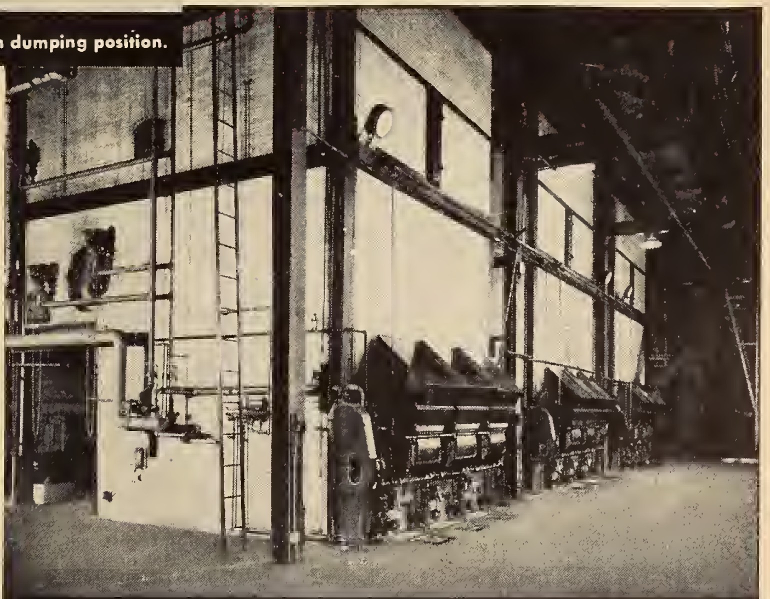


Rear view of C-E Spreader Stoker with one section of grates in dumping position.

THE C-E SPREADER STOKER PAYS FOR ITSELF OVER AND OVER

In an average installation the cost of coal used in a year exceeds many times the initial cost of a C-E Spreader Stoker. Moreover, the first cost of the stoker is soon absorbed by its saving in coal cost — an economy cycle that is repeated throughout its many useful years.

Approximate application range of C-E Spreader Stoker — 150 boiler hp to largest units suitable for stoker firing. Simple, rugged construction. Hopper, feeding and distributing mechanism, variable-speed drive and motor are contained in a compact unit. Rotating spreader blades feed coal into furnace in crisscrossing streams which assure uniform distribution. Fines are burned in suspension and the rest of the coal is burned on a grate — stationary or dumping type. Grate surface is zoned for regulating air admission and to facilitate cleaning. Adapted to limited space. Easy operation. Low maintenance.



Installation of three C-E Spreader Stokers firing three C-E Steam Generators.

C-E

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In May, 1951, businessmen from all over the world will converge on Toronto . . . by every means and mode of transportation.

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TORONTO MAY 28 - JUNE 8, 1951

DEDICATED TO THE PROMOTION OF INTERNATIONAL TRADE BY THE GOVERNMENT OF CANADA

BUSINESS AND INDUSTRIAL BRIEFS

(Continued from page 832)

under all conditions. Cleaning by vibration, assisted if necessary by a slight backflow of air, has been chosen by Vokes in preference to methods involving heavy reverse flow. As with all collector plants, it is desirable on several counts that it should operate under a slight depression and this can easily be arranged in the Vokes' plant. Typical uses of the Vokes' dust recovery filter plant in Great Britain are in the collection of dusty chemical products such as quinine, phosphates and plastics and in the reclamation of tobacco or tea dusts.

●

Bepco Motors.—Bepco Canada Limited recently announced that they can now supply a complete range of motors with the latest NEMA ratings and with NEMA mounting dimensions and shaft extensions. These motors can be supplied for any enclosure — protected, drip-proof, splash-proof, T.E. fan-cooled; and for any characteristics — squirrel cage or wound rotor, normal or high torque, high slip, frequent reversals, variable or multi-speed, continuous or intermittent rating. Complete details may be obtained from any Bepco office or representative.

●

Unit Heaters. — Canadian Sirocco Company, Ltd., 310 Ellis Street, Windsor, Ontario, announce a major development in the design of the Canadian Sirocco ceiling-mounted, vertical unit heater. Instead of old-style directional louvers, the Company's vertical models are now equipped with new Equitemp air diffusers. The new diffusers are said to provide better heat diffusion with more even temperatures and adjustable length of down blow.

Besides the vertical unit heater, Canadian Sirocco also manufactures Venturafin unit heaters for horizontal blow. Both vertical and Venturafin models are designed for steam or hot water systems.

●

Conveyor Belt Edging.—Dunlop Tire and Rubber Goods Co. Ltd., have developed a new "Flexlock" edge for conveyor belts. This new edge provides greatly increased anchorage of rubber to the belt carcass, combined with at least 200 per cent increase in edge cushioning and, it is claimed, at least 200 per cent increase in edge abrasion resistance. The new product also provides extra edge impermeability to the entrance of moisture, grit, acids, oils, etc. into the fabric carcass of the belt. This new development replaces the "Shuron" belt edge which was developed and patented by Dunlop in 1925.

●

Plastic Plant. — Canadian General Electric Co. have opened a large modern custom moulding plant in Cobourg, Ontario. They now announce that they are expanding their injection moulding facilities to produce considerably larger thermoplastic mouldings. Members of the Company's plastics division state that thermoplastic moulding is one of the fastest-expanding segments of the rapidly-growing plastics industry. The improvement in properties of such thermoplastic materials as polystyrene, polyethylene, and the cellulosics have, according to a Company spokesman, made possible a much broader market in the industrial and engineering field for plastic moulding.

●

Stainless Steel Sheets. — An immediate saving of about 10 per cent to the average consumer in the price paid for Canadian-produced stainless steel sheets was foreseen recently when Atlas Steels Limited announced the schedule of prices at which it will sell the production of Canada's first mill for the rolling of stainless steel sheet.

Atlas, long a producer of tool steels, specialty steels, and stainless steel in rods, bars, and wire, has just completed an extension to its mile-long plant at Welland, Ontario, to provide ample capacity for the current and future demand for hot rolled and polished sheets.

●

British Caterpillar Plant.—Caterpillar Tractor Co. Ltd., is the name of a newly formed British Company which is a subsidiary of the Caterpillar Tractor Co., Peoria, Illinois. The new Company will engage in the business of procuring, inspecting, storing, and shipping British-made genuine Caterpillar parts to dealers in the United Kingdom and other countries.

Employment at the newly-formed British plant will approximate 125 people.

●

Floor Finish. — Monsanto Chemical Company has announced that an associated concern, Plastic Products of Ottawa, Ohio, have developed an abrasion-resistant, durable floor finish for gymnasiums and other recreational rooms. This transparent, penetrating coating is known as "Lino-Plastic".

●

Cominco Improvements.—At an approximate cost of $250,000 the Consolidated Mining & Smelting Co. of Canada Ltd. plans to construct a new pump-house to be located at the main reservoirs adjacent to the metallurgical plants at Trail, B.C. The building will ultimately house all pumps delivering water to the Company's chemical plants which are on a level about 350 ft. higher. The current project will be for the first part of a larger building which will be constructed as required. The job at hand calls for a single storey building 36 ft. wide by 58 ft. long and 26 ft. high built of reinforced concrete. A new 6,000 gal. per minute pump, powered by a 1,400 hp. synchronous motor, will be installed. A header for future pump installations will also be included as well as provision for future relocation of existing pumps. Cominco's Trail operations use 50,000,000 gal. of water per day.

Two conveyors have been installed at Cominco's Sullivan Mine, Kimberley, B.C. to raise ore from the 2,850 foot level to the 3,350 ft. level. 7 ft. by 15 ft. inclined tunnels have been made to accommodate these conveyors. The conveyors will consist of 36 in. rubber belts and will be operated by 200 hp. motors. The new conveyor sections will connect with the six section conveyor system installed in 1944. The total length of the six original and two new conveyors will be in excess of 4500 ft. and the system will handle 400 tons of ore per hour. The individual conveyor sections are interconnected by an automatic control system.

●

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WATER TREATMENT ENGINEERING AND CHEMICALS

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Torque Converter.—A new model of the Zero-Max Variable-Speed Torque Converter, for use with motors from 1/15 hp. to ¼ hp. has been announced by Revco, Inc., Minneapolis. This new unit, which has a torque rating of 20 inch pounds, provides full torque conversion at all speeds and infinitely variable speed from zero to ¼ the input motor speed. According to the manufacturer the full torque conversion feature of the unit makes possible the use of smaller, lower cost single-speed electric motors. It is also claimed that the positive, infinitely-variable speed control makes it ideal for laboratory equipment as well as ordinary uses such as blue-print machines, conveyors and any application requiring variable speed.

●

Plastic Covered Screw.—The Forman Insulating Screw Corporation, 401 Broadway, New York 13, N.Y., has introduced a new composite fastener for electrical, vibration, and thermal insulation uses. This new fastener is comparable in strength and accuracy to a standard metal screw but it has the following additional characteristics. It consists of a serrated metal core which has been extrusion-coated with a thermoplastic material. The type of core and plastic used depends entirely on the use to which the screw will be put. After the extrusion process the resulting composite rod is cut in an automatic screw machine to form accurate threads and a strong head. The metal core runs the entire length of the screw and furnishes most of the screw strength. The plastic exterior gives the new screw all of its extra insulating and sealing qualities. The metal core carries the torque applied by a screw driver or

(*Continued on page 840*)

HORTON WELDED STEEL TANKS

for Alcohol Plant

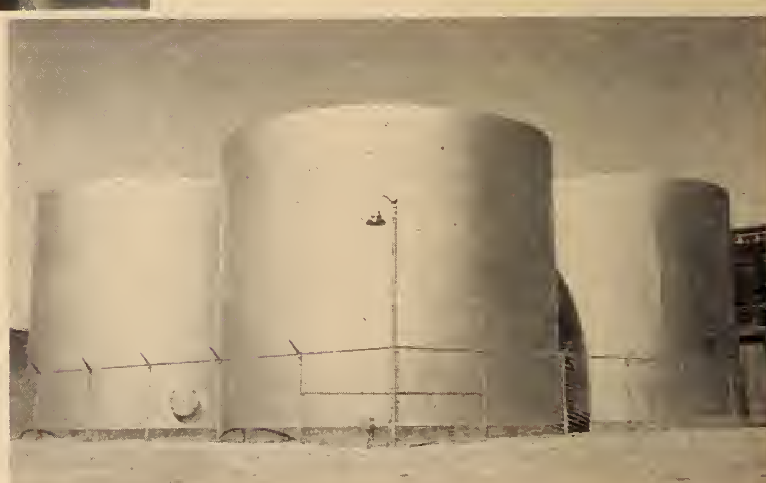
The structures shown in the accompanying views were built for the Commercial Alcohol Limited's plant at Gatineau, Que. The cone-bottom bin shown at the left is used for the storage of powdered, hydrated lime, used in the processing of the waste sulphite liquor from which alcohol is produced. The flat-bottom tanks in the view below are used for the storage of the alcohol manufactured at the Gatineau plant.

Adequate storage facilities are essential to efficient and economical plant operation. Welded steel tanks are widely used for storage jobs because of their efficiency and low maintenance requirements — usually just a coat of paint applied regularly.

We are equipped to design, fabricate, and erect all types of tanks and steel plate work. Horton flat-bottom tanks; elevated water tanks; bins; cylindrical, spherical and spheroidal pressure containers are a few of the welded steel plate structures we are designing, fabricating and erecting for industries. Write our nearest office for complete information on steel tanks and plate work.

Above: 20-ft. diam. welded bin used for the storage of lime.

Right: 30-ft. diam. by 24-ft. high alcohol storage tanks.



CANADIAN INSTITUTE OF STEEL CONSTRUCTION INC. C·I·S·C

HORTON STEEL WORKS LIMITED

TORONTO, ONT. FORT ERIE, ONT. MONTREAL, QUE.

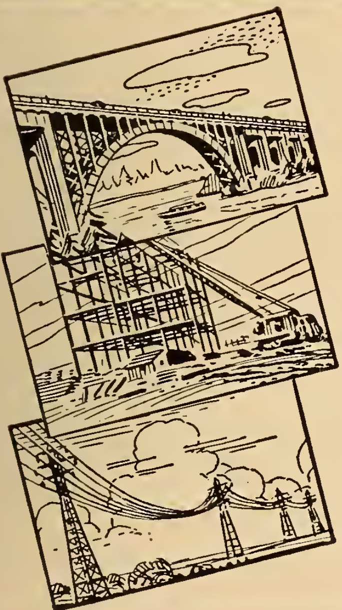
Representatives: Mumford-Medland, Ltd., Winnipeg, Man.—Gordon Russell, Ltd., Vancouver, B.C.

MEN OF EXPERIENCE

BUILT THIS GRANDSTAND

New Grandstand of Canadian National Exhibition, Toronto. Fabricated and Erected by the Men of Canadian Bridge.

General Contractors—Pigott Construction Co. Ltd. Architects—Marani & Morris. Engineers—Wallace & Carruthers.



One of the most vital factors in the design, fabrication and erection of steel structures is the "know how"—gained from long experience—of the men on the job. For almost 50 years, Canadian Bridge has been acquiring a vast store of priceless knowledge and experience . . . in every climate . . . over every kind of terrain, not only in Canada but throughout the world. And today, the greater experience and varied skills of Canadian Bridge specialists, are at your disposal—to assure you of unqualified satisfaction and complete dependability.

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(Continued from page 837)

other driving instrument. There is no danger of the plastic chipping or cracking under torque.

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Two other advantages are claimed for this new product—the unlimited colours offered make production coding simple; and the plastic threads, when used with a metal nut, tend to seize and form an effective lock—thus eliminating the need for lock washers or lock nuts.

●

Heating Systems.—A new line of control valves with piston operators, for convector installations and other applications in confined spaces where ordinary valves cannot be accommodated, has been developed by Johnson Temperature Regulating Company of Canada, Ltd.

These new, compact, valves are adaptable to almost any type of piping connection for the accurate proportional control of low pressure steam or hot or cold water. They are made in ½-in. and ¾-in. pipe sizes. In addition to conventional union angle and union globe patterns, the manufacturer offers reverse flow, double-union angle and female union and female union inlet globe bodies. In the water valves, a V-ring self-sealing packing utilizes the force of the water pressure to effect a positive seal. For low pressure steam service, specially compounded moulded split-ring packings provide long life with a minimum of attention. They are readily accessible for adjustment or replacement. Specifications and installation data may be obtained from the Johnson Temperature Regulating Company of Canada Ltd., 3615 Danforth Ave., Toronto 13, Ont.

●

Post Hole Digger. — The "Earth Drill" just announced by McCulloch Motors Corporation of Los Angeles, is a new 5-hp. gasoline-powered post-hole digger, which, it is reported, is capable of drilling at a high rate of speed in any type of earth or clay. It is completely portable, requiring no tractor or vehicle for its operation. The drill can be converted into a standard chain-saw in less than a minute. Conversion consists merely of detaching the drill assembly and attaching a chain-saw assembly.

Weight of the Earth Drill complete with 6-inch auger is only 79 pounds. It has been designed to permit drilling at any angle and reversal of rotation of the auger. Augers in 6, 9, and 12 inch diameters are available.

●

Electroplating-Rectifier.—A new oil-immersed selenium rectifier, especially designed for electroplating, is available from Canadian General Electric Company's control division. Believed to be the first standard rectifier using hermetically sealed selenium stacks to withstand the corrosive atmosphere of a plating room, the new unit is available in two models: 6/12 volts, 1500/750 amps., 230/460 volts a-c, 60 cycles, three phase; and 9/18 volts, 1500/750 amps., 230/460 volts a-c, 60 cycles, three phase. The new rectifier consists of a transformer, fan, and 12 rectifier stacks arranged in a steel casing. Each stack, hermetically sealed in an oil-filled can, contains matched selenium cells connected in parallel through heavy internal bus bars to mechanically sealed terminals, utilizing Neoprene for sealing and glazed porcelain for insulation. Each unit consists essentially of two rectifiers with individual bus bars brought out at the rear. These may be connected in series or parallel to give full current at normal voltage, or half current at double voltage.

The transformer is arranged so that the primary may be connected for 230— or 460 volt circuits. Taps are provided to compensate for line voltage variations.

●

Appointments and Transfers

Stelco Appointment. — K. B. MacNaughton, formerly Toronto district sales manager of The Steel Company of Canada, Limited, has been appointed sales manager of the sheet, strip, tinplate division of the Company. He will make his headquarters in Hamilton.

●

Trade Commissioner Service. — An office of the Canadian Trade Commissioner Service has been established in Colombo, Ceylon. Paul Sykes, formerly Trade Commissioner in Singapore, has been appointed head of the new office.

●

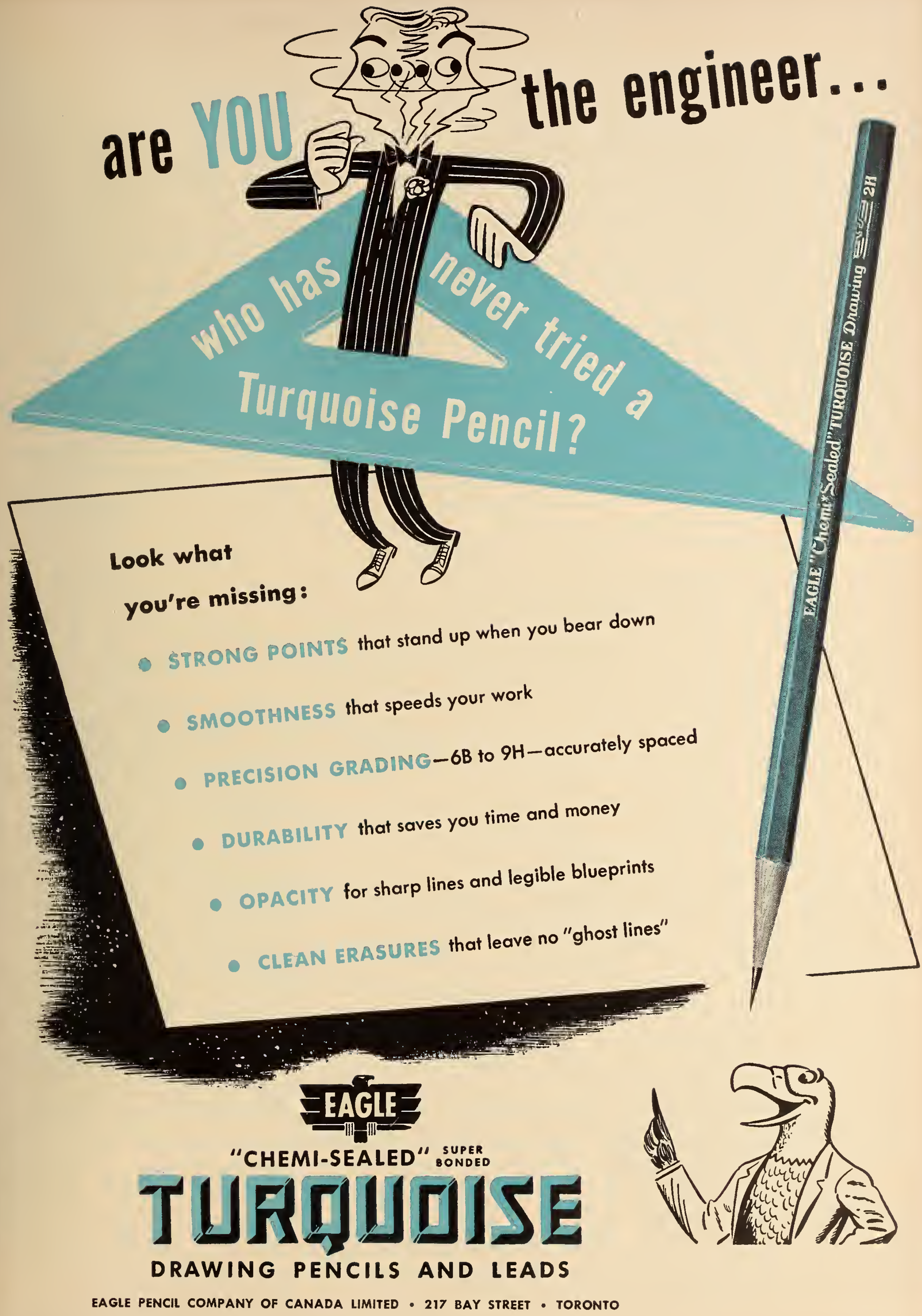
J. J. R. Sumner.—J. J. R. Sumner has been named head of the American-Coleman of Canada with offices in Toronto. The Toronto firm will handle sales and distribution of American-Coleman equipment in Canada. The parent Company produces several types of road and automotive equipment.

●

Atomic Conference Delegates. — Dr. R. E. Bell of the research division of the National Research Council, Atomic Energy Project at Chalk River, has left for England to attend the Birmingham Meeting of the British Association for the Advancement of Science. He will report recent experimental work with neutrons from the Chalk River heavy-water pile. Dr. Bell and Dr. D. G. Hurst will represent the project at the International Nuclear Physics Conference, being held in Oxford this month, under the auspices of the British Atomic Energy Research Establishment.

●

Vivian Engine Works Change. — Brush Electrical Engineering Co. Ltd., a British concern, has acquired the controlling interest in Vivian Engine Works Ltd., a company which has been producing Diesel engines in Vancouver for the past 40 years. M. W. Vivian, former president, is remaining on the board of directors and is retaining a holding in the Company. Brush Electric own and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control among many other companies: Mirrlees Bickerton & Day Ltd., Stockport; Messrs. J. H. McLaren Ltd., Leeds; Petters Ltd., Staines; National Gas & Oil Engines Ltd., Ashton-under-Lyme; Henry Meadows Ltd., Wolverhampton. All these companies are manufacturers of Diesel engines and the range produced is from 1½ hp. to 2,900 hp. These engines are supplied for electric generating sets, marine purposes, Diesel electric locomotives, and automotive uses. In addition the Brush Company have a large electrical works at Loughborough, Leicestershire, where they produce a complete range of alternators, switchgear, and steam turbines.

●

Trade & Commerce Changes.—J. S. Irvin has resigned from the post of director of the emergency import control branch of the Department of Trade & Commerce. Other resignations from the same department are W. E. McDermott, director of the import allotment division and G. B. Greene, assistant director of the allotment division. Mr. Irvin is joining the staff of the Steel Equipment Co. Ltd., Mr. McDermott is now with Reo Motor Co., and Mr. Greene is with Sheridan Equipment Co.

W. F. Bull in addition to his duties as director of the commodities branch will succeed Mr. Irvin as director of the emergency import control branch. E. J. McWilliams has been appointed assistant director of the emergency import control branch and A. F. Cunningham, in addition to his duties as director of the projects division, has been appointed director of the allotment division.

●

Allis Chalmers Appointment.—John R. Lindsay has been appointed manager of the Winnipeg district office of Canadian Allis-Chalmers Limited.

J. R. Lindsay

Mr. Lindsay graduated in engineering from the State College of Washington in 1943. He served in the U.S. Navy for 3½ years. He joined the Toronto staff of Canadian Allis-Chalmers in 1927 and was transferred to Montreal in 1949. Previous to his current appointment he was in the industrial division of the Company.

●

C. B. Rutherford

Dominion Rubber Co. Appointments.—C. B. Rutherford, H. Wolfhard and E. H. White have been elected directors of Dominion Rubber Co. Ltd.

Mr. Rutherford is general manager of the mechanical goods division, and Mr. Wolfhard general manager of the footwear division. Both are vice-presidents of the company.

Mr. Rutherford has been with Dom-

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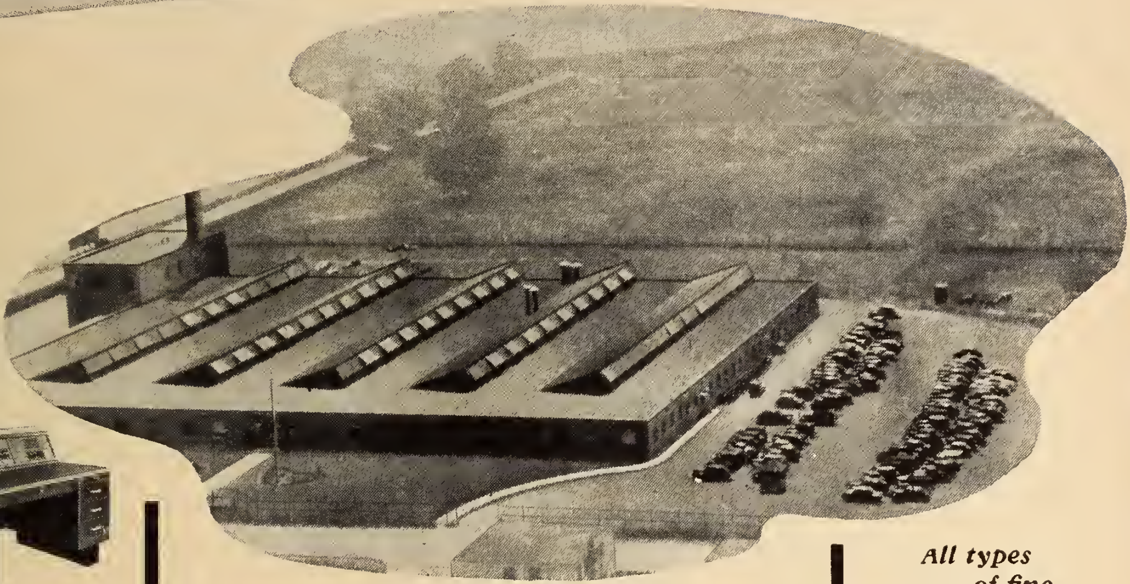

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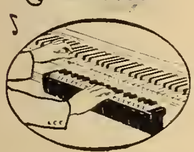

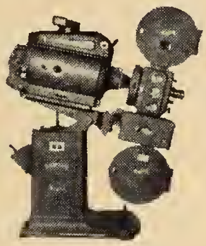

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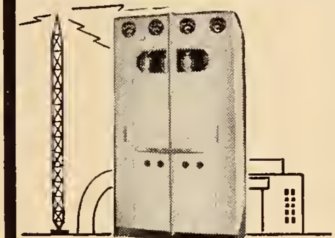

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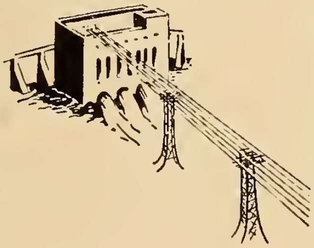

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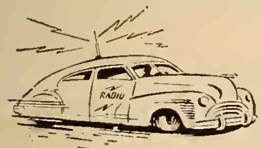

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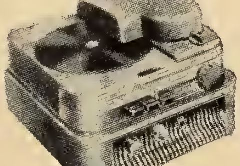

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inion Rubber since 1915 and Mr. Wolfhard since 1912. Mr. White is a vice-president of United States Rubber Company which he joined in 1903.

●

C. P. Madely.—Charles P. Madely has been appointed manager of indus-

C. P. Madely

trial sales for Montreal Locomotive Works. This is a new post and marks the Company's decision to build a wide range of industrial machinery and steel products as well as diesel-electric locomotives. Mr. Madely was formerly plant manager of the Montreal Locomotive Works.

●

New Westinghouse Office.—The formation of a new Niagara district branch office for the Canadian Westinghouse Company has been announced. R. O. Cleworth has been appointed manager of the new branch.

●

L'Hoir Inc. Appointment. — L'Hoir Incorporated has announced the appointment of Nicholas M. de Munnik as Toronto representative. He succeeds the late W. Lyle McAdam.

●

"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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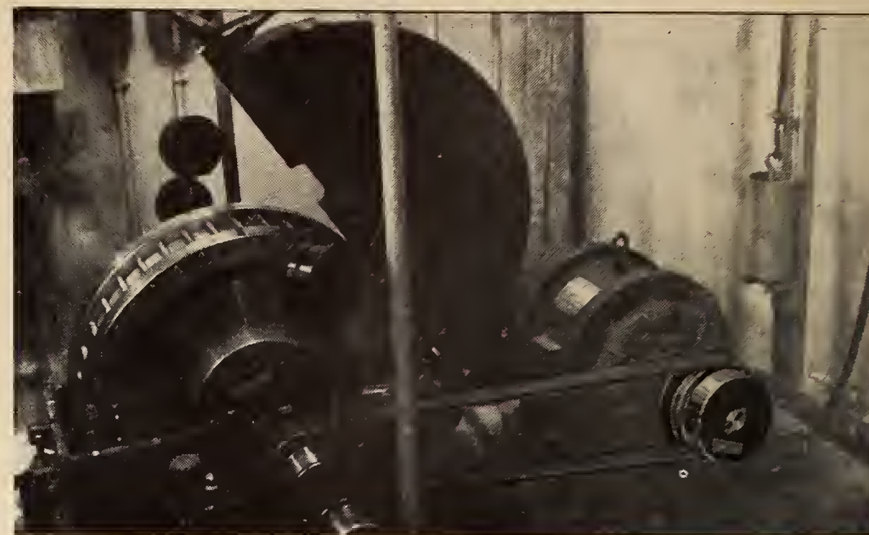

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Marine Pumps.—"Marine Centrifugal Pumping Engines" is the name of a hand book produced for superintendent engineers, chief draughtsmen, engineer-officers, and others responsible for the selection, installation and running of Drysdale centrifugal pumping machinery in marine installations. This hard-covered 60 page publication is an excellent hand-book of its kind. Copies will be mailed to *Journal* readers on receipt of request on official letterhead.

●

Engineering Standards.—No. 3 of volume 17 of the Dominion Engineer contains an eleven page article on engineering standards. The author is G. Nobe, Standards Engineer, of Dominion Engineering Works Ltd. For copies write to the Company at Post Office Box 220, Montreal, Que.

●

Ferranti Bulletin.—In a recent issue of the *Journal* reference was made to bulletin No. 106 a Ferranti Electric Limited publication containing 32 pages on informative material on "Transformer Connections and Distribution Systems".

This bulletin was first published in 1937 and the first edition was quickly absorbed. The current edition has been revised and there is a very heavy demand for copies. As stated in the earlier reference to this publication, a limited number of copies have been set aside for *Journal* readers. Applications for copies should be addressed to Ferranti Electric Limited, Mount Dennis, Toronto 15, Ont.

●

Scottish Handbook. — "Scotland—Manufacturing and Export Centre" is the title of a brochure released by the Scottish Council (Development and Industry) with headquarters in Edinburgh, Scotland. The pamphlet gives short descriptions of the manufacturing advantages which have made Scotland so successful as a world supply centre of manufactured goods. It outlines labour conditions, availability of materials, transportation facilities, financial regulations and conditions, research and teaching facilities. It has been produced specially for those who are interested in establishing plants in Great Britain. For copies apply to the Secretary, The Scottish Council, 1 Castle St., Edinburgh 2, Scotland.

●

Caterpillar Booklet. — "Beat Back the Snow with 'Caterpillar' Equipment" is the name of a publication produced by Caterpillar Tractor Co. For the past two years, Caterpillar Tractor Co. has been sending photographers into those areas where snowfall has been heavy and pictures have been taken showing Caterpillar euipment in operation. Copies of this booklet (Form 30023) may be obtained by writing to the Caterpillar Tractor Co., Peoria 8, Ill., or to any Caterpillar distributor in Canada.

●

Screen Separators. — A new 24-page brochure on Patterson Gyrocentric Screens for wet and dry separation of chemicals, plastic powders, crushed rock, abrasives, adhesives, soap powders, refractories, paint, enamel slip and frit, for de-watering and liquid recovery processes, and other types of production separation operations, has been published by The Patterson Foundry and Machine Co. (Canada) Ltd., Toronto, Ont. The brochure illustrates 22 standard Patterson Gyrocentric screens and includes installation photographs, screen specifications, drawings and detailed information on the use of Patterson screens in various industries.

●

Gear Data Sheets. — Hamilton Gear & Machine Co. Ltd., 950 Dupont St., Toronto 4, offer a further technical bulletin "Bevel Gears". To be placed on the mailing list for this and other Hamilton Gear and Machine Co. Ltd. publications please communicate with the manufacturer.

●

SKF Data Sheets. — For some time Canadian SKF Company Limited, 1057 Bay St., Toronto, discontinued the periodical mailing of sheets of useful tables and charts. The practice has been resumed and Journal readers may be placed on the mailing list for these informative sheets by communicating with the Company.

●

Toolmakers' Microscope.—The Gaertner Scientific Corpn., 1201 Wrightwood Ave., Chicago 14, has just released a new bulletin on the "Gaertner toolmakers' microscope". This is an entirely new presentation of the advantages and uses of this precision instrument. Copies may be obtained by applying to the manufacturer.

●

Instrument Catalogue.—Scientific Instrument Manufacturers Association of Canada (SIMAC) announce that publication of a joint catalogue listing participating member companies and manufacturers products will be ready for release in October.

Of importance to those engaged in research and scientific development work is a comprehensive list of products available which are manufactured in Canada. Approximately 8 full pages of products listing is included in catalogue.

Member companies are co-operating with the SIMAC catalogue committee in pooling mailing lists which will include almost every institution throughout Canada.

Companies and institutions requiring a copy of the SIMAC joint catalogue should send their request to SIMAC, P.O. Box 57, Postal Station "A", Toronto.

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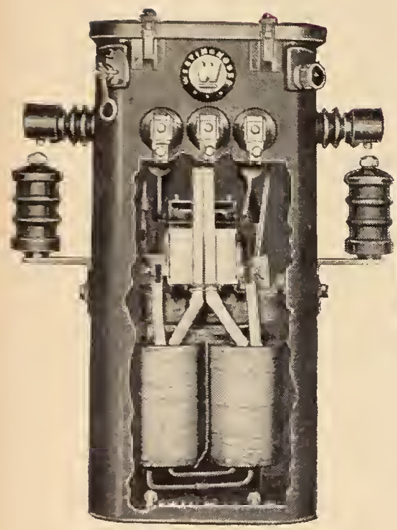

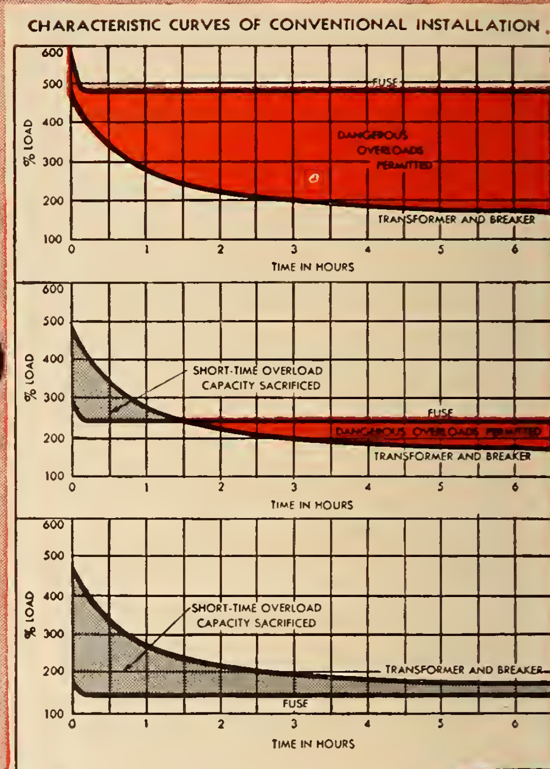

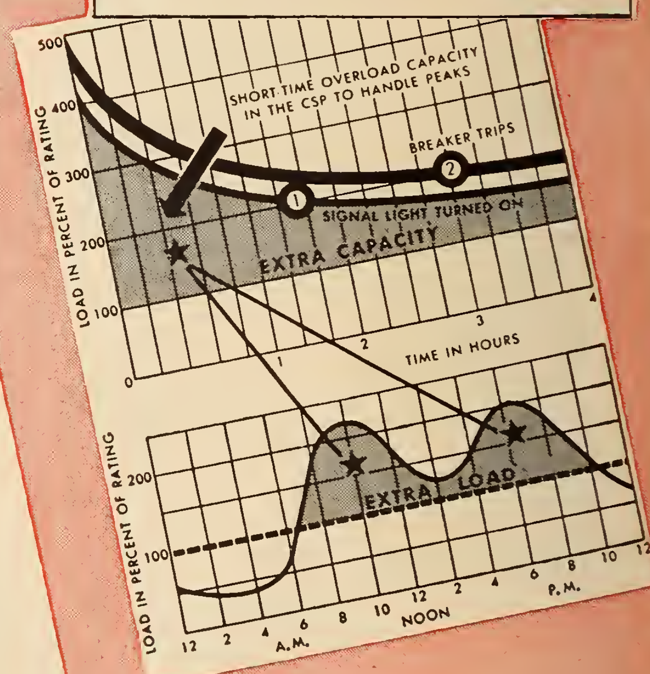

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L. AUSTIN WRIGHT, M.E.I.C.
Editor

W. D. LAIRD, M.E.I.C.
Assistant Editor

L. F. GRANT, M.E.I.C.
Field Secretary
236 Avenue Road, Toronto.

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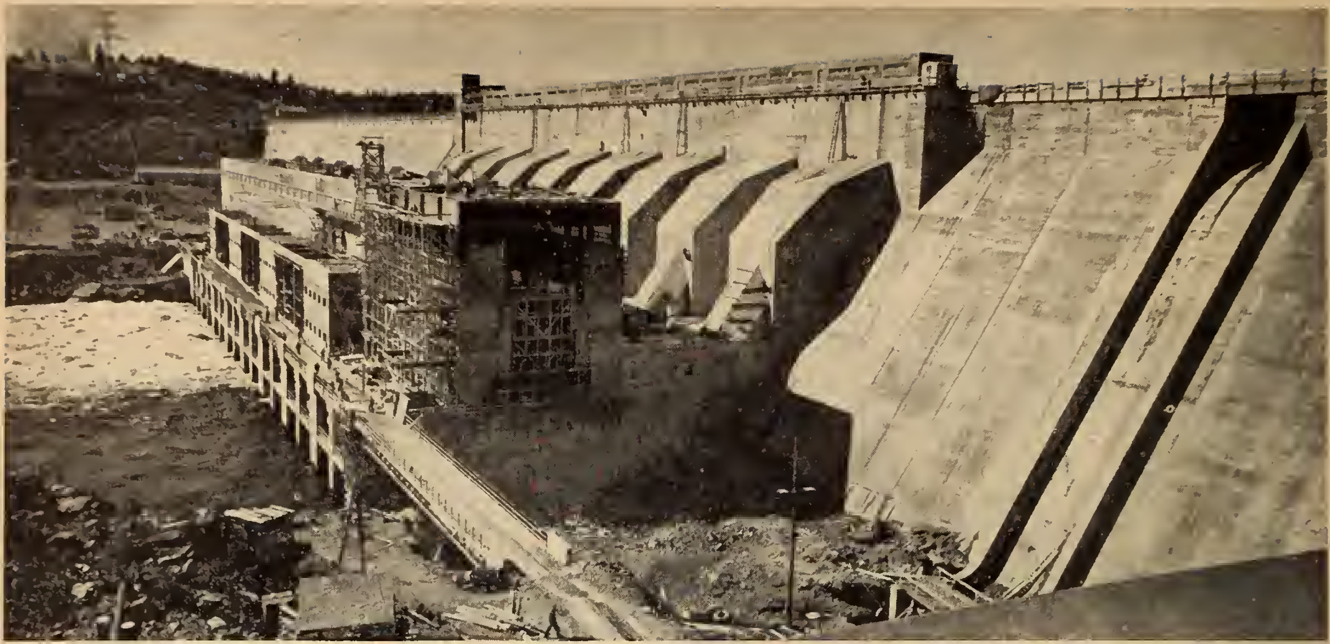


ENGINEERING ASPECTS of the OTTAWA RIVER POWER DEVELOPMENTS

by

J. R. Montague, M.E.I.C.

Director of Engineering,

Hydro-Electric Power Commission of Ontorio, Toronto.

A paper presented before the 64th Annual Generol ond Professionol Meeting of The Engineering Institute of Conodo, ond the Annuol Summer Meeting of the Americon Society of Civil Engineers, Toronto, July 1950.

GENERAL DESCRIPTION

The Ottawa River, throughout the greater part of its length, forms the boundary between Canada's two most highly industrialized provinces — Quebec and Ontario. It has a drainage area of some 56,000 square miles above its confluence with the St. Lawrence near Montreal. The Ottawa and its tributaries has a potential of some 4,000,000 horsepower of installed hydro-electric capacity. At the time of writing, some 1,760,000 horsepower of this capacity is in operation, and by the end of 1952, with the sites presently under construction and expansion, this figure will have been increased to approximately 2,500,000 horsepower.

The watershed, particularly in the upper or northerly portion, is well provided with lakes, both large and small, capable of being utilized to provide a comparatively high degree of regulation of the flow. On its 700-mile course, the river has a fall of some 1200 feet to water level at Montreal, made up of numerous falls and rapids offering attractive opportunities for the development of hydro-electric power.

This river is one of the most historic in America providing as it did in the early days a route for exploration and colonization of the areas to the west and north. In the early seventeenth century Champlain explored this route first as far as Allumette Island opposite Pembroke, and subsequently proceeded to the present site of the town of Mattawa, thence to Lake Nipissing, continuing via the French River to Georgian Bay. It is interesting to note that some 254 years later a farm boy near the village of Cobden found an astrolabe which Champlain had lost on one of his portages. In the eighteenth century, the lumbering industry, taking advantage of the

Fig. 1. Des Joachims Development — General view of powerhouse from northerly bank.

extensive timber resources on the watershed, encouraged the establishment of settlements along its shores. To this industry and to fur trading we owe the initial development of the area agriculturally and industrially.

Flow Regulation

Flow in the Ottawa is regulated by a system of large storage reservoirs situated on the main river above Temiskaming and on the principal tributaries. Numerous smaller branch reservoirs, and sizable headponds at the several generating stations also contribute to the regulation. Chief among the major reservoirs are Dozis, Rapid Seven, Quinze and Temiskaming lakes on the main river; and Kipawa Lake on the Kipawa river, Bark lake on the Madawaska, Cabonga and Baskatong on the Gatineau, and Cedar and Mitchinamikus lakes on the Lievre.

Table I is based on data currently on hand, and may exclude some smaller installations recently placed in service. It gives, however, a fairly accurate picture of the importance of the tributary streams. Summing up the resources presently developed or under construction we have the impressive total of nearly 2,500,000 horsepower.

The undeveloped sites are estimated to have a capacity of some 1,300,000 horsepower, exclusive of those presently under construction or extension. Of these sites, however, some are of small potential capacity and not economically attractive at present. The most important site in the group is that of Carillon where, with a head of 65 feet, some 500,000 horsepower might be installed. Some presently developed sites may be increased in capacity by rearrangement, or as a result of increased storage facilities.

In summing up the total hydroelectric resources on the watershed we have

Developed or under construction	2,468,480 hp.
Undeveloped	1,300,000 "
Possible extensions..	280,000 "
Total present and potential power resources	4,048,480 "

Deducting sites which may not prove economical, a round figure of some four million horsepower would appear to represent a reasonable ultimate total for the watershed.

Table I

Developed and Undeveloped Sites on the River

Main River

Operating generating stations located on the main river are shown in the following table:

Name	*Head Ft.*	*Installed Capacity hp.*	*Remarks*
Rapid Seven	68	64,000	....
*Des Quinze	90	90,500	....
**Des Joachims	134	480,000	....
Bryson	60	78,400	....
Chats Falls	53	224,000	....
Chaudiere	36 to 40	58,000	....
(Miscellaneous Installations)			(Other installations for direct mill service.)
St. Vincent de Paul ...	18 to 26	54,800 to 72,000	....
Total.......		1,066,900	

*—New 34,500 hp. unit at the Des Quinze is included.
**—Placed in initial service June 28, 1950. Completion scheduled for early 1951.

New plants under construction are tabulated hereunder:

Name	*Head Ft.*	*Installed Capacity hp.*	*Remarks*
La Cave	77	192,000	Provision for two
Chenaux	40	160,000	additional units.
Total		352,000	

Tributaries

The plants installed on tributaries of the Ottawa total more than one million horsepower and are listed hereunder:

Name	*Head Ft.*	*Installed Capacity hp.*
Montreal River		
Indian Chute	45	4,500
Hound Chute	32	5,340
Fountain Falls	30	3,000
Upper Notch	48	13,000
Matabitchuan River		
Matabitchuan	312	13,200
Winneway River		
Belleterre	...	2,800
Kipawa River (via Gordon Creek)		
Kipawa	200	27,500
Mattawa River		
Mattawa	...	1,130 or 830
Black River		
Waltham	125	9,500
Bonnechere River		
Miscellaneous	...	2,240
Madawaska River		
Barrett Chute	150	54,000
Calabogie	30	6,000
Stewartville	150	81,000
Mississippi River		
High Falls	78	3,720
Miscellaneous	...	3,500
Rideau River		
Miscellaneous	...	4,300
Gatineau River		
Paugan	136	238,000
Chelsea	93	170,000
Farmers	65	120,000
Lievre River		
High Falls	...	120,000
Masson	185	136,000
Buckingham	30	10,500
Miscellaneous	...	5,200
Rouge River		
Bell Falls	...	7,200
North River		
Miscellaneous	...	3,600
Other small plants on tributary streams	...	4,600
		1,049,580

DES JOACHIMS DEVELOPMENT

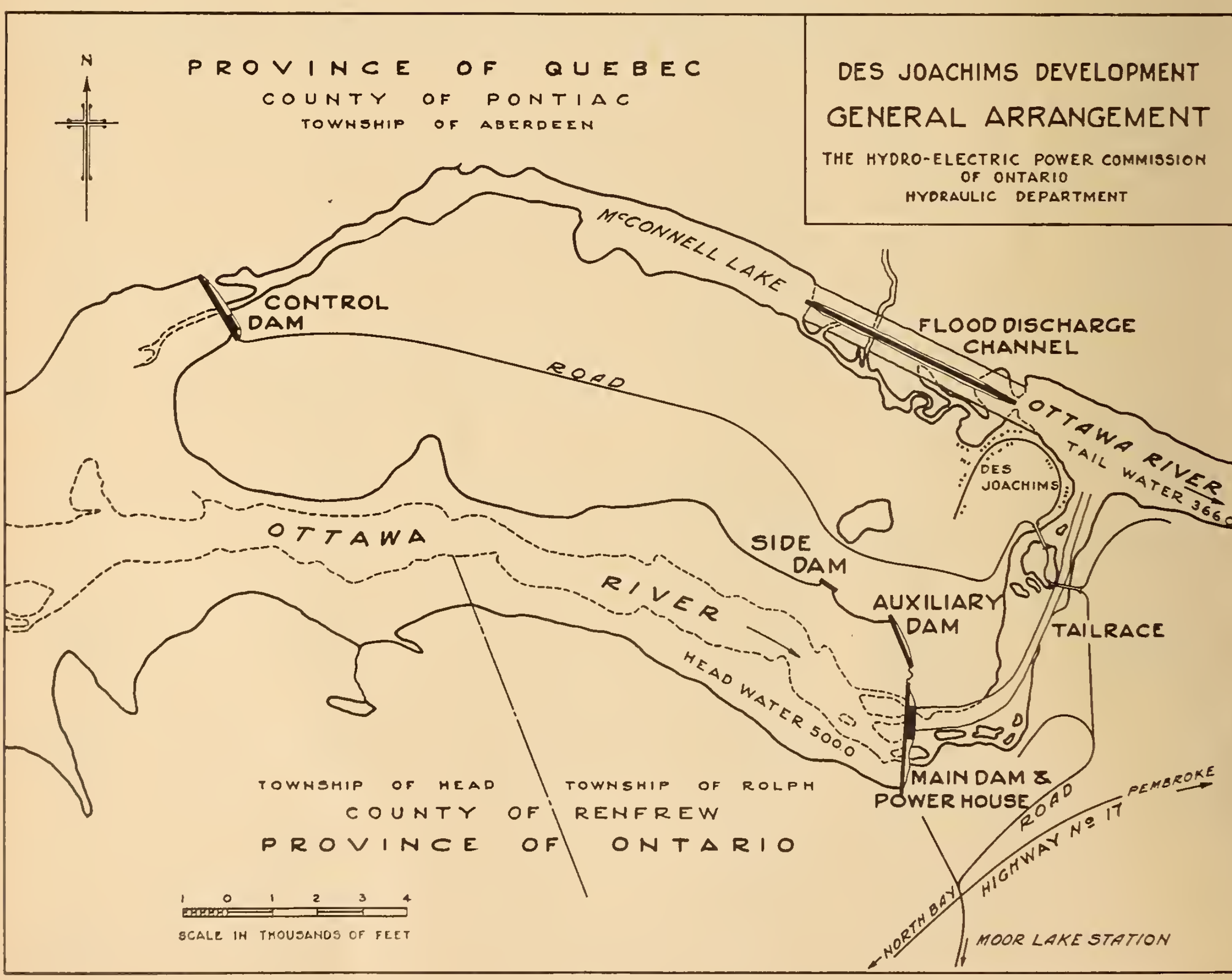
Located on the main river at the Rapide Des Joachims near a pleasant little village of the same name which lies at the outlet of McConnell lake, the Des Joachims power project has the distinction of being the largest capacity plant thus far developed on the watershed. With a maximum headwater elevation of 500 and normal tailwater at 366, the nominal gross head at this site is 134 feet. The net operating head at which the turbines are rated is 130 feet, providing for tailrace and penstock losses and necessary variations in headwater and tailwater levels. The installed capacity of 480,000 horsepower or 358,000 kilowatts is derived from eight units, one of which is normally for standby, or for use when more than ordinary flows prevail on the river. The accompanying General Arrangement plan illustrates the scheme of development which comprises essentially the main dam and powerhouse extending some 2400 feet across the river, at the head of a series of rapids, together with auxiliary structures.

The bulkhead sections of the dams are of conventional cross section, designed to withstand an ice pressure of 10,000 pounds per linear foot and an uplift pressure of full static head at the upstream face diminishing to maximum tailwater level (if any) at the downstream toe — all considered to apply to two thirds the area of the base. This assumption as to uplift has been demonstrated as quite conservative at a number of recently constructed dams in which uplift measuring tubes have been installed. All structures are founded on competent rock comprised generally of a granite gneiss.

Featuring the construction of these structures might be mentioned the headworks section of the main dam, where lengths of sixty feet were required to provide continuity with the unit spacing in the intake and power house. Here, as elsewhere, lifts up to fifty or fifty-five feet were permitted, as discussed in other papers on the subject of high, versus shallow lifts.

It has been the opinion of the writer for some years, that large pours, involving a minimum of joints, provide a greater degree of soundness in a dam structure than can be obtained by a comparatively large number of shallow pours. Dissipation of the heat of setting over a long period of time enables adjustment without cracking, largely through the phenomenon of plastic creep. Verification of this principle has been given by the actual occurrence of cracks in pours incorporating open elevator access tunnels, through which cold air has been allowed to flow, and to rapidly lower the temperature of the surrounding concrete. Such up-drafts should be prevented until the interior concrete tem-

Fig. 2. General arrangement of the Des Joachims power site showing principal features of the development.



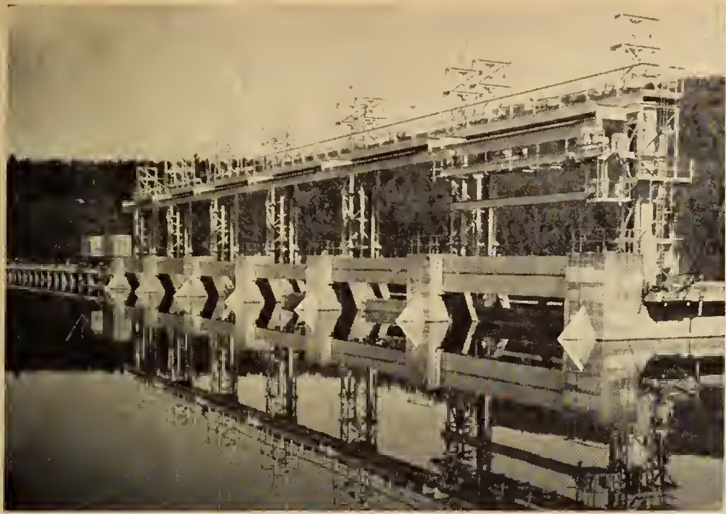


Fig. 3. Des Joachims Development — View of McConnell dam sluice gate section from the forebay.

Fig. 4. Des Joachims Development — Interior view of powerhouse.

perature has dropped to near normal.

On the intake structures on the main dam the racks are located well forward so that buoyant trash may be readily lifted out and heavier debris, such as water logged roots or logs, may be pushed downward to repose harmlessly on the river bed some distance below. Provision is made for the installation of steel stoplog gate sections for dewatering the headgates. The latter are of the fixed roller type, closing off the two openings at each intake, and rendered watertight by brass sealing strips. Downstream from the headgates are two 3-foot by 4-foot air vents to supply free entry of air to the penstocks in case of quick closure of the headgates. Access to the penstocks is provided through these openings and manholes at the power house end.

A novel feature of the headworks, which is being incorporated in the newer plants, is the frostproofing chamber located across the downstream face, and provided with outlets for the later installation of low capacity electric heating elements if found necessary. The object of this chamber is to prevent freezing of water in the air vents and headgate zone during severe winter weather.

The 22-foot diameter concrete-encased steel plate penstocks have field-welded longitudinal joints and double riveted single outside butt-strap circumferential joints. They were designed for a maximum tensile stress of 15,000 pounds per square inch under full pressure-rise conditions. Each penstock is connected to a steel plate volute scroll case, which is riveted to the cast steel speed ring of the turbine. This assembly, including the lower portion of the penstock and the turbine scroll case, is embedded in the concrete power house substructure.

Generating Station Equipment

Each of the eight vertical-shaft generating units comprises a Francis type turbine direct connected to a conventional type generator and operates at a speed of 105.9 r.p.m. Each turbine has a rated capacity of 62,000 bhp. at 130 feet head. The runner is of cast steel in one piece weighing 49 tons. It is flange connected to a 35-inch diameter forged steel shaft. The guide bearing is of the self-pumping oil lubricated type.

Governors are of the twin cabinet type located upstream and centrally with respect to the two units served. Flyballs are motor driven from current supplied by permanent magnet generators mounted on top of the generator. The governors can detect and rectify speed changes of less than 0.05 per cent. Auxiliaries include an overspeed centrifugally operated shutdown switch mounted on the permanent magnet generator set; also emergency shutdown solenoid in the governor cabinet arranged for both automatic and manual operation. Shutdown with this equipment may be complete or to speed-no-load.

The governor pressure system supplies oil at 200 psi through individual pressure and sump tanks, which are interconnected to form a twin system. Operation of the gear type pumps is by " Echelon " control, i.e. one of the pumps supplies both pressure tanks under normal operating conditions while the other is on standby, and starts only when pressure falls to a pre-determined level below normal.

The generator is a totally enclosed 50,000-kva. 0.9-power factor, 3-phase, 60-cycle, 13.8-kv. machine. Cooling-water coils are located in the corners of the rectangular casing through which is recirculated some 112,000 cubic feet of air per minute. Excitation of the generator is from direct connected main and pilot exciters under control of rheostatic-type regulators. The main and pilot exciters and the permanent magnet generator for governor fly-ball drive, are mounted on top of the upper bracket which also carries the combined guide and thrust bearing. To reduce the height of the generator above floor level the oil pot for this bearing is located within the bracket. Of the total 568 tons weight, 275 tons are in the combined shaft and rotor.

The generating station is served by two electrically operated cranes, each having a rated capacity of 170 tons on the main hook and 25 tons on an auxiliary hook. An equalizer beam provides for the utilization of both cranes in the handling of heavier loads. On the headworks deck an outdoor type motor operated gantry crane is provided for handling headgates, the steel panel emergency gates, and the racks. Hooks of 40 tons and 4 tons capacity give flexibility of application and speed in operation.

Dewatering of the draft tubes is accomplished by the installation of steel panel gate sections from the tailrace sub-deck level, and draining the water through pipes leading to a sump, one of which is provided for each pair of units. Each sump is equipped with two vertical shaft pumps rated at 2,500 and 200 g.p.m. respectively under 55 feet normal operating heads.

Power House Superstructure

Particular attention was accorded the architectural features of the project, with special consideration to the appearance and appointments of the power house superstructure. Some 590 feet in length, over 55 feet in width and 65 feet in height to top of coping, the superstructure is of structural steel framework having column spacing of twenty feet, and reinforced concrete walls and roof with expansion joints at every sixth column. A pleasing treatment of the exterior wall surface was accomplished by the use of form panels, with the sheeting running in opposite direction in each lift. The finish texture was attained by sandblasting the 1-inch by 6-inch tongue and groove B.C. spruce sheeting.

Daylight is admitted to the generator room through some 8000—12-inch by 12-inch glass blocks in the upper portion of the upstream and downstream walls, and through a steel frame single glazed 24 x 42-foot window in the northerly end wall. All other windows, in the offices and reception room are of aluminum, some single and some double hung, single glazed except in the air conditioned rooms where double glazing was used. The floor of the generator room is of quarry tile with a terrazzo base and border.

The machine and electrical shops, battery, cable, lunch, locker and wash rooms are all located on the generator room floor level. The 36-foot by 49-foot control room, located on the second floor of the office and reception wing, has an arched accoustic ceiling and is indirectly lighted from a cove on one wall immediately behind the operators.

Log Chute and Tailrace

The V-shaped steel plate log chute, located near the northerly end of the dam, terminates in a short concrete section. The lower portion is horizontal to insure the logs being deposited safely on the surface of the tailrace water. A feature of this slide is the use of a motor-operated Taintor type gate to control the flow through the twenty foot wide concrete entrance. By arranging this gate to depress into a recess to open, any desired depth of flow for the passage of logs can be obtained. Steel sheeting on the sloping upper surface provides a suitable apron for the logs which, through a concrete transition section, are introduced into the steel chute.

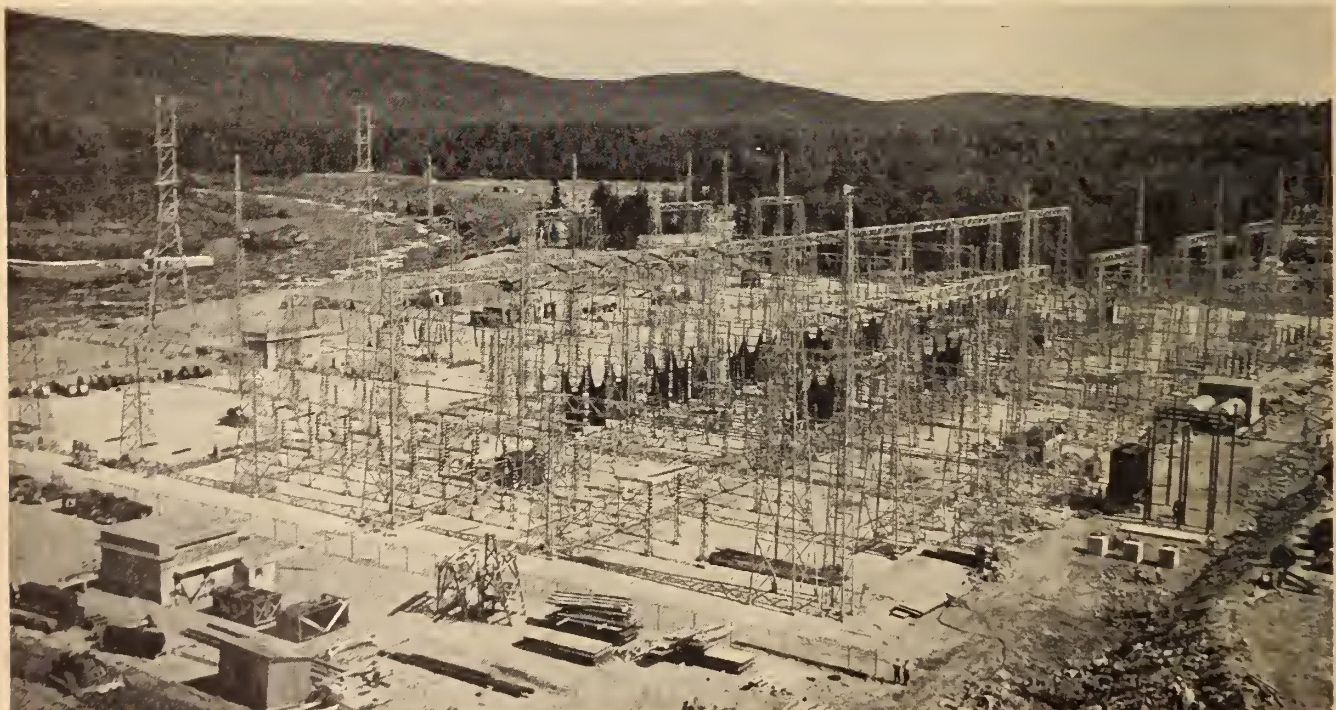
The tailrace channel, excavated in the riverbed some 7000 feet in length, conveys the discharge from the generating station to a point below the rapids. The channel terminates in what is known as the Deep River section of the Ottawa, where depths up to 300 feet have been sounded. The bottom here lies only 65 feet above mean sea level. Downstream from the power house the channel transitions to a width of 175 feet. Excavation was almost entirely in solid rock with depths ranging up to 40 feet. The total quantity of rock removed was 1,400,000 cubic yards, a task of no small magnitude within the eight months period available between closure of the main dam and starting of the generating units on dry-out run.

McConnell Dam and Flood Channel

As will be seen from the general layout, a substantial dam was required to close off the ancient river channel passing to the north of the present main river. This dam, 1600-feet long with a maximum height of 130 feet, provides a convenient means of by-passing excess flow well away from the generating station.

Known as the McConnell Control dam, this rock-founded structure is of concrete construction incorporating six power operated, fixed roller type sluice gates 40 feet wide, with sills 25 feet below normal headwater level; also 40 stoplog sluices 16-feet wide and 20-feet deep. The stoplogs are handled by means of two motor operated spud winches of conven-

Fig. 5. Des Joachims Development — General view of 230 kv. switch yard.



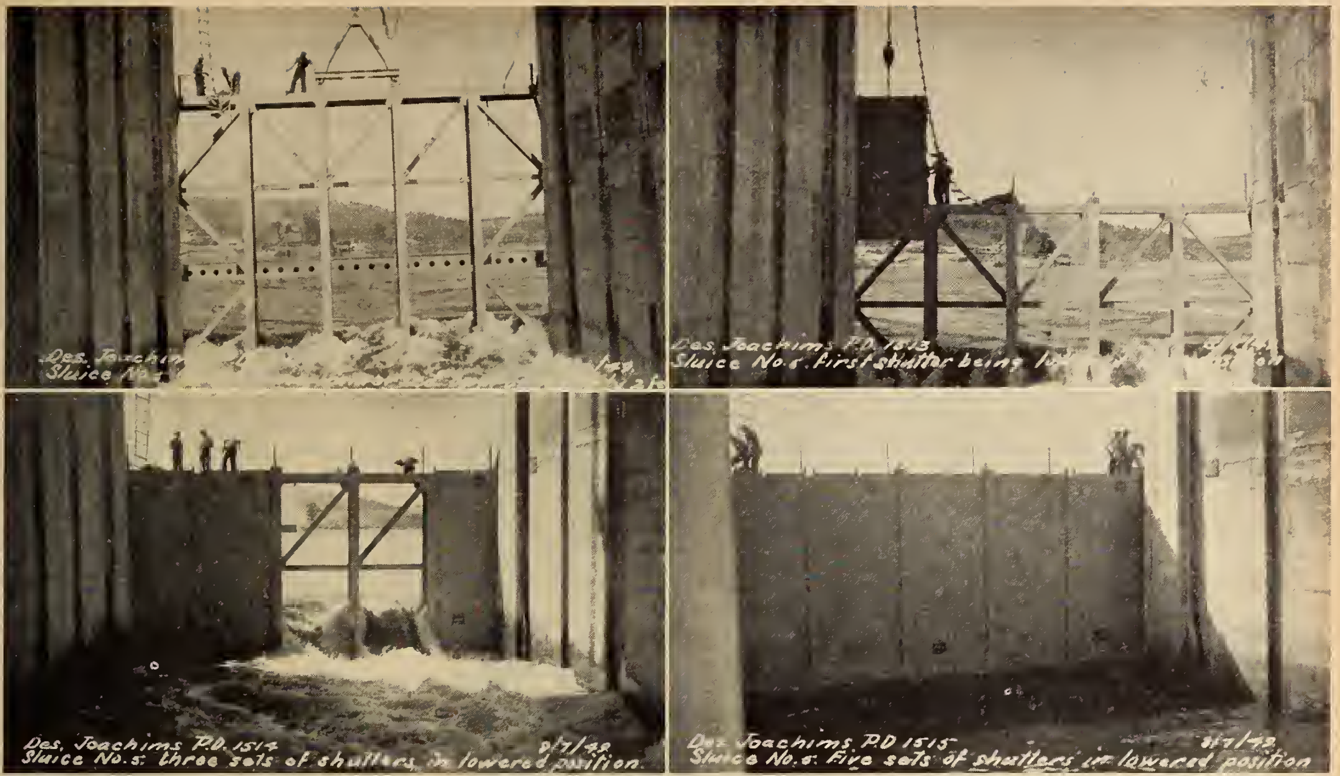


Fig. 6. Four stages of dam closure at Des Joachims. At the upper left the shutter frame is being lowered into position; at upper right it is in position and the first shutter is being fitted. At lower left, three shutters are fitted and, in the lower right photo, closure is complete.

tional rack and pinion design. A six inch extra heavy pipe spreader holds the lower ends of the spuds in the checks confining damage due to a "wild" log to the forged steel lifting hook protruding through the plate steel spud foot.

The sluice gates are of the screw-lift type, plate and girder construction, with fixed rollers and bronze sealing rods. The gates are closed in by sheathing over the downstream side of the girders, and are kept ice-free by electric heating elements within this enclosure. Freezing of the gate checks is prevented by tubular electric heating elements located in cells forming a part of the steel check assembly. Nine temporary openings were left in this dam to by-pass the river flow following closure of the main dam.

During periods of high river flow the excess water passes through this dam into McConnell lake and through a partly excavated and partly eroded channel into the Deep River pool below. Initially only a comparatively small pilot-cut was excavated through sand and gravel, capable of discharging some 15,000 cfs. This channel has now eroded to sufficient size to handle an average spring freshet, and will readily enlarge as further capacity is required. The eroded material is being deposited harmlessly on the bed of the very deep section of the main river into which also discharges the tailrace. This channel demonstrates the feasibility of inducing straight line erosive action in material of reasonably uniform composition.

Dewatering and Dam Closure

With a maximum recorded flood flow of 150,000 cfs. the Ottawa river presented a problem of some magnitude in dewatering the bed of each of the three channels at the main dam site, and in effecting closure of the temporary openings left in the dams. Dewatering for the main dam was done in two stages, the first of which was to cofferdam the Ontario channel, throwing the entire river flow down the interprovincial and Quebec channels. Following completion of the basic construction in the dry area, including the installation of nine diversion sluices 40 feet wide, separated by full height piers 20 feet wide, the first-stage cofferdams were removed. The second stage cofferdams were then constructed across the interprovincial and Quebec channels, allowing work to proceed on the remainder of the dam and power house.

Among the prime factors to be considered in the closure procedure were the passing at all times of minimum water requirements for the generating stations located further down the river, and provision of sufficient discharge capacity to dispose of freshet flows, whenever they might occur, without causing headpond levels which would overtop incompleted sections of the dam. In addition to these requirements sufficient water had to be conserved to fill the 1,100,000 acre-foot, headpond.

Detailed scheduling was necessary for every pour and other water-level-sensitive features of the project. Only minor deviations from these schedules were possible without creating conditions which might seriously jeopardize the over-all project schedule and estimated cost. To assure adherence to the predetermined plan it was not only necessary to accord intensive consideration and study to the problem, but also to acquire equipment specially designed to meet exacting requirements.

Laboratory models were employed to check the scheme as a whole and the basic equipment required therefor. Unforeseen difficulties were thus discovered in advance and methods of overcoming them were evolved. Not only did these model tests effect marked

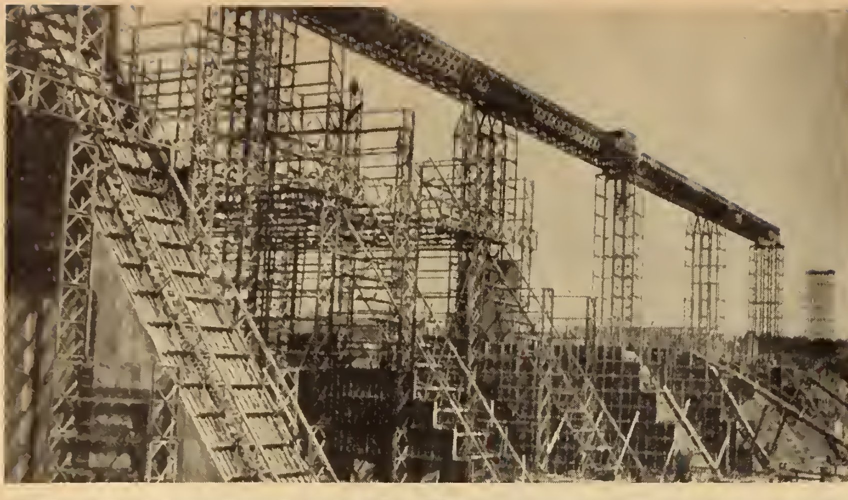


Fig. 7. Above: Bailey bridge application for concrete aggregate conveyor supports.

Fig. 8. Below: Bailey bridging used to support powerhouse access bridge.

economies but established confidence on the part of those responsible for the operation and insured success in the outcome.

To have confined the closure operations to the main dam would have delayed excavation of the tailrace, or necessitated its being done in the wet at substantially greater cost. Accordingly nine temporary closure sluices were left in the McConnell dam, similar to those provided in the main dam, though somewhat more complicated by virtue of the permanent sluices to be finally constructed on the crest. With this arrangement, when the headpond level had been raised by main dam closure operations to a level sufficient to pass water through the McConnell dam, the tailrace site became accessible for excavation. Concurrently with the completion operations on the main dam and headworks the McConnell closure pours were being placed according to schedule. This procedure enabled the plant to be placed in operation several months sooner than would otherwise have been possible.

On the main dam there were 19 of these closure pours made before beginning on the 39 similar pours at McConnell. Above the former group there still remained some 70 feet of concrete to be placed by conventional methods, always safely above the level of the headpond, which was by this time discharging its surplus water by way of the McConnell closure sluices.

Each closure pour was made behind a 95 ton steel gate 46-feet wide by 33-feet high. Three of these gates were required to keep pace with the closure schedule. Each gate comprised a 50-ton structural steel framework designed to receive five 9-ton steel shutters. Gate components were handled by an electrically operated derrick, which with its flanking tender cars travelled on a Bailey bridge runway constructed across the tops of the 20-foot wide dividing piers. This derrick is fitted with one 75-ton main and two 10-ton auxiliary booms for the hoists of which power was supplied by means of a trailing cable.

In effecting a closure the derrick car carrying the master frame was moved into position and its load transferred to jacking points over the 40-foot opening along with its tender cars carrying a complete set of shutters, counterweights, hanger links and other auxiliaries. In lowering, the frame travelled on retractable rollers bearing on steel roller paths incorporated in the concrete piers, and was held in line by side or end fixed rollers operating against side guides. When the desired position was reached the weight of the frame was then transferred to links extending to anchors near the top of the dam. The rollers were then retracted, allowing the current to press the frame tightly against the concrete along the bottom and at both sides where its edges were rendered watertight by natural rubber " mutton chop " or " music note " seals. As a further precaution, the frame was tied against the face of the dam at all four corners with turnbuckle rods.

The five steel shutters 8-feet wide by 31-feet 6-inches long were next placed in position by the main derrick to cut off the flow passing through the frame. Each of these shutters was divided into two 15-foot 9-inch, 4½-ton lengths for clearance and convenience in handling. The first length was lowered into the frame, temporarily dogged at the top until the second length was bolted to it, and the unit was then lowered the remaining distance. These panels were placed progressively from the outside toward the centre to avoid unbalanced hydraulic forces. They were fitted with fixed bearing and guide rollers for ease in placing, and made watertight with " music note " seals along the sides and rubber strip seals across the bottom.

The complete assembly stands out from the face of the dam a distance of 3 feet to enable construction of concrete forms. After due allowance for setting of the protected pour, the closure gate was removed by reversal of the procedure described above, moved to the next scheduled location and reinstalled.

The model tests to which reference was previously made revealed, among other things, the necessity of venting-holes in the web of the bottom, horizontal girder of the frame to relieve the substantial hydraulic uplift as the gate approached the bottom of the opening. They also indicated the need for counterweights to further assist in overcoming this force. Also apparent from these tests was some means of preventing accumulation of loose rock and boulders against the low level initial sills to which the closure gate must seal. Concrete baffle piers, placed upstream from each opening effectively solved this problem.

Bailey Bridge Applications

More than 5,550 tons of Bailey bridge sections were used to expedite construction and to build permanent structures. Among the principal applications of a temporary nature were the concrete conveyor trestle, extending the full 2,400 foot length of the main dam; a power house access bridge extending 580 feet across the Ontario channel capable of carrying loads up to 75 tons. This latter was of triple-double construction, with maximum spans of 120 feet supported on concrete piers. Bailey sections also formed the framework carrying the aggregate conveyors extending approximately one mile from the gravel pit to the mixing plant. It served also to conserve form lumber and carpenter man hours which were in short supply, especially in the early stages of dam concreting operations. Its salvageable qualities extend its prospective utility over a number of projects.

Permanent Bailey structures included a concrete-decked restrained-truss bridge spanning 120 feet over the trash channel north of the power house; also as tower supports for the steel plate section of the long chute; and other applications such as bridges for the transmission line patrol road.

Introduction of Generated Power into System

Copper busses in metal compartments conduct the 13.8 kv., power from each generator through a 3,000 ampere, air-blast circuit breaker in a metalclad structure, thence through single-conductor cables to the main transformer bank. Each bank consists of three 33,333-kva. single phase water-cooled transformers, connected delta-star to step-up to 230-kv. with the high voltage neutral solidly grounded. Each transformer has two low-voltage windings to receive the output independently from each of two generators. This results in an arrangement of four main transformer banks on a deck over the tailrace piers, to serve the eight generating units. A transfer track enables movement of transformers into the power house erection bay.

The switchyard area is located a short distance from the southeast corner of the power house on rock fill. It contains fourteen 230-kv., 800-ampere, 5,000,000-kva. rupturing capacity, pneumatically operated oil circuit-breakers, each with its own air compressor and storage-tank. Twelve of these circuit-breakers are arranged for three-pole reclosure and the other two for single-pole tripping and reclosure. The 230-kv. ring bus is based on the one and one half breaker per element arrangement. From this bus four 795,000 cm., acsr conductor, steel tower transmission lines lead southward to the Minden switching station and one westerly to the La Cave project, with provision for a future sixth line.

Relay, telephone, and oil treating buildings, oil storage tanks, control duct lines and necessary piping and roadways are located within this yard. Carrier communication and relaying on the 230-kv. circuits is provided.

From Minden two circuits extend to the Kipling (Toronto) station, thence to the Burlington station. From there a single circuit runs to the Westminster (London) station. A second pair of circuits from Minden passes through the Barrie area directly to Westminster. From the latter point a two-circuit tower line, with only one circuit presently to be strung, connects with the new J. Clark Keith steam-electric generating station at Windsor. The over-all distance from Des Joachims to Windsor is 410 miles.

CHENAUX DEVELOPMENT

Scheduled for initial operation in December, 1950 the Chenaux power project is the second of the three major Ontario Hydro plants to be constructed on the Ottawa River in the post-war program. It is located near the head of Chenaux rapids adjacent to the Quebec village of Portage du Fort. At this point the river diverges from its generally easterly course to flow in a southerly direction. The headwater, with a normal elevation of 285 extends upstream to the foot of the Rocher Fendu rapids, and the tailwater discharges into the upper reach of the Chats Falls generating station headpond, normally at elevation 244.5. The gross head of forty and one-half feet may in some years be reduced substantially by heavy freshet flows but, as this condition obtains generally during the lighter load period of the spring or early summer season, the output limitation is not serious.

When the French explorers, some three hundred years ago on their way to the west, encountered the rapid channels in this vicinity, they gave to them the name "Chenaux" (plural for "chenal" or channel). The arduous portage was called "Portage du Fort" from which the adjacent village derives its name.

This project, as at Des Joachims and ultimately at La Cave, will contain eight generating units. Plant capacity will be 160,000 horsepower or 120,000 kilowatts.

The general arrangement includes the power house and headworks flanked by some 900 feet of gravity-type bulkhead dam sections in the main interprovincial channel, a sluiceway-control dam spanning a dewatering and flood discharge channel excavated through a depression across Limerick Island, and a secondary bulkhead and sluiceway section across the Portage du Fort channel on the northeasterly side of the river. As at Des Joachims the dam sections here are designed for an ice thrust of 10,000 pounds per linear foot assumed to apply at one foot below normal headwater level.

In addition to the work at the immediate site, a channel improvement involving 11,000 cu. yds. of underwater rock excavation, is also required near the upstream headpond limit, raising of a Canadian National railway bridge to provide the requisite clearances above the water surface of the headpond, the clearing of 2,000 acres of land to be flooded, and the relocation of some 2 miles of highway and secondary roads.

The foundation rock at the site

Fig. 9. Chenaux Development — Limerick Island dam.

is generally of a dolomitic limestone with basic intrusions of diorite and gabbro.

The headworks-powerhouse section is of conventional design for plants of similar head. It has three entrance bays per unit, each equipped with racks, checks for emergency steel stoplog sections, and fixed-roller type headgates in succession leading to the reinforced concrete volute scroll case. Two air vent chambers located close to the centre line of the breast wall, are provided for each entrance bay. Manhole entrance to the scroll case is located on the easterly side of each unit.

Draft tubes are dewatered for access to and inspection of the turbine runners by installing in the two draft tube outlet openings steel stoplog gate sections handled by a light gantry operating on the tailrace deck. Offtake pipes lead from the low point in the draft tube floor to the main power house sumps into which the water can be drained with a minimum of lost time.

Generating Station Equipment

Each of the eight vertical-shaft generating units comprises a fixed-blade propeller turbine direct connected to a conventional type generator. Operating speed is 94.7 r.p.m.

The 30-ton turbine runner has a diameter of 205 inches and develops 21,000 bhp. under 40 feet head. It is flange connected to the 25-inch diameter forged steel shaft. The babbitted turbine guide bearing is self-pumping, oil lubricated. Ten cast iron stay vanes guide the flow of water into the turbine and provide central support for the substructure and generator.

Twin-cabinet type governors are located on the up-stream side of the power house floor, and centrally with respect to the two units served. Permanent magnet generators, direct connected to the top of the main generator shaft, supply current for the flyball motors. The Commission, at its Alexander generating station on the Nipigon river, was the first to adopt this type of governor flyball drive. The governor has a speed sensitivity of 0.05% or better, and a minimum operating time for full servomotor stroke of four seconds. Auxiliaries include an overspeed centrifugally operated shutdown switch mounted on the permanent magnet generator; also an emergency shutdown solenoid in the governor cabinet arranged for both automatic and manual operation. With this equipment, shutdown may be complete or to speed-no-load.

Rotary gear type, 200 g.p.m. pumps driven by 40 hp. squirrel cage motors supply the governor system with oil at a nominal pressure of 200 psi. While each unit has its individual pump they operate in pairs under "Echelon" control. Each pump is equipped with adjustable unloader and relief valves.

The totally-enclosed 17,000-kva., 0.9-power factor, 3-phase, 60-cycle, 13.8-kv. generator is cooled by recirculation of some 55,000 cubic feet of air per minute through cooling-water coils located in the corners of the rectangular generator recess in the substructure concrete. Over this opening, at floor level, there is a steel enclosing-cover. For winter operation warm air is by-passed into the generator room through louvres.

Generators have non-continuous amortisseur windings. The rotating amplifier type of excitation with static regulator control, with direct connected main exciter, but without direct connected pilot exciter, was adopted for both the Chenaux and La Cave stations. No installation of this type on hydro-electric generators had, to our knowledge, been in service prior to the time these machines were ordered.

At Chenaux the induction-motor-driven amplifier is used to buck or boost the exciter field. The amplifier armature is in series with the main exciter field with a static type regulator exciting the amplifier's field winding. A separate stabilizing field winding on the amplifier provides for lower excitation limit and acts also as a polarizer to insure the amplifier's building up with correct polarity. A frequency compensator is incorporated in the regulator equipment to take care of frequency variations resulting from load changes on the main unit. Provision is made for easy transfer from regulator control to manual control of the main exciter.

The advantages of the rotating amplifier excitation with static regulator are that maintenance of moving contacts on a rheostatic regulator is eliminated, and more sensitive corrective reaction to line voltage changes is obtained because there is no dead-band. Further, no shut-down of the generator is required if the regulator goes out of service, as is required if a direct-connected pilot exciter fails. The omission of the pilot exciter reduces the height of the power house.

At both Chenaux and La Cave, where this type of regulator has been adopted provision is made on the main units for the future installation of a direct-connected pilot exciter, should experience with this new type of equipment prove unsatisfactory.

Two electrically operated cranes, each having a rated capacity of 100 tons on the main hook and 25 tons on the auxiliary hook serve the generating station. For the handling of heavy loads, in excess of the capacity of one crane, an equalizer beam combines the lifting capacity of both cranes. The out-door type headworks gantry has a main hook of 25 tons and an auxiliary hook of 4 tons capacity for the handling of headgates, steel stoplog gates, and racks.

Each group of four units is provided with a sump equipped with vertical shaft pumps rated at 2300 and 400 g.p.m. respectively under 52 feet normal operating head. The primary purpose of the larger pump is for draft tube dewatering.

Generating Station Superstructure

In keeping with the Commission's policy of consideration for the esthetics of its structures, the generating station superstructure was designed to present a pleasing appearance. Of structural steel framework with reinforced concrete walls and floor slabs, and pre-cast haydite roof, this structure has a length of 462 feet, a width of 58'-4½" inside and a height of 50'-4½" to top of coping.

The generating-unit spacing of 62'-0" centre to centre determined the steel column spacing of 20'-8", there being three bays per unit. This governing dimension also influenced the exterior wall treatment. Here, the surfaces are patterned in panels 20'-8" long by 4'-9" high, with the form markings running in opposite directions in each lift. The finish texture was acccentuated by sandblasting the 1" x 6" tongue and groove B.C. spruce form sheeting.

All windows are double-or single-glazed aluminum frame, either fixed or double-hung. Additional daylight is introduced through a glass block band 5-feet high on all sides near the top of the superstructure.

Two pairs of glazed aluminum folding doors 18'-0" wide by 24'-6" high provide access to the erection bay for large equipment from the main approach and for transformers from the tailrace deck.

The 38 x 42 foot, air-conditioned control room is located at the westerly end on the second floor, upstream from the generator room. Visitors may view the control room through a plate glass window, and the power house from a cantilevered concrete balcony.

Control room lighting is currently the subject of much discussion among engineers, architects, and operators, and the Commission has a number of types in use at its various plants. At Chenaux illumination is obtained through a louvred-type plastic luminous ceiling. Valuable data on the subject of lighting may be derived from results of installations at the several new generating, frequency changer, and large switching and transformer stations now nearing completion.

The generating station interior finish includes painted concrete walls and ceiling with floor of red quarry tile and terrazzo base and border. The lobby and reception room have cottoned finish on plastered walls, acoustic tile ceilings, and terrazzo floors. Offices have painted plaster walls, acoustic tile ceilings, linoleum floor covering, and recessed fluorescent lighting.

With the exception of the generator room all walls are insulated with furring tile and the roofs with fibre board.

Entrance doors and frames are of anodized aluminum; other doors and frames are of hollow metal construction.

Mechanical Maintenance Centre

At each large generating station minor mechanical and electrical parts are serviced in shops within the plant. However the cost of equipment for maintenance and repair of major parts is such that an area shop, centrally located in relation to the other plants on the Ottawa and Madawaska rivers, is more economical than provision of such equipment at each plant. Chenaux proved to be suitably located for this purpose, and at the easterly end of the generating station the superstructure has been extended to accommodate both large and small machine tools including a 20-foot boring mill.

Log Chute and Tailrace

Except for lesser fall and shorter length, the V-shaped steel plate, Taintor-gate-controlled log chute at Chenaux is similar to that at Des Joachims.

With the generating station fitted into the main river channel, the water surface of which stands conveniently at tailrace level, comparatively little excavation was needed to provide get-away for the plant discharge.

Limerick Island Dam and Flood Channel

To assist in dewatering the site during the construction period and to by-pass excess water when the plant goes into operation, a channel 310 feet wide, 22 feet maximum depth and 1300 feet in length was excavated across Limerick island to join with the easterly or Portage du Fort channel. Approximately 380,000 cubic yards of earth and rock excavation was required for this channel.

The dam controlling the flow in this channel is 1100 feet long. There are 6 sluiceways 40 feet wide and 35 feet deep equipped with 31 foot high steel gates of the fixed-roller, screw-stem type, and 16 stoplog-controlled sluice-

Fig. 10. Chenaux Development — Head gates viewed from within the scroll gate.

Fig. 11. Chenaux Development — View of headworks and powerhouse from the partially filled forebay.

ways 16 feet in width. The logs for the latter are handled by means of rack and pinion, motor-operated spud-type winches.

Portage Du Fort Dam

This structure carries eight additional stoplog sluices similar in design and operation to those in the Limerick island dam. The remainder of the 1,400 feet of crest length consists of gravity bulkhead section.

In addition to the sluiceway operating decks on these dams it was necessary to construct a roadway deck along virtually the full length of each to replace the highway cut by the flood channel and the bridge removed from the Portage du Fort channel, the site for which is now occupied by the dam. Typical sections through these structures are shown in the accompanying drawings.

Dewatering and Closure

The procedure for handling the river flow during construction was relatively simple. Before breaking through the natural barrier left at the upper end of the Limerick island channel, and removing the cofferdam at the lower end, piers of the concrete control dam were constructed in the dry near the channel entrance. To limit the headpond level to a minimum and thus economize on cofferdamming, the full rollway sections in both the large and small sluices were omitted, but low concrete sills for sealing closure gates were placed. Checks to accommodate future closure-dewatering gates were provided in the sides of the sluice piers at the upstream and downstream ends.

This channel with its partially completed sluices was, when opened, capable of passing the full flood flow of the river. Cofferdams were then constructed across the main and the Portage du Fort channels providing access to power house and auxiliary dam sites.

With all structures now sufficiently advanced to permit raising the headwater, closure operations are proceeding by closing off the upstream and downstream sides of one sluice at a time in the Limerick island dam and pouring the rollway concrete. It is expected that full headwater level will be attained by late autumn of this year.

The method adopted for closing off the larger (40-foot) sluice openings to enable pouring of the concrete rollways in the Limerick island dam merits some mention if only by virtue of its simplicity. Only a single stage operation was necessary in any of these sluices and expensive equipment for its execution was, therefore, not warranted. As emergency steel stoplog gates are normally provided with large sluice gate installations advantage was taken of these plus an additional set to expedite the work. Model tests were conducted to insure correct procedure and these indicated the need for lowering the gate sections in groups of four, held together with a special harness, to avoid instability in the swift current. With this precaution and some jockeying as between the upstream and downstream gate groups, surprisingly little difficulty was encountered in forcing them to a watertight seal on their sills despite their lack of rollers. Ample dry space was thereby provided for the forming and pouring of the rollways.

With only 230,000 cubic yards of concrete to place in the entire project no elaborate plant was justified. Two mixers of two cubic yards capacity each with semi-automatic batching in a central plant produced concrete as required, for delivery by pumpcrete direct to the forms, or by truck to auxiliary pumpcrete stations from which it was piped into place.

Electrical Features

The metalclad switchgear is installed in compartments on the downstream side of the building with openings into the generator room. The spaces between these compartments form pockets for the main step-up transformers which are separated by concrete flash walls and are accessible from the tailrace deck.

The 13.8-kv. generator output is stepped up to line voltage of 230-kv. through two banks (with a spare unit) of single phase, water-cooled, 23,000-kva. transformers connected in star on the high-voltage windings with the neutral solidly grounded. Each transformer has two half-capacity low-voltage windings for delta connection, to each of which two generators are connected through individual air type circuit breakers in the metalclad structure.

Station service power will be provided by two 2,000-kva., 3-phase, 13.8/2.4-kv. transformers located on the transformer deck. These are connected to separate generator group busses. Another source of service power will be through a 2,000-kva. 115Y/2.4-kv., 3-phase transformer installed at the high-voltage switch-yard and supplied by tap line from a 115-kv. transmission line from another generating source. A metalclad service power structure with eleven air-type circuit-breakers controls service power feeders to the dams, switchyard, and the operators' colony. Power house distribution is at 575 volts through a metal-clad assembly using air circuit-breakers.

The 230-kv. switchyard is located on the right bank of the river some 600 feet from the power house. Two 230-kv. circuits from the step-up transformer banks are brought to the structure by a supporting angle-tower on a small island in the tailrace. At the switchyard, these are bussed through two 5,000,000-kva. rupturing capacity oil circuit-breakers arranged for single-pole tripping and reclosing to supply one 230-kv. transmission circuit extending southwesterly to the Peterborough Transformer Station. Space is available for future extension of the switchyard.

Transmission line protective relaying at Des Joachims, Chenaux. and La Cave uses impedance angle relays with power line carrier to cover 100 per cent of the line. Usual back-up relaying is also provided.

The construction and engineering organization of the Commission being engaged on a number of other projects, it was found advisable to have the bulk of the work for Chenaux performed under contract by other organizations, under the general supervision of the Commission's engineering staff.

LA CAVE DEVELOPMENT

Third in the schedule of Ontario Hydro's Ottawa river projects, La Cave is expected to begin operation toward the end of 1951. Located some five miles upstream from the town of Mattawa at the foot of the first rapids above the Des Joachims headpond, La Cave raises the river level to elevation 583 creating a headpond of 12,000 acres and extending 30 miles upstream to the Canadian Department of Public Works control dam at the outlet of lake Temiskaming. With normal tailwater level of 502 feet above mean sea level a gross head of 81 feet is created at this site. The operating head at which the turbines are rated was set at 77 feet.

The plant is designed for an ultimate installation of eight units with rated capacity of 257,000 horsepower or 192,000 kilowatts. Initially only 6 units will be installed with a total capacity of 192,000 horsepower—144,000 kilowatts.

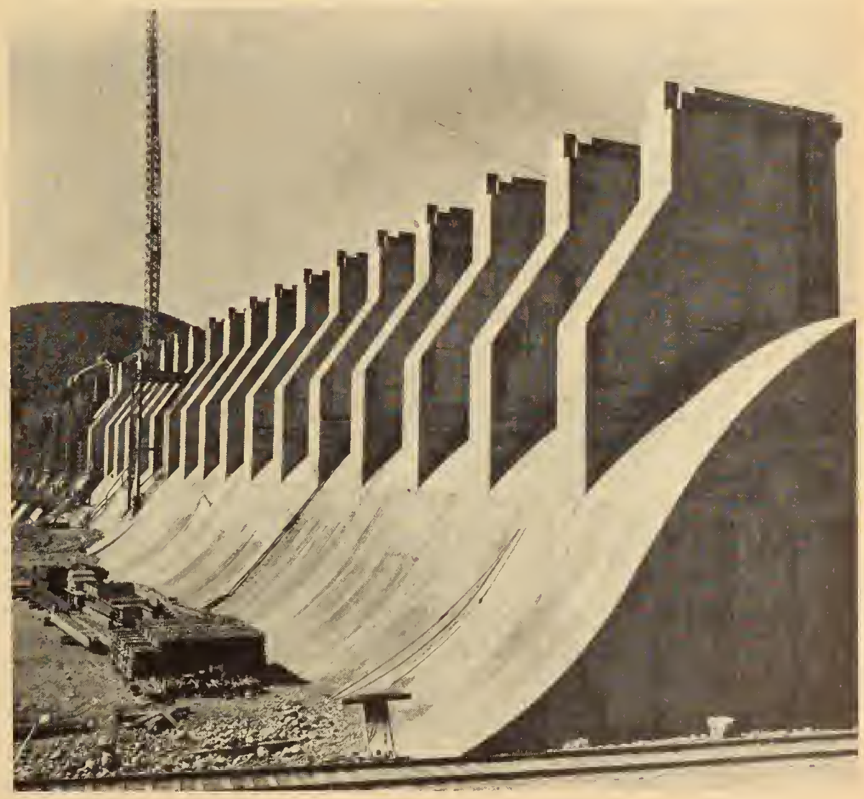
The natural formation of the rock surface, as revealed by extensive diamond drilling through varying depths of earth and gravel overburden, was of such character that a relatively simple, virtually straight-line plant layout was possible. As illustrated in the general arrangement plan, the structures in succession from the right bank of the river include a section of gravity bulkhead dam, generating station, 6 sluice gates, 42 stoplog sluices, and again gravity bulkhead tying in to the high rock on the left bank. The last contains the headblock of the log chute which leads to a point on the shore opposite the tailrace outlet. The overall length of structures from end to end of dam is 2500 feet. On the right bank, downstream from the dam, are located the access road and switchyard. The latter being located on a hillside required special design to meet the irregular topographic conditions.

The foundation rock throughout consists generally of sedimentary and igneous gneisses with some granitic intrusions.

Associated with the main generating features of this project there are extensive auxiliary works required, some of which are the result of raising the river level. These include the relocation of some 37 miles of Canadian Pacific railway line, channel improvement a short distance below Temiskaming dam involving excavation of approximately 400,000 cubic yards of gravel from the river bed, raising the wood-yard and townsite of the Canadian International Paper Company in the Temiskaming area, and the construction in collaboration with the Ontario Department of Highways of some five miles of access road leading from Mattawa to the plant.

The headworks and power house substructure are of the conventional type—integral all-concrete construction. Racks, provision for the installation of steel stoplog gate sections, and fixed-roller type headgates, follow in succession in each of the three openings leading to the reinforced concrete conduit

Fig. 12. La Cave Development — Close-up of rollway section topped with 16-foot stoplog sluices.



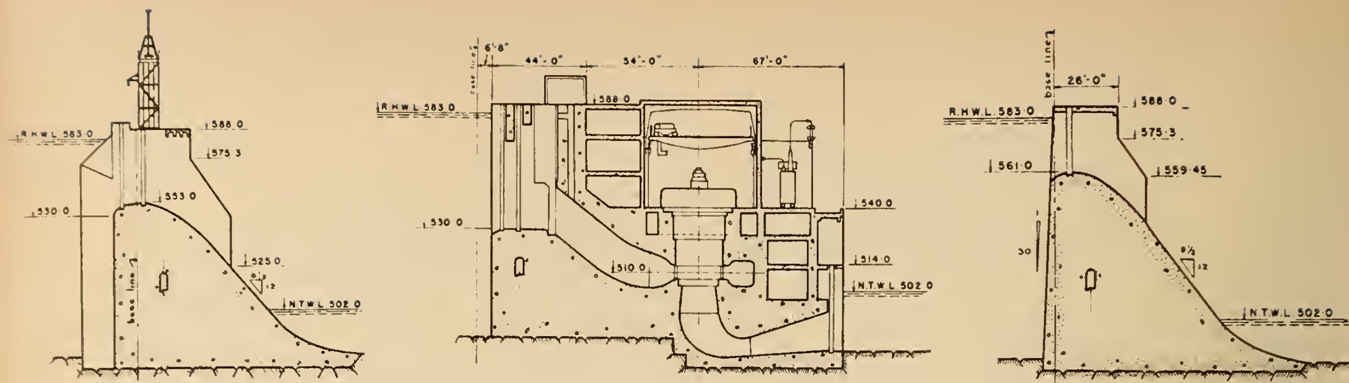


Fig. 13. Structure cross-sections at La Cave. Left, sluice section. Centre, power house section. Right, stoplog section.

and scroll case. Vents in the breast wall supply air to the space behind the headgates when they are closed suddenly. These vents not only relieve the conduit from the external atmospheric pressure due to partial vacuum inside, but also protect the headgates from excessive pressure. Manhole entrance to the scroll case is located to the left and downstream from the centre line of each unit.

For inspection and minor maintenance of the turbine runner and associate parts, the draft tube is dewatered by the installation of steel gate sections in each of the two outlets as at both Des Joachims and Chenaux. Similarly the water in the draft tube drains to a sump from which it is readily pumped to the tailrace.

Generating Station Equipment

Each of the vertical-shaft generating units consists of a Francis reaction turbine direct connected to an umbrella type generator operating at a speed of 94.7 r.p.m. Unlike the other projects described in this series the turbines for La Cave are being supplied from two different sources, those for units one to four constituting one group of like manufacture, and for numbers five and six coming from another source.

The specified turbine rating in both cases calls for a capacity of 33,000 bhp. under a net effective head of 77 feet. Runners are all of cast steel in one piece, flange connected to 30 inch diameter forged steel shafts. For the first group the guide bearings are of the oil-lubricated babbited type for which oil is circulated by means of viscosity pumps.

Ten cast steel stay vanes per unit in the first group, and fourteen in the second, guide the water into the turbine and provide central support for the substrueture and generator.

Fig. 14. La Cave Development — View showing application of Bailey bridging for concrete conveyor trestle. Powerhouse draft tube forms are at left centre.

The same twin-cabinet type governor arrangement as in the other plants is provided, with permanent magnet generator current source for the flyball motors. The usual motor-driven gear pumps supply oil at 200 psi., for the governor system and are arranged to operate in pairs under "Echelon" control.

Each generator is a totally-enclosed 27,000-kva., 0.95 power factor, 3-phase, 60-cycle, 13.8-kv. machine with thrust bearing located below the rotor. In the corners of the enclosing casing are water coils for cooling the recirculated ventilating air. A direct-connected exciter and a motor driven rotating regulator are provided for each unit as at Chenaux but those at La Cave are of different manufacture. The main direct-connected exciter has three field windings. The main field will permit the unit to be operated under hand control with the motor-driven pilot exciter out of service. A stabilizing field, supplied from an external source, is to be used during manual control to insure complete stability on the straight part of the saturation curve of the main exciter. The third field is under control of the pilot exciter when the statically operated voltage regulator equipment is in service; it is disconnected when the unit is on manual control. Convenient means of changing from regulating control to manual control are provided. This type of control has similar advantages to those outlined for Chenaux and does not require the direct current armature of the motor driven pilot exciter to be connected in series with the main field of the direct-connected main exciter.

The usual two cranes with equalizer beam serve the generating station. The rated lifting capacity of each crane is 107½ tons on the main hook and 25 tons on the auxiliary hook. The headworks gantry has main and auxiliary capacity ratings of 40 tons and 4 tons respectively.

Transformation and Switching

The 13.8/230-kv. step-up transformers are single-phase forced-oil water-cooled units rated 36,000 kva. with high-voltage windings connected in star with neutral solidly grounded, and with two separate 18,000-kva. low-voltage delta windings. These are in two banks and, with a spare transformer, are located on a deck over the tailrace piers. Two generators are connected through air-blast breakers in the metalclad structure to a generator bus which supplies one low-voltage winding of one bank of transformers. The other low-voltage winding of the same bank is similarly connected to the next two generators. Thus one bank will step-up the output of four generators. The 230-kv. connections from the transformers span to a tower on shore thence to the switch-yard just below the powerhouse on the right bank of the river.

From the busses of two pairs of generators, a station-service 2,000-kva. transformer is supplied through an air-blast breaker and has a built-in voltage regulator for plus and minus 5 per cent range.

In the switchyard the 230-kv. bus is arranged as a ring with one outgoing transmission line to the Des Joachims development. The oil-circuit breakers on this line are arranged for single-pole reclosing. Provision is made for two future lines. Connected to the ring-bus will be a 60,000-kva. bank of 230/115/13.2-kv. auto-transformers. The 13.2-kv. tertiary winding may be used in future to supply some small local loads. The 115-kv. winding will be connected to a transmission line extending westerly via North Bay to Crystal Falls generating station in the Northeastern region where interconnection will be made with other lines supplied from power sources to the north and west. This latter tie is significant in that it marks the first power line interconnection between Northern and Southern Ontario.

Fig. 15. La Cave Development — General view showing concrete conveyor system. Bailey access bridges and partially completed dam looking from right bank of river.

Generating Station Superstructure

Designed as a well balanced full length structure when eight units are ultimately installed, the initial superstructure length will be only 426 feet. It has a width of 54 feet and a height to top of coping of 56 feet. The height of the building is being kept to a minimum and the interior appearance enhanced by the adoption of rigid frame roof girder construction instead of the conventional truss.

Treatment of the exterior concrete surfaces will be as at Des Joachims and Chenaux. The three plants will thus present a uniformity of surface appearance without the monotony of sameness in outline.

An elevator of 2,000-pound capacity serves all floors and extends to the crest of the dam where it opens out into a glazed lobby affording a full view of the forebay. The first floor of the administration wing accommodates the shops and reception room. The second floor has a 35'-6" x 45'-0" control room, observation gallery, and offices. On the third floor are such services as first aid, conference-lecture room and air-conditioning equipment. In general the arrangement is similar in principle to the corresponding areas of the other plants but with variation in interior esthetic treatment.

Dewatering and Dam Closure

To enable cofferdamming and dewatering of that portion of the main project site (particularly that of the powerhouse) lying within the river section, with a minimum of lost time, it was found most economical to construct a diversion channel in the low lying easterly shore through which the entire flow of the river could be by-passed. Accordingly, a channel with a minimum width of 360 feet, a length of some 2,700 feet, and a maximum depth of 30 feet, was excavated as shown on the accompanying general arrangement plan.

Along the line of the dam, within the confines of this channel, concrete piers were constructed with a width of 28 feet and a height of some 70 feet to the sills of the permanent sluices. Between these piers sill-floors were installed against which to seal the closure gates and to form the base of the remainder of the concrete section up to and including the stoplog regulating sluices surmounting the spillway crest at this point. The seven 38 foot openings between these piers will be closed on the completion of the remainder of the structures in the same manner as at Des Joachims, utilizing the equipment provided for that project. A detailed schedule of pours will be followed in bringing the headpond level up in stages suitable to the progress in the construction of other parts of the work, including the diversion of the Canadian Pacific railway lying along the easterly bank of the river upstream, and coordinated with river flows available at the time. √

WINTER CONCRETING PRACTICE ON LARGE DAMS

A paper presented before the Annual General and Professional Meeting of The Engineering Institute of Canada, and the Annual Summer Meeting of the American Society of Civil Engineers, Toronto, July 12-14, 1950.

by

G. Mitchell, M.E.I.C.

Construction Engineer

and

R. B. Young, M.E.I.C.

Assistant Director of Research, Construction Department, Hydro-Electric Power Commission of Ontario, Toronto

Any construction job, large or small, should be planned as far as possible to have its concrete work done in temperatures above freezing. Work that can be completed in less than a year should be started as early as possible in the spring, especially if it is a concrete job. Longer jobs should be planned to have such operations as excavation, cofferdams, etc., done in winter. So far as it is possible and practicable, the Hydro-Electric Power Commission of Ontario adheres to this policy.

In Ontario, due to climatic conditions, winter concreting is almost unavoidable on jobs of any size. Records for the Province, except its southern part, indicate that the average mean temperature is less than 32° F. for six months of the year. For three of these months, it is under 10° F., and for the month of January it is below zero. To stop construction in winter would mean a shutdown each year of at least five months, a procedure estimated to be more costly than working continuously.

At the present time, the Hydro-Electric Power Commission of Ontario is engaged in a huge program of hydro and steam powerplant construction. Most of these developments require three to four years for their completion, and will use more than 2,500,000 cubic yards of concrete (880,000 cubic yards in one development alone). All of this concrete could not be placed in above-freezing temperatures and provision had to be made for extensive concreting in winter. This paper describes in brief, the conditions which have to be set up and the methods followed for this and like work.

Supplying Heat

Heat is one of the major requirements for winter construction. This means heat for the various buildings used for concreting purposes, heat for aggregates and water, heat for thawing out forms, heat for protecting concrete after placing, and for numerous other uses. The kind of heat adopted for all of these uses is steam heat, either wet or dry. A boiler plant is, therefore, a necessity. The installed horsepower required for concreting is, for all practical purposes, in direct proportion to the mixing capacity of the concrete plant. On Commission jobs it has worked out as a rule of thumb that for every yard of mixer capacity 100 hp. of boiler capacity is required. This figure is for construction steam only, and does not include steam required for shops, camps, and other auxiliary services.

In general, the Commission provides ample heat for sustained temperatures of 20-30° F. below zero. There is nothing that slows up a concrete program faster in winter than lack of heat. If possible, all boilers are concentrated in a single building. They may be fired with coal, light fuel oil, or Bunker C oil. Electric boilers have also been used, but a shortage of electrical energy precludes their use at present. Because fuel oil has become quite expensive and coal requires large storage areas, Bunker C oil is probably the most practicable fuel at present. When used it is shipped in tank cars equipped with steam coils and the boiler plant is located on a railway siding at the job.

Careful study must be given to the design and location of a boiler plant, keeping in mind not only the demands upon it, but where the steam is to be used. The boiler house should be amply large to provide a room for adequate drying of tarpaulins when they are brought in covered with ice. Planning for winter construction also includes the use of steam unit heaters, steam hose, tarpaulins, and other necessary accessories.

All boiler plants now in use by the Commission on construction jobs are operated at 100 pounds steam pressure. If lower pressures are required for other operations, then pressure reducing valves are installed. Steam at 100 p.s.i. is used for concreting because the nature of the work demands changing of lines and there is little protection for pipe lines which have to be left exposed. If steam at 15 p.s.i. were used, nothing but cold water would result at the end

The current vast development program of the Ontario Hydro has afforded a unique opportunity for their engineers to carry out research on the placing of concrete in winter. In this paper the authors share this experience with the profession, dealing in turn with the supply of heat, housing of equipment, heating aggregates, distributing concrete, forms, curing, fire protection and costs, a conclusion is reached that winter concrete costs some 8 per cent more than that poured at normal temperatures.

of most lines and they would freeze.

Where steam lines are permanently located and do not have to be moved, the insulation is usually asbestos. Steam mains are usually hung from brackets on the top of short poles, so that where they cross roads there is as little interference as possible with traffic. In other instances they are located inside a continuous box built at ground level, and insulated with sawdust or shavings.

Housing Equipment

On some Commission jobs conveyors have been installed to handle aggregate from stockpile to mixer and concrete from mixer to forms. These conveyors must be housed and the housing heated for efficient operation. Thus the convenient way to carry steam mains to forms is within such a conveyor housing. It is an axiom with the Commission that all conveyors operated in the winter be housed and heated, except for very short aggregate conveyors where it has been found that if the head and tail pulleys are protected, the conveyor will operate satisfactorily even at 30° F. below zero.

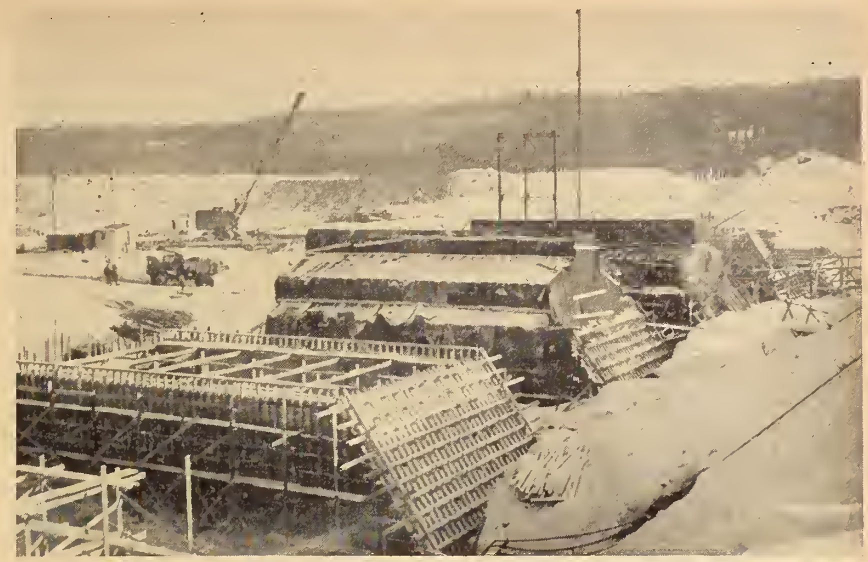
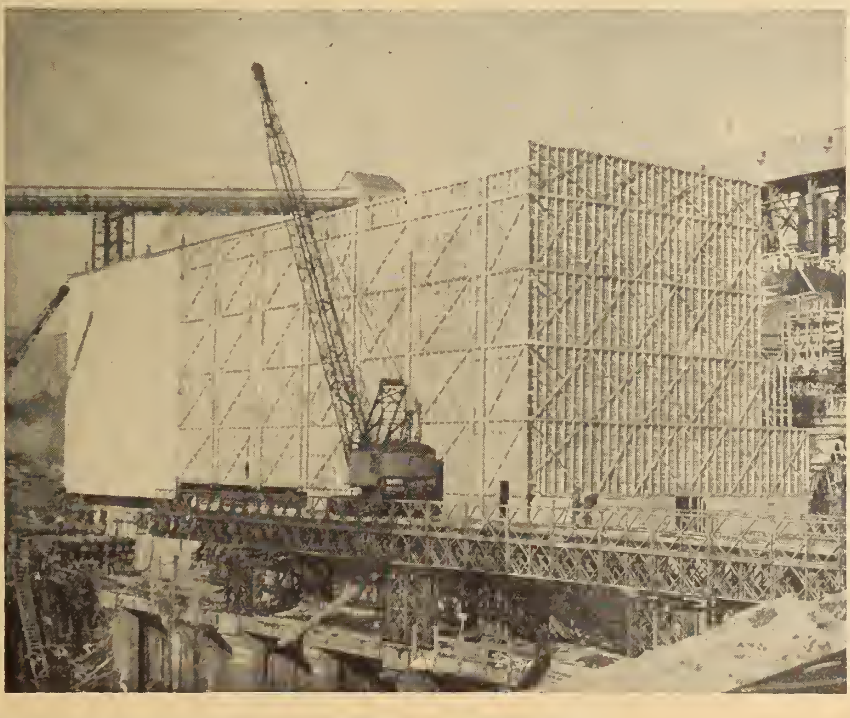


Fig. 2. Winter concreting at Pine Portage Development in sub-zero weather. Note canvas housing over top of form preparatory to placing winter concrete and the incomplete high-lift form in the foreground.

Water mains to the mixer plant are another important item. These are usually heated by running a steam main along side, wrapping both with asbestos paper and housing them in a box insulated with sawdust or shavings. For long water lines a low voltage hot-bed cable has been used successfully to prevent freezing. The cable is placed spirally around the pipe, which is then wrapped with asbestos paper and located in an insulated box. One point to remember when using hot-bed cable is to keep heat on all summer, because if the current is cut off the insulation becomes damp and a short circuit results when current is again turned on.

It is important that the mixer plant be properly housed and heated. The Commission has several large-capacity mixing plants which are completely housed from top to bottom, including the bins. If steel bins are used it is especially important that they be housed. If heat is maintained only underneath the bins and not on the sides, then freezing in the bins will result. Steam unit heaters are the common method for heating the mixer plant. The required number are placed near the base of the building and heat allowed to rise upward to the various floors, and finally to circulate around the bins.

Fig. 1. Winter construction with temporary housing around powerhouse superstructure.



Heating Materials

Where aggregate is obtained from gravel or sand deposits, all screening and separating is done in mild weather, starting as early in the spring as possible. If there is to be a heavy concrete program for the following winter, ample stocks of aggregate must be provided before freezing weather sets in. These stockpiles are generally placed in a straight line along a tunnel through which the aggregate is reclaimed.

Experience has shown that in winter concreting, only the sand and water need be heated. In late fall with temperatures a little below freezing, water is heated, and later as the weather becomes colder and stockpiles frozen, heat is applied also to the sand. No attempt is made to warm the coarse aggregate, since it contains little moisture and heating the sand and water has proven sufficient to produce concrete of desired temperature.

An economic and satisfactory method of heating sand in quantities of one hundred and twenty

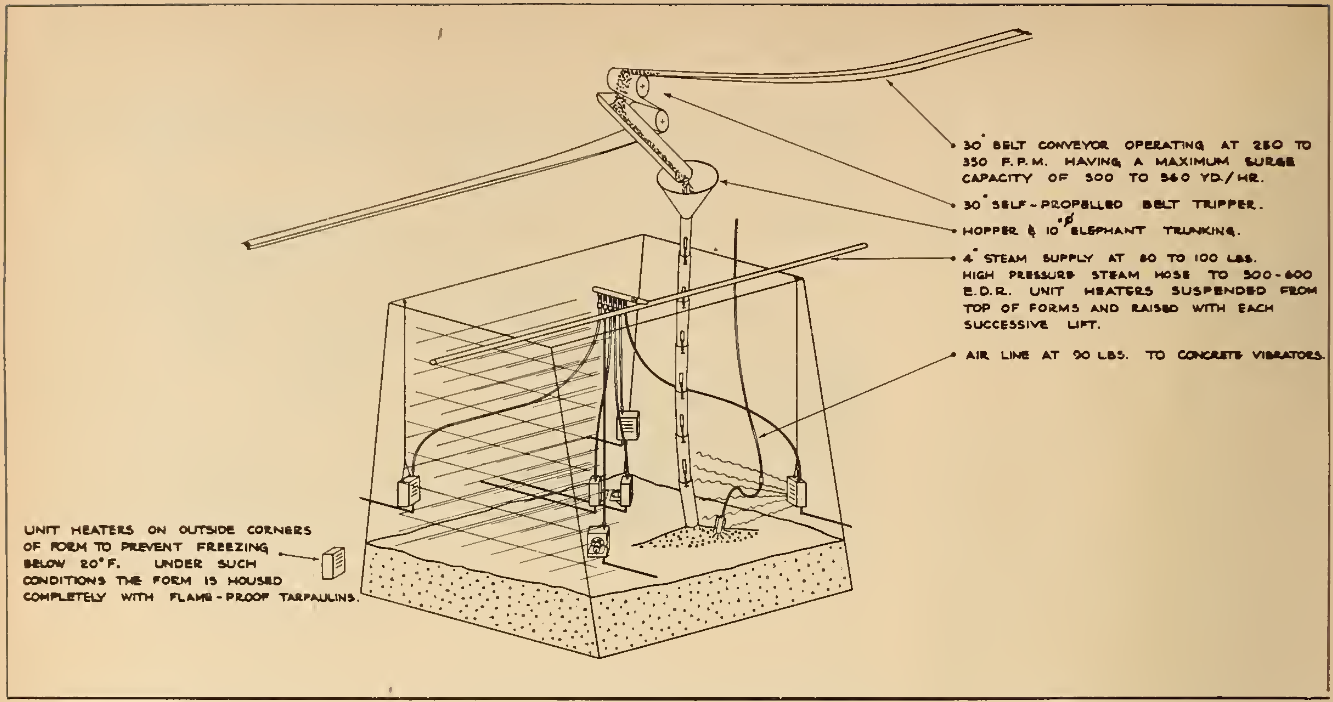


Fig. 3. A diagram illustrating method of placing concrete in high-lift forms during sub-zero weather.

tons per hour and more has always been a problem, and the best solution so far found is by the use of steam jets. When the sand is reclaimed by a conveyor operating in a tunnel under a stockpile, jets are inserted at the top of the pile and tarpaulins spread over the sand in order to maintain a more uniform distribution of heat and to prevent the formation of crusts. When hot, the sand is bulldozed to above the gate feeding the reclaiming belt. Since the piles are large, jets may be used at several points and plenty of sand kept heated.

This method has been found to be much better than installing a series of perforated steam pipes under the whole pile since the latter requires heating more sand than is to be immediately used and is thus wasteful of steam. It is our experience also that the weight of sand usually breaks the pipes below because of inadequate support and the system then becomes inoperative. However, several ready-mixed plants in Canada successfully used the latter method, but they support the steam pipes on concrete slabs beneath the piles or on the roof of the reclaiming tunnel. Heating at the top of the pile, as in the method used by the Commission, produces a sand which is free from frozen lumps and which is comparatively dry because of the excellent drainage in the pile itself, providing a better control of the water content of the sand, and hence of the concrete in which it is used. It is also economical because steam may be turned off when concreting is not in progress.

Heating sand by inserting steam jets from a reclaiming tunnel is never resorted to, unless in an emergency, and to heat sand by using steam heated coils of pipe is practically useless, unless there is plenty of time and the quantity required is small. Where sand is reclaimed by shovels, steam jets are inserted in the working face of the pile, the hot sand loaded into trucks and delivered to a hopper feeding a belt conveyor.

With automatic mixing plants having capacities up to 160 cubic yards of concrete per hour, large quantities of water have to be heated. This is accomplished by the use of steam coils and jets. An enclosed wood-stave tank with a capacity of seven to ten thousand imperial gallons is usually built adjacent to the mixer plant, high enough to feed to the batching floor by gravity. Submerged steam coils are placed in the bottom of the tank of sufficient capacity to provide all hot water needed for maximum plant output. Hot water is taken off near the top of the tank and cold water fed in at the bottom, water levels being controlled by a float valve.

The temperature of the water is regulated by a thermostatically controlled steam valve. The operating range is usually from 100° to 140° F. Temperatures up to 180° are used on occasion when necessary. By adjusting the heat of the water, the concrete on discharge from the mixers can be maintained at a reasonably uniform temperature regardless of outside conditions or the heat in the aggregates. For most work the temperature of the concrete when placed should be as low as possible to avoid excessive heating within the concrete later.

There is nothing to be gained and much to be lost if concrete is placed at a temperature higher than necessary. In the first place it is not economical, but more important, it has disadvantages which have a practical bearing on the quality of the concrete produced. When placing in an enclosed space, hot concrete will tend to produce a fog which will interfere greatly with its efficient and proper handling. Also the warmer the concrete, the faster it loses its plasticity and the higher are the temperatures reached during its early hardening, both of which are objectionable.

On the other hand, too cool a concrete may affect the rate of hardening to such a degree as to cause excessive form pressure. Forty degrees Fahrenheit is considered by us to be a minimum temperature at which concrete should be deposited. This however is hard to maintain consistently in large scale operations, and most of the concrete is placed at around 50° F. although for reinforced concrete higher temperatures are used.

Distributing Concrete

Transportation of freshly mixed concrete in winter presents no particular problem. If by belt conveyor, the conveyor is housed in a heated building for its entire length, which not only prevents loss of heat from the concrete but makes for efficient conveyor operation. No belt will operate satisfactorily in freezing temperatures if not properly housed. If transportation of concrete is by truck, no attempt is made to cover the surface of the concrete if the haul is less than a mile or unless the temperature is well below zero; temperatures taken before and after hauling show that the heat loss under these conditions is negligible.

For longer hauls and lower temperatures tarpaulins are spread over the concrete. This winter, on one job, the Commission hauled 42,000 yards of concrete three miles in rear-dump Euclid trucks without difficulty. If transportation is by buckets hauled on trucks, no protection is usually required, although for long hauls and excessive delays, it may be advisable to provide heated housing on the truck, the heat being supplied by an oil stove.

Where concrete is pumped, it has been found that there is little loss of heat in the pipelines if the concrete is kept moving through them, and except in the very coldest weather, they need no protection. However, if pumping has to be stopped due to delays at the forms, freezing may occur blocking the pipes. For lines to be in use over a considerable time, protection is therefore advisable.

If the pumpcrete line is short, tarpaulins wrapped around the pipe and a steam line laid alongside will provide adequate protection. For longer or more permanent lines, a continuous box is built around the pipe with removable top and sides and a steam line is installed inside. It is important, when using pumpcrete in the winter, to inject live steam into the line before starting to pump. If this is not done, the first concrete pumped is gradually chilled until it reaches a point where freezing occurs.

Forms

For the past twenty years the Commission has followed the practice of eliminating as many horizontal joints as possible in their concrete structures. Concrete is placed in lifts as high as fifty feet, necessitating forms of like height. To fill them requires the continuous placement of anywhere from 2,000 to 15,000 cubic yards of concrete. The sheathing in these forms is usually ¾-in. plywood, or 1 in. by 6 in. dressed dry lumber. Where plywood is used, it has not been found necessary, except on cold, windy days, to cover the forms with tarpaulins for the protection of the concrete, but with lumber this is necessary. Tarpaulins, when used, are made as tight as possible and the number of openings between them reduced to a minimum.

A wooden working platform is built at the top of the form and covered with tarpaulins that drape over and are fastened to the side forms. This platform is built approximately six feet above the ultimate level of the concrete in the forms, in order to provide adequate working space when the concrete reaches its full height.

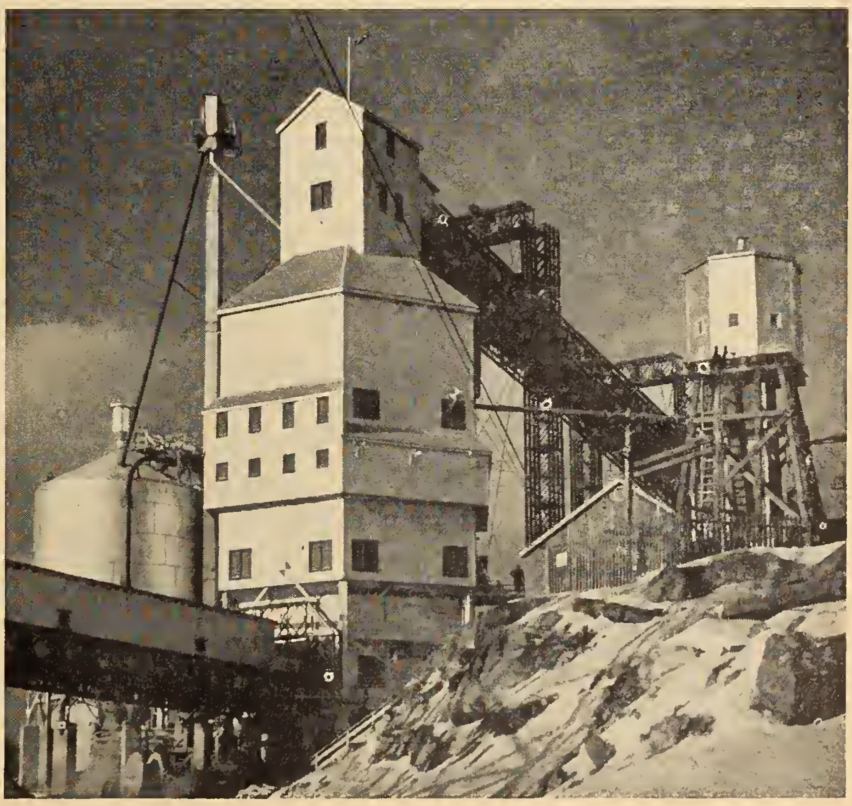
Unit heaters are used exclusively for heating inside the forms; salamanders, oil stoves or other potential fire hazards are absolutely banned as sources of heat. All unit heaters are connected by steam hose both at inlet and discharge, and are hung with light block and tackle from supports above the form in the housing. They are first placed at the bottom of the form to be used in conjunction with steam jets in providing heat for general clean-up of ice and debris before concreting starts. As concreting progresses and the level of the concrete in the form rises, the unit heaters are raised so that when placing ceases, they are in a position to protect the surface of the concrete.

Consideration should be given to the physical size of the unit heater, as it has to be pulled in and out between reinforcement and through false work. A good practical size is one which weighs in the neighborhood of 190 lb. with an E.D.R. (Equivalent Direct Radiation) of 600; such a heater requires about 8.4 boiler horsepower of steam to operate. Anywhere from six to twelve of these heaters are used in a form, depending on its size.

Curing and Protection

Concrete requires moisture for its curing, whether in winter or summer, and with dry heat used

Fig. 4. General arrangement of the 180 cubic yard mixing plant at Des Joachims Development on the Ottawa River. Note the complete housing around the mixing plant, water tower and concrete conveyors.



for frost protection, surfaces exposed to it must be kept moist. A man is therefore constantly employed wetting the concrete where exposed and sometimes a layer of sand is spread over surfaces to prevent too rapid evaporation. Curing has also been done with wet steam introduced into the working space left above the concrete. It has been found however that tarpaulins and woodwork eventually become so coated with ice that it is more satisfactory to use dry heat and keep the surfaces wetted. Tops of lifts are protected for at least 72 hours and side forms are left on as long as possible, usually for from three to four weeks.

Many engineers feel that the heat generated by mass concrete during hydration is sufficient to protect it from freezing. Unfortunately the heat available from this source in the first few hours is insufficient to maintain the temperature of the concrete at safe levels and supplementary heat is required. In moderately cold weather, the forms will protect the concrete behind them from freezing, but fresh concrete surfaces in contact with air need protection for at least 72 hours before being exposed to freezing temperatures if they are not to be damaged thereby.

It is difficult to formulate rules to follow in deciding where, when, and how much protection is needed. Wind, temperatures, type and design of forms, degree of housing, etc. are all factors in determining this. While heat costs money and should be conserved where possible, the primary consideration is the safety of the concrete. To aid judgment and to ensure that adequate protection is provided at all times and under all circumstances, the Commission's jobs are equipped with recording thermometers and thermocouples to provide exact information of the temperatures actually existing in the concrete, forms and enclosures.

Much has been learned from this practice. For instance, it has been found that corners and edges are most liable to damage, that with a wind blowing and temperatures dropping, special precautions need to be taken, and that forms give a great deal more protection than generally supposed. Wherever it is considered desirable to know the temperature the bulbs of the recording thermometers or the thermocouples are placed at the surface of the concrete immediately below the form sheathing, and it is one man's job to read these instruments, to record results and to report to his superior if the temperature of the concrete in any place approaches dangerous levels.

For concreting thin wall sections, housings of tarpaulins are built to completely envelop the form. Ample space is provided at the sides for steam unit heaters and at the top for working space. On larger jobs where numerous small quantities of concrete have to be placed in the same general area, such as for a powerhouse, a housing large enough to include all the ultimate forming is built and heated, thus providing excellent working conditions and adequate protection. Bailey bridging, modified as necessary, has been a very convenient support for some of this housing.

Vertical Joints

In addition to the usual drains, checks and waterstops with which the vertical joints of the dam are provided, the Commission also coats the entire surface of the joint with emulsified asphalt to a thickness of 3/16 in. The application of this asphalt in winter has presented a problem. The material is useless if allowed to freeze, so has to be stored in a heated building, generally the boiler house. It comes in drums weighing approximately 600 pounds. It has to be heated to be applied. It is applied by air ejection, being drawn from the drum and delivered through a hose to the point of application. To meet these conditions, the drum is carried on a skid which is housed and heated by a unit heater and which may be pulled by a tractor to wherever needed.

Fire Protection

One of the important points to consider when planning for winter work is fire protection. Fires may arise from welding and cutting operations, but in the past most of the fires in form work start in tarpaulins. During the recent war, the Armed Forces developed a liquid which can be used to flameproof tarpaulins, and for the past four years the Commission has permitted only this type to be used.

As a result, no major fires have occurred in form work on jobs built by the Commission's own forces, although a contractor on one of the developments had a rather serious fire when flames spread to tarpaulins which were not flameproofed. It is important to remember that spraying a tarpaulin does not make it flameproof; it has to be impregnated by being fully immersed in the liquid. For ease of handling, tarpaulins are generally 12 by 12 ft. or 12 by 16 ft. in size.

Fire hose is located close to all form work and to all buildings. If a conveyor is used for distributing concrete, a water main, exclusively for fire protection, is placed in the conveyor housing. If there is danger from freezing the main will be kept dry and will be controlled from a valve protected from freezing but easily accessible. Water lines are sectionalized by means of valves, so that if one section is destroyed by fire, the others may be used by simply turning off a valve.

Additional pressure is obtained on all lines by having a standby fire pump, connected directly with the water line. If, however, the water line is a long one and the capacity at its end is not considered sufficient for fire protection, an auxiliary standby pump is installed taking water from a nearby source.

All housings for mixers, conveyor belts or forms are thus protected by fire lines, hydrants with adequate hose being located inside structures as well as out. Also a generous supply of hand extinguishers is always available in every building. In order to prevent the spread of fire in buildings containing conveyor belts, fire walls are built at frequent intervals. Wooden trestles located adjacent to form work are treated with fire retardant chemicals to make them more fire resistant.

For fighting fire, a fire brigade, headed by a fire chief reporting directly to the Construction Superintendent, is organized. Members of the brigade are usually taken from the mechanical staff. There is also available a fire truck equipped with water tank, pump and hose, and a man is constantly in attendance.

Costs

Obviously concreting in winter costs more than in summer, for one cannot enclose a form or heat it without spending money. Our experience has been that mass concrete placed in winter will cost approximately eight per cent more than similar concrete placed in summer. This percentage includes the cost of the installation and

(Continued on page 877)

The EDMONTON-GREAT LAKES PIPE LINE

by

L. F. Kahle,

Executive Vice-president,
Interprovincial Pipe Line Co., Toronto, Ont.

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

Eighteen months of careful planning by Imperial Oil engineers, followed by record construction progress, make the Interprovincial Pipe Line an outstanding Canadian engineering achievement. Here the author discusses in turn the surveys, determination of economic size of pipe, procurement of steel, pipe specifications, design of pumping stations, construction features, and finally the need for the pipeline and the benefits that will accrue to Western Canada through its completion.

It was not long after the discovery of the Leduc oil field, just south of Edmonton, in February, 1947, that consideration was given to the idea of a pipe line to provide a market outlet for this new source of Canadian crude. By the time Leduc was firmly established as one of the major oil finds on the continent in recent years, plans had crystallized for a pipe line running east from the Edmonton area. This was not the first pipe line dreamed of for Western Canada. As early as 1938 the advantages of a pipe line outlet were apparent. It was not until the Leduc discovery however, that sufficient reserves were in sight to make the venture economically sound.

Subsequent developments and changes in the western producing picture which followed, resulted in the actual planning of the line being divided into two distinct stages. The pipe line as originally projected was to carry crude from the Edmonton area to refineries at Regina, with any demands east of there to be supplied by rail from Regina, and the first planning was done on that basis.

An engineering design office was established in Tulsa, Oklahoma, and the first Canadian engineers to join that pioneer group arrived there late in 1948. Tulsa was selected chiefly because it is the headquarters of a large number of pipe line operators and supply companies. This made available to the engineering staff all the vast experience of these established companies and the representatives of equipment manufacturers, whose products would be needed in such an undertaking. In November of 1949 this group moved to Edmonton, where the headquarters for the Interprovincial Pipe Line Company was established.

Air Surveys Saved Time

One of the first tasks in this initial planning stage was an air survey of the proposed route. Several reconnaissance flights were made early in 1948 to examine the terrain between Regina and Nisku, Alberta, a small railway point near the Leduc field. After the most favourable general route was chosen to avoid major ground contours, lakes and difficult terrain, it was plotted on dominion government topographic maps of a scale three miles to the inch. A contract was then awarded to the Photographic Survey Corporation of Toronto for a photographic survey of the route to provide stereos and mosaic prints for close study. Viewed through a stereoscope, contact prints showed ground contours and extreme elevations and depressions in exaggerated relief.

When the complete set of stereos was available, they were used to locate major obstacles such as farm buildings and other permanent structures on the route before the line was located on the mosaics. From the mosaics were made up plats or maps, showing the route of the pipe line. These maps provided the information for the detailed ground survey carried out in the spring, summer and fall of 1949. By the end of 1949 completed plans were presented to the Board of Transport Commissioners for approval of the route selected. The use of the air survey eliminated the necessity of a reconnaissance survey, which in the past has proven both tedious and costly.

While this part of the job was progressing, engineers were finding the answers to many of the other vital questions which faced the pipe line planners in its earliest stages. What maximum throughputs could be delivered? How would varying temperatures affect viscosity of the crude? How much would the pressure drop per mile in various diameter pipe? And on the less technical side but most important in that period of extremely short supply — where would the required tonnage of steel come from?

Pipe Design and Supply

By the summer of 1948, about 100 wells had been completed in the Leduc field and the estimated recoverable reserves were placed at 200 million barrels. This appeared sufficient to support production adequate enough to supply the requirement of the prairie refineries by pipe line to Regina. Pressure drop calculations were made for pipe of 16, 18, 20 and 22 inches O.D. with 1/4, 9/32, 5/16 and 11/32 of an inch wall thickness. Curves of pressure drop per mile versus throughput up to a maximum of 110,000 barrels a day were plotted.

The number of pumping stations required for the various throughputs was calculated for the pipe sizes mentioned and for the four wall thicknesses. A graph of throughput versus line pressure was then plotted. As a result of these studies, and following discussions with pipe manufacturers, the decision was reached to use 16-inch pipe. Hydraulic studies on the 18, 20 and 22-inch pipe were shelved, and work was concentrated on the 16-inch with three wall thicknesses —5/16, 9/32 and 1/4 of an inch. All of this was on the basis that the pipe line would terminate at Regina.

This immediately set off a search for steel, which soon assumed an international flavour as negotiations went on in Canada, United States, Britain and Europe. Most steelmakers could promise steel deliveries no earlier than 1952. The solution finally developed stands as a fine example of co-operation among steel manufacturers in different countries and the customers who depend on them for steel. British manufacturers agreed to ship 30,000 to 40,000 tons of plate to Canada, which though not suitable for pipe rolling, was satisfactory for other purposes.

In exchange for this plate The Steel Company of Canada agreed to release from its Hamilton plant enough special pipe line steel plate to allow Page Hersey Tubes Limited to produce the pipe line's requirements. Customers who would otherwise have used that special plate agreed to the slight inconvenience and were protected against any increased cost by the pipe line company. In order to fill the contract for pipe, Page Hersey Tubes proceeded with construction of a completely new rolling mill at Welland, Ontario, for making pipe up to 16 inches in diameter, representing an investment by them of $5,000,000.

After comparing tonnages involved and the savings to be effected by telescoping or tapering with varying wall thicknesses of pipe, it was decided that for safety and construction reasons that the pipe be held to two wall thicknesses—5/16 in. and 9/32 in. It might be interesting to note that the saving made by telescoping, based on the then quoted prices for pipe in Canada, amounted to a little more than $1,000,000.

Extension to Lakehead

By the fall of 1948 development drilling at Redwater, about 30 miles northeast of Edmonton, indicated another major oil strike. The need for moving the crude into refineries supplying the more densely populated marketing areas of eastern Canada had been obvious from the start, and the Redwater field provided the additional reserves to make a pipe line east of Regina economically sound. It appeared obvious then that the greater part of the Sarnia refinery's requirements could be supplied by Alberta crude. To supply Sarnia during the summer season when navigation was open on the lakes as well as the Regina and other prairie refineries, would require a capacity of approximately 90,000 barrels a day between Edmonton and Regina.

This put the pipe line planners into the second stage and required a whole new set of studies. Detailed investigations and studies proved Superior, Wis., was the logical terminus for the most economical route both from the standpoint of construction costs and maintenance. To build to a Canadian port on Lake Superior would have required $10,000,000 additional investment and operating costs would have been increased by 10 cents a barrel.

One of the first results of this rapidly mounting potential production was the decision to increase the size of the pipe in the Edmonton to Regina section from 16 in. O.D. to 20 in. O.D. Using a factor of safety of 1.5 and wall thickness tolerance of minus 12½ per cent for 42,000 p.s.i. and 46,000 p.s.i. yield steel, the engineering group had established that the 16-inch line would have a maximum throughput of 125,000 barrels a day at 1050 pounds operating pressure with eight pumping stations.

By increasing the pipe to 20 in. O.D., the throughput would be increased to 145,000 barrels a day at the same 1050 pounds pressure, but only four pumping stations would be required. The increase in cost of the 20-inch pipe over the 16-inch pipe was more than offset by the savings resulting from decreasing the number of pumping stations. This saving through fewer stations is estimated at about $1,000,000 annually in operating costs.

As the contract already had been awarded to Page Hersey Tubes for the 16-inch pipe for the original Edmonton to Regina system, it was necessary to utilize this pipe elsewhere in Canada on the eastern extension. Investigations showed it was practical to use it on the section from Regina to Gretna, Man., because there would be a fairly sizable take-off at Regina, decreasing the throughput and the required size of pipe line east of that city.

Eighteen-inch diameter pipe was chosen for the American section of the line between the International Boundary south of Gretna, Man., and Superior, Wis. This was because by using 18-inch pipe with a thinner wall — namely 9/32 of an inch — and operating at 837 pounds maximum pressure, considerable saving could be made in initial investment and operating costs without impairing the throughput capacity of the line.

Specifications for Pipe

With the route and extent of the project settled, the general specifications of materials to be used were made for the line itself and for the pumping stations. The pipe is of high-test steel being turned out in 40-foot joints, with ends bevelled ready for the welders on the right-of-way. These joints are longitudinally welded and cold expanded by internal hydraulic expansion which substantially increases the yield point. The steel specifications call on .20 to .25 carbon and .50 to .75 manganese. After investigations of the various materials available to protect the pipe from corrosion, it was decided to coat the line with coal tar enamel, reinforced with a fibre glass material and with a coal tar impregnated asbestos wrapper. The enamel, known as Bitumastic 70-B enamel, is produced in Canada.

All available data and general information were gathered regarding depth of frost penetration throughout the pipe line route. It was decided that three feet of dirt covering on top of the pipe would provide reasonable winter operating temperatures of the oil, of 25 degrees to 30 degrees F. This cover also would provide adequate protection to the line from damage due to farmers plowing their fields or hauling equipment across the pipe line route.

Special attention was given to the pipe and its protection at river crossings. Pipe with ½ inch wall was selected for these crossings, and concrete river weights were added to keep the pipe in the river bed and to prevent movement or floating during flood periods. Crossings of the North Saskatchewan river near Edmonton and the Battle River, near Hardisty, were completed late last winter, with construction crews operating from the frozen river surface. An early thaw delayed the crossing of the South Saskatchewan river, and this section of the line will be put in during a low-water period this summer.

All of the oil scheduled to move out of the terminal at Superior is to move by lake tanker. Since this could only move during the summer months, when the lakes were not ice bound, sufficient storage was needed at the terminal to permit operation of the line during the winter months. To provide this, 12 tanks, each with a capacity of 150,000 barrels, are to be erected which will make storage space available for 1,800,000 barrels of crude. Loading facilities at Superior have been designed to put oil on board the lake tankers at the rate of 20,000 barrels an hour.

Pumping Stations

Six stations along the route would keep the oil moving with an initial capacity of 90,000 barrels a day from Edmonton to Regina and approximately 70,000 barrels a day in the sections east of there. This can be increased by 50 per cent through the addition of six more stations.

Planning the pumping stations presented many different problems, and involved conferences with various equipment manufacturers. In view of the extreme weather conditions to be encountered throughout the pipe line route, it was decided that the pump station buildings should be of steel frame and masonry walls and be unitized as much as possible. Considerable attention was given to the heating system for the buildings, which will be about 75 feet by 200 feet by 24 feet high. The main source of heat will be from waste heat boilers, one to each engine, absorbing heat from the exhaust gases and generating steam at approximately 15 pounds pressure. These waste heat boilers will produce approximately one pound of steam per operating horsepower, and will be supplemented by automatic oil fired boilers.

It was decided that three complete pumping units, operating in series, would provide the greatest flexibility of operation under all load conditions, with good operating economy and at an appreciably lower first cost. This in-series setup comprises a diesel engine of sufficient horsepower driving through a speed increaser to a single stage centrifugal pump. Diesel engines—or dual fuel engines where natural gas is available — were chosen in preference to electrical drive after making economic studies of the types of operation. Due consideration was given to flexibility of the diesel drive and the natural hazards, such as weather conditions, etc., involved in the remote parts of the country where the pumping stations will be located.

For the Edmonton and Kerrobert stations, four units consisting of four dual fuel engines each rated at 1080 horsepower at 600 r.p.m., are to be installed, thus providing a standby unit at all times. At the Regina and Cromer stations, three units rated at 810 hp. are to be erected now, but provisions are being made to install the fourth as a standby unit at a future date. The Gretna station will have three 540 hp. units while at Clearbrook only two 810 hp. units can handle the initial load. In order to make the operation of the pumping stations as dependable as possible, considerable time was spent in the design of the engine jacket water cooling system, the engine lubricating cooling system, the engine fuel oil purification system and automatic controls were provided to shut down the units in case of failure in these auxiliaries.

As the type of design of the system is what is known as the "closed system" with no relief tankage floating on the line, instrumentation has been designed to hold pressure surges to a minimum. By means of a high flow metering device on the discharge of each station a warning can be given to the station personnel of a major line break or leak downstream from that station.

Construction

To build the full 1,180 miles of pipe line, a work schedule of 150 days was set because of the short construction season in this part of the world. That 150-day schedule makes this the fastest major pipe line construction job ever undertaken. Other larger and longer lines have been built, but not in the limited time stipulated on this job.

In order to meet the program, the pipe line was divided into three divisions for construction purposes. The contract for the 450-mile section from Edmonton to Regina was awarded to the Bechtel Corporation of San Francisco in affiliation with Fred Mannix & Co. Ltd., of Calgary; the contract on the 340-mile leg from Regina to Gretna, Man., went to the Williams Bros., Corp., Tulsa, Oklahoma, and the 360-mile section from Gretna to Superior is being built by Anderson Bros., Houston, Texas.

These firms, with long experience in pipe line construction, had the "know how", the specialized machinery which was not available in Canada, and the trained personnel, who hold the key positions on the job. While these experts came from the United States to direct the work, 80 per cent of the manpower now engaged on pipe line construction is Canadian, hired locally along the route, wherever possible.

The three contractors, working in three divisions, have in turn split their working units into three separate spreads of men and machinery. Thus, nine spreads are building the line and they are completing better than nine miles of pipe line construction every 24 hours of favourable weather. This is the work schedule set months ago during the planning stage.

By the end of June a total of 350 miles of pipe had been welded, or roughly one-third of the entire line. The western division has accounted for most of this progress, since floods in southern Manitoba and unseasonable snows and a late spring delayed the start of work on other spreads. But all work now is keyed to the original timetable which will see the line completed on schedule late this year. Work is also progressing rapidly on six pumping stations. Five of these in Canada are being built by Bird Construction Co. Ltd., a well-known western Canadian firm. The sixth station at Clearbrook, Minn., is being built by Walco Engineering and Construction Co., of Tulsa.

Urgent Need for Wider Market

It is not only the short construction season that makes this project an urgent one; its influence on the economy of this country is a vital consideration. Successful exploration and the extremely rapid development programmes which followed the Leduc discovery have built Western Canada's proven oil reserves to an estimated one billion barrels. Potential oil production in Alberta at the beginning of 1950 was more than one-third of Canada's requirements, while three years earlier Canada produced less than one-tenth of the oil she used.

The current rate of development is best illustrated by the figures on the oil industry operations so far this year. From the beginning of the year to June 30th, a total of 401 wells were completed in Alberta. Fifteen of those were gas wells, 86 were dry and unproductive and 300 were successful oil wells — that is 300 new wells in the first 181 days of this year.

Because a high transportation penalty prohibits the economical marketing of Alberta crude outside the prairie region, the daily average production from the western oil fields is held to about 61,000 barrels, sufficient to serve prairie refineries. That is a limit placed on production by the market available.

The wells in Alberta could currently be producing more than double the present rate and still remain within the allowables fixed on wells by the Alberta Conservation Board. Until a pipe line is completed and oil reaches out economically to new markets, producers will have about one-half of their productive capacity shut in. As things stand today each successful producer completed reduces the amount of crude that can be taken from the existing wells.

In the last 10 years, Canadian oil consumption has increased 130 per cent. Demand for gasoline has doubled and heating oil demand has been increased three and one-half times. But because gaps exist in refining capacity and transportation, and in spite of growing reserves, less than 20 per cent of Canada's petroleum needs can be supplied with domestic crude. The pipe line will go a long way toward filling the transportation gap and getting more of Canada's own crude into Canadian markets. For the pipe line, like the railroads, operating as a common carrier, will move crude for any producer or shipper who meets standard regulations, and on arrival at Superior, the oil will be loaded on to tankers to continue its eastward journey to refineries in the Sarnia, Ontario, area.

Unlike a railroad, however, a pipe line's traffic is strictly one-way. Oil producing areas are the only points of origin for traffic on the pipe line. It transports one commodity in one direction with no possibility of a backhaul, while with other transportation agencies, each railroad station or bus is an origin for traffic and the vehicles can turn around and haul back the way they came if they wish.

A railroad carries just about everything that man has found useful and it stimulates trade in any town it touches. A pipe line's one-way haul is useful only to a refiner, so the extent of the benefits of its passage through or near a town will depend on whether that community is near a refinery or has the prospects of becoming a logical refining centre.

Benefits to Prairie Provinces

Of the $90,000,000 that the pipe line will cost, some 30 per cent will be spent in direct labour payrolls. But that benefit, while considerable, will be temporary and, therefore, will be small compared to the lasting benefits which will result from completion of this project. The savings in U.S. dollars for many years is just one example.

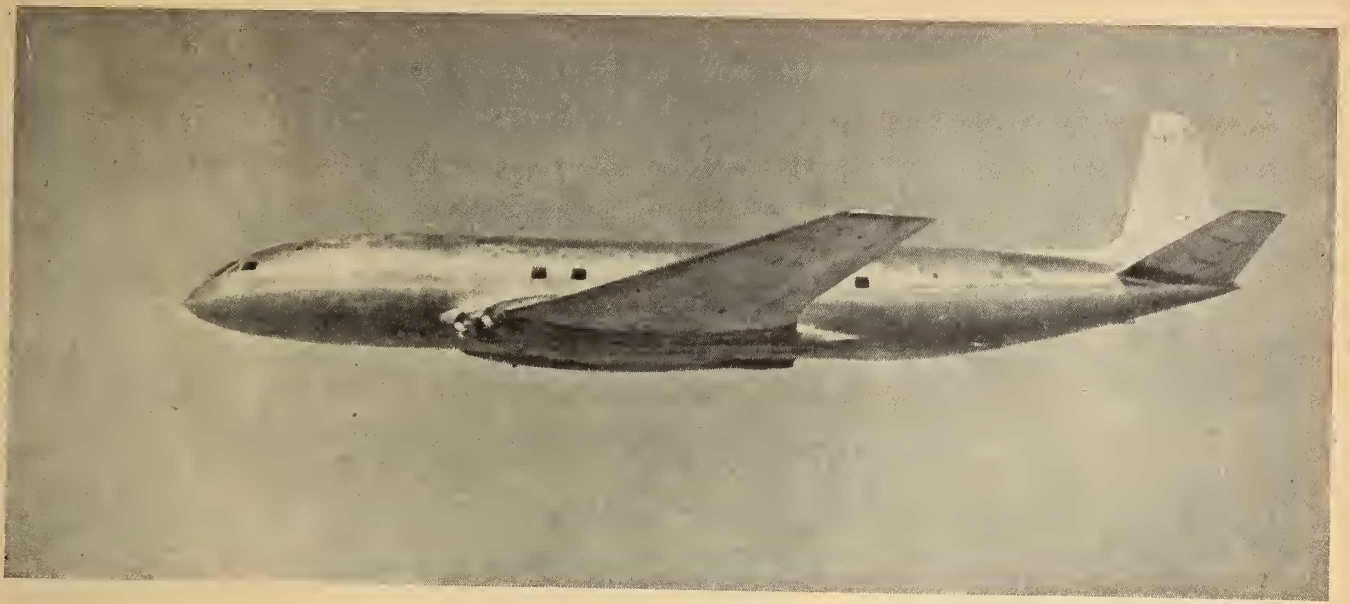
Refineries across western Canada will be receiving crude at transportation costs lower than was possible at any time in the past. Deliveries to eastern refineries will extend present markets for crude and reduced prices of products to prairie consumers will be the result. Last year the consumers of petroleum products in western Canada paid $30,000,000 less for all products purchased than would have been paid if additional crude had not been discovered in Alberta. Anything that helps prairie prosperity helps all Canada.

Sharply increased production from wells in the new oil fields of the west is foreseen. It is estimated when oil starts moving on the lakes in 1951 western production can increase to at least 100,000 barrels a day. To get this crude into the new and distant markets and in spite of lower transportation costs, the producers in the field will receive slightly less per barrel for their crude. The greater volume produced, however, will increase their income by about $3 millions a month. At the same time crude prices to the prairie refineries will be reduced, which will result in ultimate savings to the consumers.

Most of this added income will find its way back into the economy of the region. It will provide the capital needed for additional drilling, which will mean more employment in the area; more money for the buying of the necessities and luxuries of life; more traffic on the roads with the resultant need for more and better roads.

Oil has taken its place as one of Canada's major natural resources, and the healthy development of the industry will contribute to the continued improvement of the country's standard of living. Experience in industrial development has shown that any assistance given to the establishment and growth of a new industry in a community contributes not only to the particular industry, but serves to strengthen the entire economy of the area.

Thus, by the end of this year, when the pipe line starts operation, filling its important transportation role silently and underground, then Canada as a whole, and Western Canada in particular, will begin to reap the benefits of this undertaking.



Ultra-Modern Transportation

Achievements of the British Aircraft Industry

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Staff Article

Part One

The deHavilland Comet

This first article of a series on the British aircraft industry deals with the de Havilland group of companies and refers particularly to the Comet, the most outstanding civil aircraft in production by the group.

The economics of piston engine versus jet propulsion are considered briefly and mention is made of other advantages claimed for the pure jet. Some details of the Comet's design and performance are included.

Subsequent articles will deal with other major units of the British aircraft industry with particular reference to the outstanding aircraft —particularly civil transport types —on which Britain is relying for her re-establishment in the front rank of the world's aviation industry.

This is the first of a series of informal articles dealing with certain aircraft designed and built within the British Commonwealth of Nations. The articles will be of a general nature and will not disclose any design or performance information not released previously. The object simply is to bring to the attention of Canadians the outstanding accomplishments of our own scientists, engineers, and industry in this ultra-modern phase of modern life.

The articles were inspired by visits of the president of the Institute and the general secretary to several plants in England last May. It was felt that if other members of the Institute had no better knowledge of this industry's accomplishments than had these two officers, a series of articles telling in brief what they saw, might be of interest and profit.

The visits were arranged through the kind offices of W. K. Brasher, secretary of the Institution of Electrical Engineers and John Freeman, Parliamentary Secretary for the Ministry of Supply. It was a rare privilege to go through the plants under such splendid auspices. It was a thrill actually to see the planes whose names had been front page news so recently, and to talk with the people who had designed and built them. It does something to one to find that his own people, without "fuss or feathers", have revolutionized transportation and given the world leadership in one of the most essential elements of civilization.

The plants will be referred to in the order in which they were visited, and generally speaking it will be the feature plane of each company that will be dealt with. When it is remembered that a company may be turning out a variety of planes even up to eight or ten different models, it is apparent immediately that anything beyond a

Fig. 1. (above). The de Havilland Comet.

Fig. 2. An interior view of the erecting shop at Hatfield.

reference to more than one would require a book rather than an article. As a matter of fact it is the feature planes that are of immediate interest. They are the new ones. They are the ones that will alter our whole conception of commercial aviation. They are the news.

De Havilland and the Comet

A stranger in the field of aircraft design and construction has difficulty at first in grasping the significance and the place of this company in the great world of aviation.

The activities of the company, even in a world of big business, are big beyond comprehension. A reading of the history of the company reveals so many bold enterprises that it is apparent the company is big in everything it does. It has several plants in England; it even has plants in Australia, New Zealand, South Africa, India, Rhodesia, and as is so well known here, one in Canada. It is a matter of interest and perhaps surprise to note that the Canadian company celebrated its 21st birthday last year—but that's another story.

In addition to the factories, there are area supervisors in the Middle East, Far East, Scandinavia, and South America. There are 24 sales agents throughout the world. The company is one of the few manufacturers which builds its own engines and propellers as well as the planes. This explains why there are several different plants in England. It is indeed an industrial empire.

The plant at Hatfield, Herts, was the only one visited because time was short, and it was there that the Comet had been conceived and born and was even then housed. A bus ride through lovely country and interesting communities brought us to our destination at the appointed hour, but formalities at the gate that reminded us of war time, delayed our progress somewhat.

Between the public relations department and the engineers we were shown around the plant, and at noon it was our pleasure to have Mr. Peter de Havilland join us for lunch at a delightful nearby estaminet called, of all things, the Comet. This had nothing to do with the jet liner but was named many years ago in honour of another famous Comet made by the company which won the London to Australia race in 1934. It was a disappointment to learn that the restaurant does not belong to de Havillands — it seemed to fit into the picture so nicely.

Multiplicity of Products

Although we had come to Hatfield to see only the Comet, it was quickly apparent that a lot of other planes were also in production. In one shop after another we would encounter a different design, and an impressive production line. No attempt was made to find out how many different machines they were working on, but from notes made at the time and some reading done since then it appears as if, in addition to the Comet, the company has on its active list at least the following:

The Mosquito bomber so famous in the last war;
The Vampire jet fighter, used by nine different nations including Canada;
The Venom night fighter or interceptor — a development of the Vampire, with the Ghost engine;
The Heron, a new feeder line machine;
The Dove, similar to the Heron though smaller;
The Hurricane;
The Chipmunk Canadian-designed trainer, already adopted by six different air forces including the R.A.F.;
The Hornet and the Sea Hornet for the Navy;
The Ambassador, a medium category passenger transport with piston engines.

The record shows that the company exports four out of every five machines made.

—but to get back to the Comet.

The Comet is the world's first turbo-jet propelled air liner to fly and to be produced for sale and commercial purposes. It won this distinction on July 27th, 1949, by a scant ten days over the Avro Jetliner made at Toronto. When it was put through its paces at the Society of British Aircraft Constructors show in September, 1949 it caused a world sensation. Since then it has flown for hundreds of hours and in many countries. It is still the talk of the industry and the profession. Day by day additional information about it is being made available, although many of its features are still more or less secret. The company knows it has something outstanding, and reasonably enough does not propose

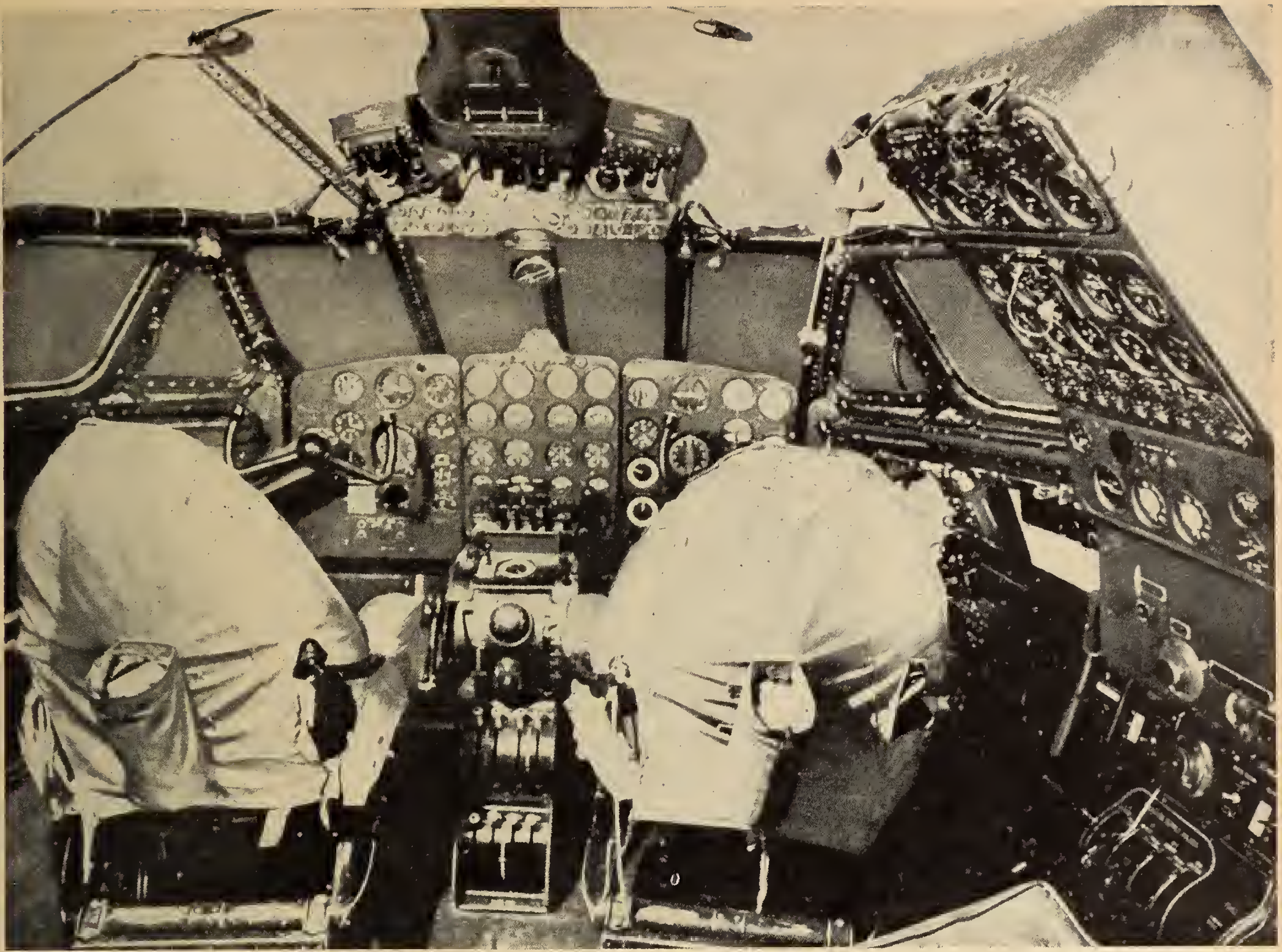
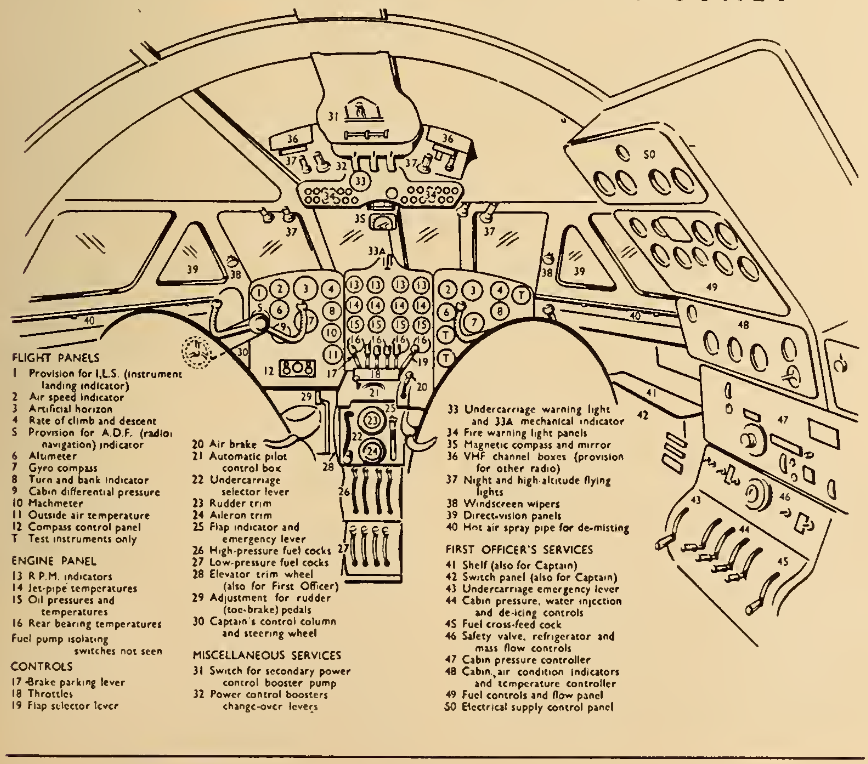


Fig. 3. The cockpit of the Comet. Key diagram appears below.

THE SIMPLE COCKPIT OF THE COMET



to give away everything to prospective competitors.

Economics

The economics of this revolutionary aircraft are most interesting. Many people who admit that jet planes are fast, believe they burn up so much fuel that they cannot compete with piston engined planes in the commercial field. The jet people don't agree. From one place and another we have gathered together a few facts and figures that bear on this, and they seem to be reliable. For instance:

Fuel consumption by the jet is about twice as great per hour as that for a comparable piston engine, but the jet fuel—kerosene—is cheaper, and what is more important in reckoning nett costs is that in the hour, the jet travels about 70 per cent more miles. On a mileage basis, therefore the jet requires about 25 per cent more fuel. Operating costs of the jet plane are about 80 per cent of those for the piston driven machine. Overhaul costs are much lower on the jet both for the engine and the airframe, due to the simplicity of the engine and the smoothness of the ride. It is claimed that maintenance costs for the jet plane are about 75 per cent of those of comparable piston engined planes. Cost per ton-mile will be about 20 per cent less than for an orthodox machine.

Another interesting way of looking at the commercial possibilities of fast flight of this kind, is to compare it with the services rendered by a passenger steamship. The de Havilland Company provide this illustration, "With a utilization of 2,550 hours a year, nine Comets (in the present state of development and discounting improvements which are in hand) could carry as many passengers across the Atlantic as the Queen Elizabeth can carry in the same period". The Comet could do the New York-London run, including two stops, in 12 hours westbound and 9 hours eastbound. The Queen Elizabeth requires about five days each way and carries 2,200 passengers—she crosses the Atlantic 40 to 45 times a year. The Comet would carry 36 passengers and make 300 trips a year, even if doing only six single trips a week. The Comet costs about £350,000 and it is reported the Queen Elizabeth years ago cost $22,000,000 and today would cost not less than 50 or 60 million. It is something to think about!

Fire and Explosion

To the prospective passenger (and his family) one of the most important considerations and one not fully appreciated by the public is that the kerosene fuel of the jet is much safer to live with than the high octane gasoline of the piston engine. The flash temperature for kerosene is plus 40 deg. C. (or 104 deg. F.) whereas with gasoline it is minus 40 deg. C. In other words the fuel for the jet is carried at a temperature well below its flash point. This should mean an end to the frightful explosions and fires that so frequently follow crashes, and which are principally responsible for injury and loss of life.

Fatigue

Jet flight is free of vibration. It is claimed that this permits persons to travel great distances without fatigue. There are noises—interesting from the ground at least—that go with the jet, but the passengers sit pretty well forward of the exhaust and therefore should not be bothered by them. The elimination of vibration and the roar of the piston engine exhaust is surely something much to be desired by the traveller.

The Comet was built from the draughting board—there was no "mock-up". About eight planes were in production when we were there. The engineers were so confident of the design, and so urgent was the need of speed to keep ahead of the rest of the world that production was not held back for many of the customary routines. Results have proven the wisdom of this policy. The first plane was flying under test less than three years after designs were started. The performance has been excellent and the minimum of "bugs" have been encountered.

Private Enterprise

Another unusual and interesting feature is that the Comet is the product of private enterprise. The government had no part in the design nor any part in the financing until two planes were ordered off the draughting board. Even then the assistance was not great, and the company carries all responsibility for everything until planes can be delivered. The principal assistance given was permission to get certain materials in short supply. The courage of a private company in taking such risks with its own money is not only a tribute to the management but also to the vast team of engineers. The plane sells for about £350,000 but it will need a lot of sales at that price to pay for the design and development cost. The figure of 100 has been mentioned as the level to be reached before everything is paid for. We have been told (not at de Havillands) that in America it would cost not less than $20,000,000 to develop a jet plane of this type. De Havilland claim their cost is much below that figure.

Orders are in hand also for 14 machines for B.O.A.C. and two for Canadian Pacific Airlines. Many other companies are showing a keen interest, but a great field of opportunity lies in the United States, where there are no machines of a comparable design, and where there appears to be no prospect of any for several years. Once the jets get going commercially, competition should do a lot for the enterprising British manufacturer.

Reasonably Conventional

The Comet is not a freak design, in fact the plane itself is rather conventional. It was a smart decision not to abandon proven features in plane design, although the temptation to do so must have been great. The prototype was on the ramp during our visit and we had an excellent opportunity for a close-up. She had just returned from a test run and was being checked over and rubbed down just like the thoroughbred she is. The first impression one gets is of sleekness and easy power. It is surely a very pleasant thing to look at, so graceful and so trim—a neat ship if ever there was one. Out in front there is a long slim protruding pointer that suggests the front end of an anteater, but we understand it is really a pitot tube.

Performance

The design is such that the wings have only a moderate loading similar to orthodox planes, so that take-off and landing can be made easily on any normal main-line airport. The cruising speed is about 500 miles per hour at 40,000 feet. The all-up weight is 105,000 lb. and the pay load 12,000 lb. The "Still Air Range" is 3,540 statute miles, and the "Practical Range" which makes allowances for taxying, take-off, climb and descent, stand-off, etc. is 2,645 miles. If the pay load is reduced to 6,000 lb. the Practical Range becomes 3,000 miles.

The passenger accommodation is for 36 but for shorter runs an alternative arrangement for 48 has been made. The cabin is pressurized to give an interior atmosphere equivalent to an altitude of 8,000 ft. Later this may be increased to give an equivalent of 5,000 ft.

The absence of propellers makes possible a more advantageous location of the engines, and also a lower setting for the entire plane. In this way access to engines for overhaul is greatly facilitated. In fact all four engines can be dropped out and replaced inside of one hour—a very important consideration for a machine that is built for speed and must be kept moving. Refuelling can be completed in 23 minutes.

The wing span is 115 ft. and the fuselage is 93 ft. long. Power is supplied by four de Havilland Ghost turbo-jets, each with a thrust at take-off of 5,000 lb. Its fuel capacity—all in the wings and jettisonable — is 6,000 Imperial gallons. In case it should be required in high altitudes, take-off assistance can be provided in the form of two de Havilland Sprite "cold" rockets. They each have a maximum thrust of 2,500 lb. over a duration of 9 seconds, and operate on hydrogen peroxide.

Every precaution has been taken to assure safety. All power controls seem to be in duplicate and "to make assurance doubly sure" there are as well, manually operated controls for almost everything. And yet with all this, simplicity is the keynote of the design —so much so in fact that a crew of only four is required. There is no flight engineer.

Controversy

Even a casual contact with the aircraft designers will reveal quickly differences of opinion on many aspects of modern plane design. The plane itself has enthusiasts for a variety of forms but the real arguments start over the engines and the straight turbo jet versus the turbo propeller. The de Havilland Ghost has a single sided centrifugal compressor which produces excellent results. Other engineers argue for the axial flow compressor. The reasons on both sides are very interesting, but it is no part of these articles to participate in the discussions. Later when we deal with other companies' products we may quote some of their authorities on several of these points.

Regardless of the economics, regardless of the merits of centrifugal versus axial compressors and other differences of opinion, it is apparent to the world that de Havilland is setting a pace. They are determined not to be overtaken. As has been the experience from the beginning, they are still making aviation history. With such a team of artisan, engineer, and management as they now possess, the future holds no limit.

It would not do to close this paper without referring again to the Canadian company, The de Havilland Aircraft of Canada Limited. It is hoped someday to do a separate write-up of the plant, and its two outstanding achievements, the Chipmunk and the Beaver.

Next

The next article will deal with the Viscount—the turbo propeller design of the Vickers Armstrong Co. It too is in the air and setting great records for itself. There is still a lot to be said for propellers and Vickers are ready to say it.

L. A. W.

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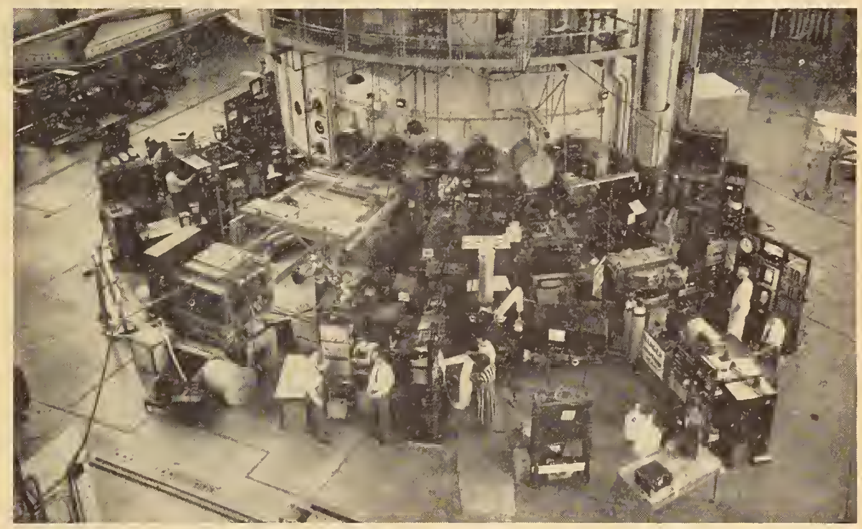
Atomic Furnace



Here is the first photograph released for publication of the heavy-water atomic pile at the Chalk River Project of the National Research Council.

The Chalk River pile has the highest neutron flux ever recorded among the world's known nuclear reactors and it thus offers unique facilities for collection of fundamental data on atomic energy. Concentrated beams of neutrons emerge from openings in the reactor into the various assemblies of experimental equipment which the picture shows massed in front of the pile.

The neutron flux of the reactor is used to bombard various materials to produce the radioactive isotopes that are finding increased usefulness in biological, agricultural, medical, and industrial fields.

WINTER CONCRETING PRACTICE ON LARGE DAMS

(*Continued from page 868*)

operation of the boiler plant, steam lines, heating of aggregate and water, and the protection and heating of forms and buildings.

Conclusion

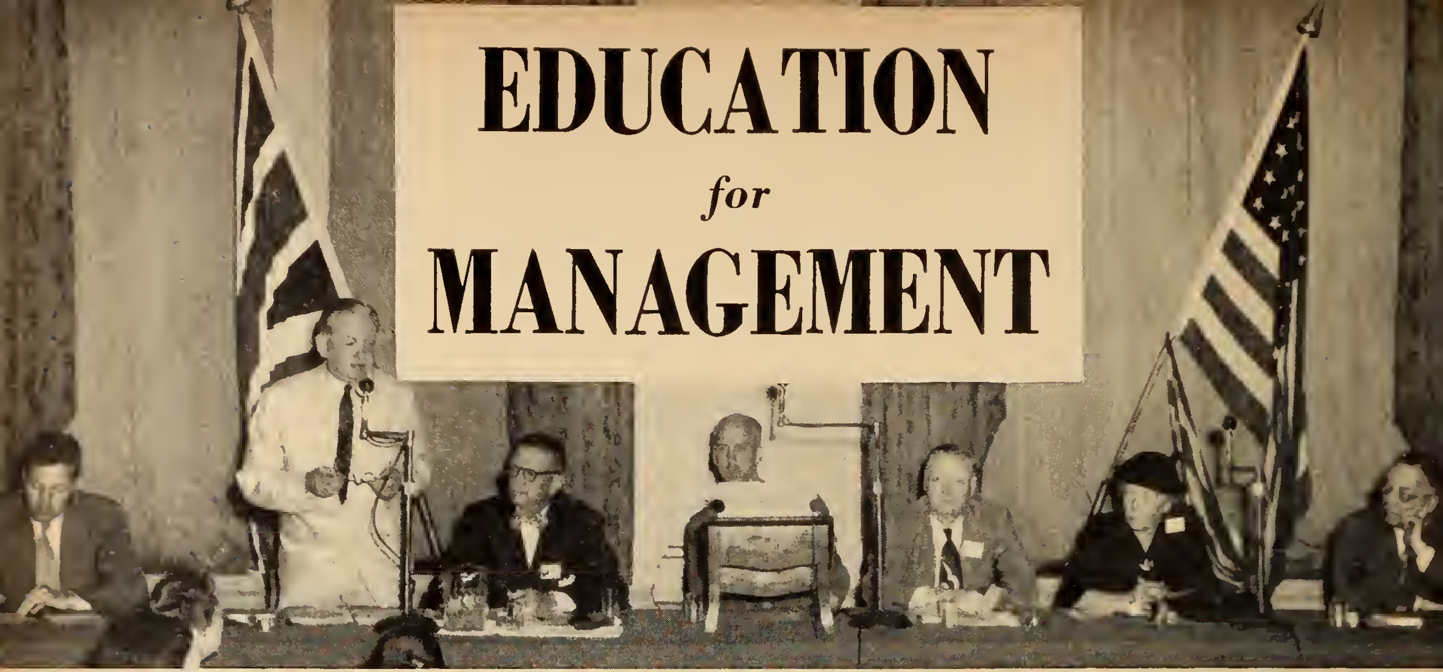
In conclusion, it should be again pointed out that schedules of construction should be so arranged that the big bulk of concreting is done in non-freezing temperatures. Unfortunately, due to the seeming urgency of the completion of work, this is not always possible. If winter concrete has to be resorted to, it is not difficult to provide satisfactory conditions for doing it. Success depends on simple precautions and careful planning, and no one need avoid a winter job. √

E.I.C. Annual Meetings 1951 and 1952

Dates and locations of future annual meetings are:

1951—May 9 to May 11: Mount Royal Hotel, Montreal

1952—May 5 to May 7: Hotel Vancouver, Vancouver



EDUCATION *for* MANAGEMENT

A panel discussion held at the 64th Annual General and Professional Meeting of The Engineering Institute of Canada, and the Annual Convention of the American Society of Civil Engineers, Toronto, July 14, 1950.

Moderator

C. A. Peachey, *Montreal*

Chairman, Canadian Management Council

Panel

Lillian M. Gilbreth, *Montclair, N.J.*
Carl H. Cotter, *New York City*
F. G. Ferrabee, *Montreal, P.Q.*
Lyndal Urwick, *London, England*
E. W. McBride, *Toronto, Ont.*
S. G. Hennessey, *Toronto, Ont*

Mr. Peachey—Ladies and gentlemen, this panel will present to you views on the subject of "Education for Management". This subject was selected as being one of broad and vital interest to engineers and one perhaps which engineers often, or at least sometimes, neglect. It is a subject of great scope, and we cannot hope to solve a great many problems here today. If we can make you aware of the scope of the problem I do not think the time will have been wasted.

It might be of interest to tell you how this management panel came into being. The subject of management has come to the fore in the last fifty years rather quickly. In Canada a few years ago a group of societies, all partly interested in management, formed a Canadian Management Council. The Engineering Institute was one of those bodies — in fact, I would say the leading one — and it is greatly to the credit of the Engineering Institute and the engineering profession that they appreciated this need for management activity. This Canadian Management Council applied for and was accepted into membership on the International Committee of Scientific Management, which is the only international organization in the world fully devoted to a study of management.

This panel is not a formal one, in the sense that we have prepared papers. We shall try and keep it on as informal a basis as possible and talk, to some extent, off the cuff. All members of the panel are authorized to interrupt each other if they think it necessary. We met for a few minutes at breakfast, and I was a little dismayed and a little pleased to notice the wide divergence of feeling on the subject.

The Panel Members

I will start off with a brief introduction of the panel members. Dr. Lillian Gilbreth is president of Gilbreth, Incorporated, well known management consultants. She has been in the van of the management movement since the early part of the century and has made a great contribution to it. Her specialty, perhaps, has been home management, and she has found time, as you know, to raise a large family in the course of her career. She needs no further introduction to us.

Lieut.-Col. Lyndal Urwick is a well known British management authority, head of the firm of Urwick, Orr and Partners, and vice-chairman of council, British Institute of Management. I am sure those of you who are posted on management literature have read many of his publications and writings.

Rear Admiral Carl H. Cotter (C.E.C.) U.S.N. (Ret.) spent some thirty years in the United States Navy and served in the engineering services with great distinction in most parts of the world. He is now president of Merritt, Chapman & Scott Corporation of New York City, one of the biggest marine salvage organizations in the world. His firm is also concerned with the construction of bridges, buildings, and other structures. Their offices are scattered up and down the two coasts of the United States. The operation of such an organization takes skill in management.

Mr. E. W. McBride, is assistant

manager of mills, Abitibi Power & Paper Company. Mr. McBride has been concerned with problems of organization, personnel, and training with that large company.

Mr. F. G. Ferrabee is vice-president and general manager of Canadian Ingersoll-Rand Company, Limited, in Montreal. His firm is a notable leader in management matters, and that leadership is in no small part due to Mr. Ferrabee's own qualifications.

Professor S. G. Hennessey, of the University of Toronto is professor of economics and what is perhaps of more importance to this panel, he has been director of the management conference which that university has put on in the past two years.

With these few remarks I am going to ask Admiral Cotter to lead off and spend a few moments telling us just what he means by "Education for Management" . . .

Admiral Cotter—I consider it a great honour to be here in Toronto and to have the opportunity of meeting members of the American Society of Civil Engineers and the Engineering Institute of Canada. I think these meetings are very desirable.

Education itself may be broadly defined as the systematic development of man's power to think and to reason and to arrive at logical conclusions and a particular course of action. Education for management, however, can actually be discussed in terms of two entirely different problems. It means one thing if we talk about educating the fledgling engineer or the professional man to assume the responsibility of management, or for the future assumption of management's responsibilities; it means an entirely different thing if we consider education for management as a problem of educating existing management to a realization of its responsibilities. Both these problems may exist, but in my opinion the latter is by far the more important.

Aside from the question of pre-career study and training, education for future management is essentially a responsibility and a problem for existing management itself. However broad the student's training is, education is never completed until he goes through a period of practical internship, and learns by experience to analyze situations and people. Human relations can hardly be taught by precept, but in the United States alone today, there are more than twenty leading universities which have promoted extensive research in this field of human relations. However, there is no substitute for experience when it comes to dealing with people. Only an intelligent management can provide that experience and the guidance which helps a student make the most of it. Obviously, the student can hardly be guided properly if the teacher himself is in need of education on the current problems at the root of all human relations.

It is significant that the men most influential in leading American enterprise to its present technical pre-eminence have been the first to realize the fallacy of believing that the achievements of private industry speak for themselves, and that they need no emphasis.

C. A. Peachey, M.E.I.C.

One of the first goals of education for management is to erase the popular misconception that all business is impersonal. Those who would shelve the private enterprise system have played upon this theme to the hilt, encouraging the myth that management is a symbol for coldly mechanical robots. Since all problems of management are fundamentally problems of people, management must be educated to act and to speak in terms of human relations.

Emphasis on Human Relations

Lt.-Col. Urwick—What Admiral Cotter has been saying is what all of us, in all countries of the world who are interested in education for management have been emphasizing for the last half dozen years, namely, the job of the manager is, primarily, a social job.

It is true, he must be technically competent. Most of you men are engineers, and it is no good pretending to be an egineer if you can't do the ordinary straightforward technology of engineering. As you know, you must all have something more than the ordinary straightforward technology of your job if you wish to beome first-class engineers.

In management, too, there is a large and growing technology of planning, and records of control figures, of work measurement, and so on and so forth, but the most complete mastery of technique is quite useless if it is not interpreted in terms of human understanding and ability to handle human beings. The primary problem facing all of us is how are we to train those we have in our existing management, and a further new generation as they come up, in this task of giving social satisfaction to the people who work with us as friends and colleagues in our enterprises.

Now that is only—and here I entirely concur with Admiral Cotter—in small part a matter of formal education. Handling other people is a thing that can only be learned by practice, under sympathetic supervision. I would add, however, that in my opinion it is a thing that can only be learned, even by practice under sympathetic supervision, when a man is comparatively young. If you take a man much over thirty his character is set. It is extremely difficult for him to learn a different attitude toward his fellow human beings. If his present attitude is unsatisfactory, since attitude is largely a matter of feeling, he can only learn a new way of feeling about other people by being taught to feel himself.

Now, a young man can be taught through his feelings and you don't do him much harm. As they used to say in the R.A.F. during the war, 'you tear a strip or two off him and you don't leave him any the worse.' But if you take a man over thirty and start 'tearing a strip or two off him,' you may do serious damage to his personality. Hollywood has a phrase for it: "You cannot groom elderly spinsters for stardom."

I think one of the problems we must face in industry in this matter is to consider whether our practice of giving people their first promotion, very often when they are thirty or thirty-five, is in fact supported by the practice of other forms of organization which have had longer experience with this same problem notably, of course, the fighting services. The fighting services in all countries pick their officer material, usually under 25,

Dr. Lillian M. Gilbreth, Hon.M.E.I.C.

and train it deliberately for the officer's job.

In most fighting services there is a second stage beyond that. They not only pick officer material pretty young but when a man has been an officer for four or five or eight years he is usually picked again as to whether he is the kind of young officer material that is likely to go to the top. If he is, he is given a further course of very intensive training at the Staff College level in the higher theory of his profession, before he goes on to the higher reaches of command in that profession. Now, business at present has nothing like this careful gradation of selection at different stages which experience has developed in the different fighting services.

There are, therefore, two quite distinct problems, as Admiral Cotter has pointed out. There is the problem of what we are to do about our existing managers, and there is the problem of what we are to do about the next generation. I think under our title we should discuss both these problems, and here I think we might draw a distinction which is of value to all of us. That is the distinction between education *for* management and training *in* management.

Education vs Training

By education *for* management, I understand the normal educational

Lt.-Col. Lyndal Urwick

processes which are desirable for a person who is going to adopt the career of becoming a business executive. By training *in* management, I mean the actual, deliberate, mostly practical, development of the individual for the specific management job which goes on after he has started his career in some business undertaking.

Now, we often confuse these two processes because, as the Admiral quite rightly pointed out, education must go on all through a man's life—informal self-education—if he is to be of any use at all. On the other hand, the difficulty of using the two words, "education" and "training" as alternates is that training has one objective only—to turn out good managers—but education has multiple objectives.

I can make clear what I mean by citing to you, I think, the best definition of education that has ever been produced in Great Britain. It was produced not many years ago by Sir Richard Livingston, then vice chancellor of Oxford University. This is what he said—it is very simple—"All men need to make a living, not the bare one, but the best that the conditions allow. All men live in a society—all men have a personality to develop and the power of living ill or well. For all these, education must provide, and it must therefore include a vocational element, a social, or as the Greeks would have called it, a political element, and a spiritual element. Men must learn to earn a living, to be good members of a society, and to understand the meaning of the phrase, 'The good life.' An education must help them to achieve these three ends."

If you accept that broad definition of education, it is no good saying this is a simple problem, that all you must do is to teach a man how to be a good anything. It is an extremely complex problem, because in any process you contemplate you have always got to be balancing these three values . . . the vocational value, the social value and the spiritual value. You have always the triple objective to serve and not a single objective. I would suggest that we keep clearly in mind in our discussion the distinction between these two proceedings—the educational process which has this wider triple purpose, and the training process which has the single, practical purpose of turning out good managers. We should keep very, very distinct in our mind, all through our thinking on the subject, which of these two things we are talking about at any particular moment.

I think one of the most fatal obstacles to the kind of process Admiral Cotter suggested is what I have called "the Humpty Dumpty view of education"— the idea that when a man goes to school and university he collects some kind of qualification, and after that he tumbles over the educational wall into real life, and "all the king's horses and all the king's men" can never pick his mentality up again. Now, I think I have said enough to suggest lines of attack on what is an enormous problem, and it is time somebody else had a chance.

Management a Broad Field

Dr. Gilbreth—Representing the panel and the audience as well, I do think we have to thank Admiral Cotter and Col. Urwick for outlining the background and de-

Rear Admiral Carl H. Cotter

E. W. McBride

fining so clearly some of the terms. I would like to emphasize the fact that management problems do permeate every area in our lives. Of course you, Mr. Chairman, know the International Committee [C.I.O.S.] and you are also on a National Committee. All have sections on industry, and on business, but they also have sections on the farm, and sections on the home. It seems to me that this morning we have to remember the similarity of the applications in all these fields.

It is also important that in talking about education for management in any field, we do not underestimate the importance of the technical part of both the education and the training. Knowing we are going to have a conference this afternoon on education, perhaps it is just as well to save a certain number of our questions as to both technical competence and wider values to be given then. I am sure we have no thought of diluting our technical adequacy.

We also ought to stress the fact that in preparation for handling the human element, as we go into all the sciences concerned, the training may turn out to be just as technical as any of the other techniques developed. But when we emphasize, as we all do, the importance of the human element, we realize that this is a taking over of all these techniques into this warm field of inter-personal relations which exists in the home, on the farm, out in business and in industry itself.

As to exactly what area of the management field concerns us, it seems to me that we must confine ourselves more or less to the area of top management in this discussion, both because it is so important and because we cannot expect in such a short period to cover many areas. It is a fact that when countries in the international group sent in topics of greatest interest to be discussed at the conference, the question of top management, education and training for top management, was number one from every country.

Human Relations Begin at Home

Now, believing as we do that top management is a matter of tremendous importance in every field of management, I do urge those of you who represent the home field to realize how tremendously important our participation in this thinking is, because, as Colonel Urwick has said, we have two groups to think about. We have those already in management, in the top area, and we have the group preparing for it. If there is any area of the whole management field where it is necessary to think of these responsibilities and give the opportunity for this type of education it is the home field. We know in the home we do get the practical first hand experience in human relations, and human relations are the same, whether industrial relations, family relations, or whatever they may be. Here we have a first hand opportunity to prepare for, to give time for, to cooperate in, everything that the educational institutions and the industries themselves have to offer.

The fact that it is the responsibility of, and that top management has so much to do with, the setting of policies and seeing these policies carried through, is another thing that I think we should emphasize early in the discussion. I hope that, especially from our members of the panel who represent industry, we may have some comments and some discussion on these responsibilities, because when we finish, we may be able to determine the *what*, the *who*, the *when*, the *where*, and even the *why*. But unless we get the *how* worked out we are not going to have the result we are working for.

F. G. Ferrabee, M.E.I.C.

So I think the question I propose to the panel is how many of these things— *What?* . . . *Who?* . . . *When?* . . . we may consider we have agreed upon, and how promptly we may turn to the *how* of the thing being carried through.

Mr. Peachey — I am glad you made the remark about the panel this afternoon. I see certain members of that panel here and I do want them to understand that we have as a group felt we cannot neglect the technical part of an engineer's education and put something else in place of it, and send him out ill-equipped technically.

Mr. McBride—Speaking from an industrial viewpoint, I would say good management is the ability to get the most out of an organization. In most industrial companies a man becomes a manager because he has the technical knowledge and "know how". Suddenly, one day he becomes a manager, and he is then

S. G. Hennessey

faced with all the problems, chiefly of human relations, that he must solve in order to make a successful manager.

Practical Management Training

In our case most of our managers come from the ranks. We do not have a special class training for managers. In order to provide a general education and a means of improving men who are on the supervisory staff, we have started training courses. This is something new. They are chiefly patterned after the "J" courses which they use in the Army. There are four branches to the courses. There is job instruction, which is how to teach. There is job relations, which deals with the handling of men, labour matters, and so on. The third is very important — job methods. Briefly, this is productivity, which is one of the most important features of any manufacturing organization. The last is Safety. We all know the value of a safe workman.

These courses are given to everybody, from the supervisor up. Some day some of these men will be managers, and by giving these courses we hope to train them a little better. These courses number ten periods, and take about two hours a week. At this point I don't think I should elaborate further. This is merely something practical from an industry standpoint in the discussion.

Dr. Gilbreth—May I ask how far up or down the line the courses go?

Mr. McBride—They start with the supervisory foremen and go up to the superintendents. They do not include the general superintendent.

Dr. Gilbreth—Do you have any courses for managers?

Mr. McBride—No, the man who becomes a manager has to sink or swim.

Mr. Peachey—I think that highlights one of the points that was brought out earlier, that the problem goes beyond training at the lower levels. Mr. McBride was trying to bring that point out . . . the question being, after you have trained them that far, how do you get them farther? I think this problem is quite a difficult one and it has been much written and talked about.

Mr. Ferrabee — I have been thinking while sitting here that possibly a practising manager, or several of us here, might be out of place in a discussion where obviously a lot of knowledge of education should be required. I was thinking that we might be viewed as being in the position, say, of a middle wing on a football team, suddenly finding himself in a conference of coaches.

Informal Education for Management

We might know a little bit about certain of the plays and the tricks of playing, but we would have very little general knowledge of the strategy, let us say, of football. To carry the analogy a little further, I would like to bespeak the interest of this group and this panel on what might be called 'informal' education in 'formal management'. I think a lot of the areas that have been discussed as being very difficult subjects of education are those that are perhaps handled best informally.

We all recognize, for instance, how we set up a beautiful formal organization and, if we care to, we have a chart with boxes in which we put various people and say, "This fellow talks to these people", and so forth. We also know there is an informal organization within that formal organization. If you say something to a man for one reason, and the man to whom that man goes for an interpretation does not know about the reason, then he gives a little different interpretation. I think you might call these informal parts of management "fringe subjects". Some of them are, some are not, but frequently we have regarded them in that way.

I am also thinking of the limitations on the financial side of management, which are rather serious and looked into by the very top level of management. Perhaps you used to invest a thousand dollars in a machine on the basis that you could get back the thousand dollars in a year. Now you can't get it back in a year because of the complications of income taxes. Such things as that are not technical, but they are fringe subjects involving a general understanding of the field in which management is working.

Perhaps in a general way, through formal education, pupils should be taught that, even when they are top level, where they envisage themselves as alone in the world, they also have masters to serve.

To change to different levels, there are controls, taxes, and laws which affect the middle levels of management. Again, they have to lean on the good judgment or the basis of proper action which may come from previous knowledge and education which can be inapplicable. Doing the right thing from an operating viewpoint is not necessarily possible today.

To go to the lower levels, as has been brought out by some of the other speakers — I say "lower levels" with distaste; if we could get away from the "level" idea it would be better; let us say those further removed from the general knowledge part of management — the matter of human behaviour among supervisors and foremen is of very great importance, as we all know, and how is that handled in a formal education?

In other words, in setting up formal education, should we include full courses on law, the humanities, and economics? How can we bring these to the lower levels of management? If, for instance, we are going to consider the treatment of one human being by the other, should everybody who comes from the working force to the position of manager immediately take a course in psychology?

Can the effectiveness of these men be increased by putting them in touch with, for instance, a psychologist who will recognize the world in which they live and be able to give them practical psychological advice and, as has been also brought out by several of the speakers, when we complete this phase of their education, do we still have the deeper community social aspects to consider? I think possibly, as Dr. Gilbreth has said, we are on the fringe of developing techiqnues in the humanities which may become just as simple to us in the years to come as what we call our technical procedures at the present time. To go back to the football analogy, Dr. Gilbreth — and I am recognizing the challenge — certainly passed the ball to industry by saying all we had to do was to explain how we could carry out this education.

Speaking personally, I have found that much of the informal education is day to day personal contact. The influence of, the behaviour and the attitude of a person in authority to a person over whom he has authority, I think. stems largely from observation. We all copy, and I think, consciously or unconsciously, any organization or part of an organization will reflect the head of that organization or part. So I think one of the greatest forces for informal education within industry is a good example from the supervisor, say at the foreman level, up to and including the chairman of the board.

Professor Hennessey — It seems to me that a great deal has already been said and we might at this point begin to sum up. The panel has agreed on the importance of the human aspect. There has been emphasis on the importance of recognizing and distinguishing those who are said to be existing management, and those who may be regarded as future management. We can say that existing management has had fundamental training, but we must think in terms of further education.

Universities Can Help Industry

I would like to suggest that perhaps the universities can do something to assist business in this educational process. The universities have facilities and staff with greatly diversified interests. If business and the universities cooperate, much can be done to further the cause of education for business, and of education for management.

The University of Toronto has conducted some experiments in this direction. We have brought together business men of diversified backgrounds. Some have had broad experience in management, some comparatively little of that which is to be their's ultimately. By bringing them together with the university staff, we find that both groups benefit. We have been concerned primarily with middle management, to introduce a term which may be somewhere between the top management area already mentioned, and the supervisory level.

I think that I might well suggest that there has been too much agreement in this panel, and by way of creating some discussion of differences, I would like to ask who is to do the training for the middle and upper management with which we are concerned. I suggest that the universities can do something. I wonder what the other members of the panel and the audience think of that?

Colonel Urwick. — Picking up Professor Hennessey's question, "Who is to do the training?", we have got a dual problem here, because the answer to that question for the undertaking of really large scale may be quite different to the answer for the smaller or quite small undertaking. Yet the smaller or quite small undertaking has just as big a need of future management as the mammoth corporation. I think we are always inclined, or have been in the past, to discuss this problem too much in terms of the corporation that has the resources to do its own training and education. It is, as a matter of fact, a much more acute problem, certainly in Great Britain and I imagine all over the industrial world, to insure that this smaller or medium sized undertaking provides its employees with the same facilities as the large scale corporation.

Management Training in Britain

Now, it might be of interest just to talk very briefly of the embryonic attempt we are making in Great Britain to deal with this problem. A committee of which I had the honour to be chairman recommended about three or four years ago that we should establish part time training for management in every technical college in Great Britain. As many of you know, there are some 200 technical colleges in Great Britain, all under the local educational authority of the area in which the college is situated.

These colleges have developed what engineers in Great Britain feel is a satisfactory pattern of engineering training for men who have not had the advantage of a university education in engineering.

They grant to students on night work only a national certificate, and a higher national certificate. These students are young engineers who come up by apprenticeship from the shops. The great engineering institutions — Civils, Mechanicals, Electricals, and so on — regard the higher national certificate as sufficient evidence of intellectual attainment for the granting of their professional qualifications.

Now, we are following much the same pattern with regard to management. We had exactly the same problem you tend to get in other countries, of a number of specialized institutions in the field and our personnel officers, our works managers, and so on, all coming together in their own professional institutions, and all demanding of the technical colleges a slightly different matter of education.

That was setting the educational colleges an impossible problem, and the committee decided to recommend a national diploma for an intermediate examination in management, to be taken by the boy or girl already in business on night work. That diploma has nine subjects. It starts with two introductory subjects, merely intended to take the students up onto a hill and to say, "There is the road you are going to travel—have a look at it." There is one paper on the economic history of the last 100 years, and the second paper is an outline of the field of management —pure outline.

The second part of the examination consists of three background papers: one on the economic aspect of industry and commerce; the second in the legal aspect of industry and commerce; and the third, in the psychological aspect of industry and commerce. The third part of the intermediate examination consists of four tool subjects: accounting, statistics, office management and work measurement. When a student has taken this intermediate examination, he can then go on to one of two kinds of final examination, consisting of eight papers; either a final examination in the specific subject in which he wishes to specialize for his first step on the management ladder; purchasing, personnel management, production management, sales management, and so on; or to a final examination in general management, if he wants to become executive assistant to a president, or some other post in the business that requires a general view of the management problem. Both the specialized examination and the general examination have two papers which are common to all of them: one in management principles, and the other, in management practice.

Now that is the scheme, and about a hundred technical colleges in Great Britain are beginning to teach to it. But please don't think I am saying it is well done. It is just a plan, a project, and we are desperately short of competent teaching staff to tackle this problem. We are getting a great deal of help from industrial executives who are giving an evening a week to teaching this subject in technical colleges, in the tradition of voluntary public service which is so well established in Great Britain.

Small Industry is Very Important

Dr. Gilbreth—I am very glad Colonel Urwick brought the matter of the small industry into the picture. I think I am speaking for all the members of the Western Hemisphere groups, including our colleagues in Brazil as well as here when I say we are realizing more and more how important the small industry is.

The Management Section of the American Society of Mechanical Engineers is just getting out a book which should be ready in August, which has to do with small industry. Dr. Hemple is a member of the committee that has edited it. All the chapters are written by people in small industry. I mention it because we have felt very distinctly we needed to know the problems before we could do very much more.

Another study is going on at the School of Business Administration in Stamford University in California, where Professor Frank Shallenberger has made a survey of small industry in the United States, trying to get a pattern of what would be needed. This has proved so valuable that the banks and insurance companies in the U.S.A. are planning to distribute it, not with the idea that we *have* the answers, but with the idea that we urgently *need to get* the answers.

The Dean of Engineering at the University of California, in Los Angeles, is making a thorough study of the engineering curriculum to find out if we do not need a new type of training for management people, which will not change the education, but which will change the training, so that a man is more competent to take over a variety of functions from the management standpoint in the small industry, where it may not be feasible to have a large number of specialists, because the person they are looking for is general, and he has had a very great response, not only from young engineers, but also from industry, who would like to use them.

I think all the way along, the thing that encourages us so much is the high standard and standing which the universities and the colleges are gaining with the years. There seems to be a feeling all along the line in industry that you can get objective, thoughtful, provocative, and at the same time, very practical and useful material from our universities and colleges. Many industries are getting university people in to teach labour-management relations. The university staff can supplement its instructors with labour and management men and women — men who are listened to by industry, because they have the stamp of the university on them as being objective and being fair.

Mr. Peachey — I would like to direct the panel to the basic fact that engineers are trained in logic, and they go out and work with human beings who operate in a very non-logical manner. I am just wondering how we know what should be taught to engineers, particularly, so they will know how to deal with non-logical persons.

Admiral .Cotter — I am very much interested in Colonel Urwick's discussion of what Great Britain is doing with the idea of teaching people in various echelons of management. I think our problem is on a different level, because the ability of private enterprise, as I mentioned in my discussion, is not under question by anybody.

The Problem Restated

The course of action taken in Great Britain by a number of the educational institutions, and the course of action taken by Professor Hennessey and by others in the United States and Canada, to indoctrinate and to teach people proper management procedures, seem to have as an objective the maintenance of a high level of production in our industries. I don't think that is the question that we are discussing here, or should discuss. Our main question is a much more serious one: what is private enterprise management going to do to maintain its position in this world of changing conditions?

That is a question which I think is a very high level one and an important one, because it cannot be satisfactorily answered without full consideration of the factor of human relations. I don't say this training of the lower management levels is unnecessary or unwise, but I take it for granted that has been done and is being done all over and as a result, in our countries, in the United States and Canada, we have maintained a very high level of production. The trouble is that despite our high level of production we have a lot of social unrest.

Now, with regard to the specific question as to what we should teach in universities or in special schools to engineers, in order to qualify them for management, I think we can assume that an engineering education is a pretty sound basis as a starter for a successful management career.

I might say a complete course in business administration or in law is likewise a sound basis for a management career. A lawyer often is concerned with business, with problems of human behavior, the making of contracts, and the study of the laws of the country, and so on. He has to know something about these subjects when he gets into management. Engineers likewise are exposed to them, a great deal in college and much more so afterward, if they get into executive management.

More Non-Technical Study for Engineers?

I think, specifically, that the study of economics, sociology, and psychology is good, but you know, one of the troubles in America today is that our universities are so crowded with the technical courses which an engineer must take, that those courses of training which you might say are subjects in the study of human behaviour, or involving the illogical behaviour of human beings, comprise subjects that have to be put on the elective list and do not get the attention given to the more technical subjects.

Dr. Gilbreth has said that technical competence should not be discounted. A man going into an industry that produces some product must have a broad knowledge of all the processes in order to do an intelligent job of management, and for a successful management career, he must learn through practical experience how to handle people. In other words, I believe one can acquire in college a measure of technical competence, knowledge of basic educational subjects, and a knowledge of accepted and sound management practice, but this does not mean one will have all the qualifications of a successful manager. One must gain practical experience in human relations and must always, by precept and by example, demonstrate that one is ever mindful of social idealism in one's administration of the business.

Dr. Gilbreth made a point this morning, and she certainly is far better qualified than I to speak on the value of certain text books which we now have, and which are available to us, in economics, psychology, and sociology, and a few other subjects. She made the comment that they were not too well written, that they are not too practical. When you try to jam those courses into technical training for an engineer I don't believe you are going to get too much out of them in their present form. My opinion is that they should be briefed to where the engineer can get something of value out of them as elective subjects. I want to emphasize that the training he needs in handling human beings he must get by experience and not in universities or colleges.

Dr. Gilbreth — May I ask whether you feel most of the people teaching the subjects have an opportunity to get most of the experience that would enable them to write text books that would be easily understood?

Importance of Practical Experience

Admiral Cotter—I think on the strictly technical side they have a lot of experience. There is one thing lacking in a great many of them, that is the practical contact with the people in industry.

Dr. Gilbreth—The people who write in sociology, psychology, and so on . . . do you think most of them have had any opportunity to be out in the industrial field?

Admiral Cotter—Not with respect to a particular industry, but generally, yes. I think people who are professionals in such subjects may at times be consulted by industrialists, and in that way these professionals gain a lot of knowledge of the feelings, actions, and behaviour of people in industry. Such contacts with managers of various industries should be encouraged in order that textbooks may emphasize the practical side of human relations.

Mr. Peachey — Dr. Gilbreth's question is 'how can the people who write the books become practical?' Perhaps one way is for industry to take them in in the summer time when they are not teaching, let them browse around the factory, and have certain duties assigned to them and get some research done?

Mr. Ferrabee—I think there is a good deal more co-operation and liaison between the faculties of universities and industry today, for the very reason brought up in this question. The periphery fellow realizes he must get down with the people about whom he is writing and conversely, the people who are down town running around together, recognize they must have some general principles on which to steer their course.

I don't know that you can have a formal arrangement between a writer and industry. I think he would be quite a fellow to anneal the crust of the people he was trying to approach. He would be suspect in an industrial plant. If a sociologist came in and started asking people about themselves I am afraid he would take quite some time before he would get real material. I don't know whether that answers the question. Certainly the need for experience to write a book on this particular thing would involve wide knowledge, which would require contacts.

Professor Hennessey — I think the objections just noted have been well taken. It might be fitting to add that some of the best work I know of on the part of university people has been done on an anonymous basis. They have gone in as ordinary workmen, if you like, and have conducted their studies without the knowledge of the people with whom they were working. The work was done on a completely confidential basis, and there was no betrayal of faith in any way.

I would like to remind you of Colonel Urwick's explanation of "training" and "education", and to ask if the typical engineering course with its great emphasis on technical matters is not primarily a "training" programme. When we talk of the addition of sociology, economics, psychology, or whatever it may be, we are then considering the addition of a larger measure of "education" in the terms that Colonel Urwick has used.

Practical Men Also Teachers

Colonel Urwick—Might I add the suggestion that this bit of the discussion is being run on the assumption that the whole problem is to teach the academic man to be practical. But there is the other half of the problem, too, if we follow the Admiral's opening remarks, that the training job has got to be done by industry itself—that is, teach the practical man to be articulate, to teach him to transmit his experience, to be a trainer.

Certainly, in Great Britain we are up against grave difficulties in persuading people to be articulate. They were emphasized a number of years ago by Max Beerbohm. He quotes the House of Commons, as an example of what is a national tendency. He said: "Surely the House of Commons manner cannot be a natural growth. Such perfect virtuosity in dufferdom can only be acquired by constant practice. But how comes it to be practised? I can only repeat that the English are a naturally silent race. They are apt to distrust fluency—"glibness", they call it—and see behind it the adventurer, the player of the confidence trick, the robber of the widow or the orphan. Be smooth-tongued and the Englishman will withdraw from you as quickly as may be, walking sideways like a crab, and looking askance at you with panic in his eyes; but stammer and blurt to him, and he will fall straight under the spell of your transparent honesty." That is part of our problem—to teach the practical Britisher to be fluent and articulate.

Mr. McBride—I speak for the employers; most managers are production minded only. I can see your point—if you have labour unrest and a strike you are not getting very far with production. There are probably two ways of educating the managers on all the problems. One is the short courses that the universities now provide; the second is to try and train him before he becomes a manager.

But no organization, or very few organizations, have men whom they have taken on with the idea of making them managers. A man must earn his promotion by what he knows, and what he can produce for that particular industry. There is a gap there where I am not prepared to say what should be done.

Mr. Peachey—That is a very important gap and one that has not been bridged; it is part of the area we are discussing.

Dr. Gilbreth—We find that work being done in the art of communication is doing a great deal to make people more articulate and more sure of themelves. It isn't always necessary to have new courses. Many of the accepted courses in public speaking have been so completely thought through recently that the man not only puts over his points better but he begins to realize as well that human relations and his own attitude toward people are so tremendously important that he cannot put the points over by techniques of speaking or writing, but he must base these upon fundamental feelings.

Here again, I think a good deal of what is happening has been more or less a by-product of such courses as Professor Hennessey is having at the University, calling in groups of executives and calling in people out of the shops and industry to present their viewpoints. The *products* of a conference like that may be that people will go back with certain definite findings, but the *by-product* is that people have a greater appreciation, not only of human relations, but of the technique of representing yourself adequately and being fully at ease.

There are so many people in all of our areas of life who are really not at home in the world in a variety of situations. The opportunity of making them more at home is a by-product of any sort of course, and making people more adequate in human relations seems to me to be developing very rapidly through all of our countries. So we have a very optimistic situation in this special field.

Mr. Ferrabee — I would like to confirm that, Dr. Gilbreth. For example, I can think of the calling together of people from a number of different departments with a number of different interests, to a common course on something that didn't directly concern them. It happened to be a job evaluation course and the purchasing department, engineers and other people, were called together for that course. They may have attained some direct knowledge — they undoubtedly did — but the by-product is their understanding of the other people, the knowledge of how this particular study could affect those with whom they did not have many contacts and this had many times the actual value of the direct knowledge they attained.

PANEL DISCUSSES QUESTIONS FROM THE FLOOR

Mr. Peachey — I have some questions from the audience . . . perhaps you would like to read the first question and comment on it, Colonel Urwick?

Colonel Urwick — The question reads: " The most important social aspect of management is personnel counselling. Has any training programme been set up for personnel counsellors?"

Speaking for Great Britain, I don't myself know of any specific programme for training personnel counsellors, though we have at our Tavistock clinic a group of psychologists, interested in industrial problems, who are doing a great deal to insist on the importance of the directed interview as a means of getting at the facts and releasing tensions in industrial situations. I am afraid that is all I can say on that point. Perhaps somebody from the United States could amplify that.

Dr. Gilbreth — I suppose our outstanding scientific example of this sort of thing was the work done at Western Electric Company. It is an attempt to allow the person counselled to speak at length of every aspect of his problem, with the hope that having stated it he will work out his own solution.

This question is a fine example of the relationship of " formal " to " informal ", in our industrial field. In certain industries a sort of formal personnel counselling is going on and went on, especially during the war, partly from people there before the war, but supplemented by counsellors who came in to relieve the operating people of much of their human relations work. Some of these were trained, some were not trained; some did very good work, some not so good. The result was that when Mr. Morrow, of *Factory Magazine* made a survey, the operating people stated distinctly that they wished to take back the matter of human contacts and the informal, one might say, untrained function of giving personnel counselling to their people.

I think with us, at the moment, we are trying to reconcile the formal and the informal. We are, of course, doing everything we can to meet the express wish of the operating group out in production to handle human relations, but we are trying to supplement all the way from top management down, by a very close tie-in, not only with the universities and colleges, but also with the technical society working in the field. The personnel groups are especially concerned in this field, and they again are recognizing their need of both formal and informal training.

We are not fortunate enough in the United States to have the final clear answer on what is being done, that Colonel Urwick finds in Great Britain, where they are able to know pretty well what is going on all through the country. A lot of our work is not generally known. A person like Ernest Dale, who does much research work for the American Management Association, and who goes all through the country, will ultimately get the material together.

Mr. Peachey — I would like to come back to the personnel counselling for a moment. As Dr. Gilbreth mentioned, a big experiment was made at Hawthorne in the Western Electric Company. It was spread over a period of ten years, practically through the thirties. It is a very good example of the fluidity of management methods. That personnel counselling was a very fine thing and I understand it worked out very well at Western Electric for many years. Through counselling they learned better how to train supervisors and finally ended up without need for the same amount of counselling.

Preparation for Management

I have a very good question here. I think somebody will want to pick this up: "Could the panel outline action that could be taken by a young engineer so he will be trained for management when his opportunity confronts him.

Dr. Gilbreth—Having met a great many of these young men and women who so far have been fortunate enough to get opportunities to start in this field, I feel the first thing a group in their undergraduate days needs to do is make themselves articulate; let it be known all through the line in the faculty and administration, that they really are out to go into industry and management, and that they plan to forge their way rapidly to the top. If that can be done, and if the appropriate student branches of a management society can be established on the campus; if the young men or their representatives can be allowed to go to national, regional, or local meetings; if the junior sections in all of these societies can take hold and deal with the student branches, so that a young man can be perfectly sure from the time he is a student and eligible to go into a management group he will have some participation and membership all along the line; that will help.

Also, as he goes into industry, it is his job to check what opportunities there are for him to get either formal or informal training in the industry or outside. The number of these men who are realizing that education is a continuous process, and are keeping up with their own Alma Mater, or with the nearest educational institution that will take them in evenings, or at any other where they can keep on with the work, is increasing rapidly up and down the country.

So I feel that the urge to do this sort of thing is the first thing, and then contacting, all the way up the line. There isn't a single campus that will not listen to a group of students or an individual student who is out to secure help in getting some definite aim put through.

Professor Hennessey—It seems to me Dr. Gilbreth has said the important things. It seems hardly necessary to remind you that Canadian universities are more than willing and are at the present time able to offer various courses of study for those who are inclined to take advantage of them. To couple this question with the last, I might remind you that at McGill, Queen's, and Toronto, there are institutes of industrial relations. They do not offer, perhaps, extensive courses specifically designed for personnel counsellors, but there are many series of meetings which are definitely of interest and value to those engaged in such activities.

Dr. Gilbreth — May I ask the Admiral if he doesn't feel that industry would welcome an opportunity to give the young men chances for this sort of thing?

Admiral Cotter—We have families in the organization who have never worked for anybody but Merritt, Chapman & Scott. We have done pretty well in bringing people up in skilled trades. I think our company has fallen down in one respect, in not bringing in young graduate engineers. We need essentially young engineers in our business, and every couple of years, whether we need them or not at the moment, we should bring them in and put them through courses of training. We have done some of it, but the war broke up the routine.

What I am advocating now is that we again inaugurate a programme where each year we can pick two or three or four outstanding engineering graduates. They are of little immediate value, they are considerable expense to us but that is all right; we have to recognize that fact. We would send one to a yard, one up to another station, one to the office, and another to a construction project. They would work with the outstanding managers in the field and the young men would get a very excellent idea of how we operate and how we do business. If you carry on a policy of that kind you may not have much at the end of the first year but before too long you will have a pool of people who are available for productive assignments.

A large corporation is supposed to be an inhuman sort of thing, but with a large corporation you have permanence. You get a board of directors and the chairman of the board and all the other things that go along with it and when the manager goes, the vice-president, or the president, it doesn't make any difference as long as somebody else is available to step into his shoes. That is the way young engineers should get to positions of executive management . . . through a course of training in various echelons of responsibility.

I don't agree with Colonel Urwick that thirty years of age is the deadline. Even though one may be pretty "hard boiled," as he gets older he begins to get more mellow, and he begins to look at this human relations problem a little more carefully than he has in the past. The best way I know for a young man to get into executive management is to get into a corporation which is a permanent organization, and start in at the bottom. One out of three or four candidates may develop into excellent executive material.

Mr. Peachey—I think the young engineer should not overlook the fact that he, personally, has a lot of responsibility for educating himself. We have been talking here about whether the university should do it or the organization. On the other hand, if a young engineer wants to learn, he goes and gets some books about it and studies and practises. I think the young engineer of 22 or 23 just graduated, should dig into the thing and carry on from there as well as keep up with his technical specialty.

Dr. Gilbreth—I resent a little what the Admiral has said about the young engineers who have come in. It seems to me one of our great faults has been that there has not been proper selection and training of industrial scouts so that they can help the young engineer to fit into the place where his initiative will be useful and where the new material he has to contribute to the organization has a chance to show itself. I think you are pretty hard when you say most of them are of no use.

Fighting Services Provide Valuable Training

Admiral Cotter — You know there are a lot of people who have spent many years of their lives in the military services, who have grown up with it and have gone into private industry. Some of them are rather outstanding. To mention a few: General Somervell, who was Chief of Service and Supply, U.S. Army, is now president of the Koppers Company of Pittsburgh. Admiral Ben Moreell is president and chairman of the board of Jones & Laughlin Steel Corporation. Admiral Jack Towers, formerly Commander in Chief of the U.S. Pacific Fleet, is now a high executive of Pan American Airways. General Clay recently returned from Germany. He has two or three jobs — he is a director of the Marine Midland Trust Co., and also of Continental Can, and he has just taken over another job involving civilian defence for Governor Dewey. Admiral Earl Mills, president of Foster Wheeler Company, was Chief of the Bureau of Ships in the Navy Department. All these officers were trained during the years they were in the Service with one idea: when you had an order, carry it out. There were no excuses. If you got an order you carried it out. These people are broad enough to realize that in private industry you can't always do that.

Colonel Urwick—On the point of personal explanation, Mr. Chairman, I did not use the word "deadline". All I suggested was that thirty was rather a late age to come alive, supervisory-wise. It is true, confirming what the Admiral has just been saying, I have been preaching all my life that the fighting services have had centuries more experience in handling men in large quantities than modern industry, and modern industry should look at the fighting services and what they are doing. That is why I am stressing the point of getting your officer group out and beginning to train rather younger than we have been doing in industry.

Also I would refer to the second point I touched on earlier . . . taking more specific trouble with the men who are going right to the top. The fighting services do that in two ways. They pull out the top brains somewhere in the 28 to 34 bracket, and send them to an intensive staff training course which may last in the fighting service a couple of years. There they study the higher theory of their profession. Then they are given what industry very much lacks at present, a staff appointment as assistant to a General or an Admiral, where they are assistant to a chief and have to do the intellectual work of commanding without having to take the moral responsibility, which the chief takes.

I don't think we in industry realize what a magnificent training ground for future leadership the staff appointment of the fighting services provides. They ask the man to do the thinking for the chief, without asking him to shoulder the real job, which is the responsibility of leadership.

The Spiritual Aspect

Mr. Peachey — Here is another question: " In earlier remarks this morning it was said that the spiritual aspect of human relations was of primary importance. Why is it that in all discussion this side of the problem of management has not been brought out?"

Dr. Gilbreth — It seems to me that top management has a large responsibility in the field of setting the policies. Among those policies, of course, are the ones which have to do with human relations. If the person who has responsibility has himself a sense of spiritual values and a certain amount of serenity of spirit, which comes through those experiences, he should be far better equipped to handle that area, quite aside from the fact of what it may mean to his own life.

I think in our country the chief management exponent of this viewpoint is Professor Erwin Schell, of Massachusetts Institute of Technology. He not only has the inner convictions which many people share, but he has an ability to speak in this area which is rather rare. Most people find themselves slightly tongue-tied and unable to express themselves when it comes to the field of the spiritual and of the spiritual factor as it is a part of our whole management world.

To illustrate the fact that the feeling in this field is much stronger than the ability to express it, I met a young engineer in the management field in the subway not long ago and I asked how his work in management was going. He said it was going on very well. I said, " You think this is a matter of prime importance, especially the human side?" His reply was: "Dr. Gilbreth, the whole viewpoint of management, of responsibility, today is more than that; it is a way of life."

I think it is quite obvious that a young engineer who could make that remark had a keen appreciation not only of what ideals stand for, and the beliefs which after all affect policy, but he probably had a rich spiritual life of his own. So perhaps the chief difficulty at the present time is that in our work in the art of communication, not many of us as yet have been able to do what Professor Schell has done — exemplified in his own life what he so fully and frankly and increasingly is trying to put into the education of his engineers — those things that will help them participate in that area in the same way that he does.

The Problem of Selection

Mr. Peachey — There are several questions here pointing out that some people have rather innate and well developed instincts that make for successful management, and it would seem to be desirable from the economic angle alone to devote our energies and money to training those people. One question is: "What criteria can be used to select these young people for training?" It is a vital question, perhaps a rather difficult one to answer.

Mr. Ferrabee — I don't like to go back two questions, but I am still thinking of the engineer who wanted to get some training before he was thirty. I wonder whether he got the full answer. In as much as that, in my opinion, ties in with this question, might I go back to it?

One thing that has been left out of the discussion on education has been, to what extent we should try to screen those who get specific kinds of education. There is undoubtedly a great deal of maladjustment in the world, and quite a lot is in management, due to the fact that people who have the drive and the ambition to manage would have been much happier doing something else.

The young engineer who has been told something about where he can get information on management might also save himself possible delay in the process and get to the good life that has been mentioned quicker, by realizing that he is an individual. He is not just an engineer, he is a particular kind of person. If he has not attempted to analyze his personality and his aptitudes, I would suggest he do so. If he finds he has the capability, the aptitude and the interest in management, then there is no reason why he shouldn't go ' full out ' in getting all the information that has been described as available to him.

That applies to the engineer. On the general question of selection, a great deal of work has been done. There are a lot of things that can be found out very definitely about people. Tests and so forth are of a highly controversial nature I know, but speaking personally, I have been interested in the subject of selection and testing, for about fifteen years. In that time I have had an opportunity to test the tests, if you like to put it that way. I think it is highly dangerous, with such information at hand — the information that can be attained — to go back to the rule-of-thumb in selecting the individual and in selecting his work.

Educational Ability Not Enough

Mr. Peachey — There is another question here that is of interest: "If there are examinations to determine the course of management, are those examinations indicative of the qualifications required for satisfactory managers?"

The writer of the question suggested that the obtaining of school certificates, matriculation, and degrees, is not evidence of the type of intelligence required by employees. "Is the passing of examinations on Management conclusive proof of good management ability?"

I think the answer is "No". I would like somebody else to comment.

Colonel Urwick — Of course the answer is emphatically "No". Passing examinations is only evidence of certain intellectual qualities and certain knowledge. That rather hands out to the previous question. I was really glad that Mr. Ferrabee underlined the importance, if we take our responsibility at all seriously, of trying to make use of modern techniques to assist us with selection.

But let us dismiss from our minds any idea that these modern techniques are at present, or likely to be for some centuries, absolute. Our knowledge of the biochemistry of the nervous system as a background to individual and group psychology is in much too early a stage of development for us to be able to disregard in the long run, human judgment.

Dr. Gilbreth — I think we must not forget that one of the weaknesses up to the present is a lack of full descriptions of the jobs which people are to do.

The Society for the Advancement of Management made a survey of the graduates of certain schools of business administration, going out into industry to find out whether these people had the qualities that were asked for. They found that in many industries they had not made a full statement of what they wanted, and in a number of those cases did not *know* exactly what they wanted.

For example, very few will say that this person must have absolute integrity. If you say, "Why didn't you put that in?", they will say that of course they take it for granted everybody has to have that. I think a great deal too much is taken for granted in sending in a job description, especially when it comes to the human qualities. So you can't altogether blame any test group and feel the test is not adequate, if you haven't given a description of the sort of thing you want tested.

Labour and Management

Mr. Peachey—Here is a rather interesting point:

"Is the education of man designed to achieve only the satisfaction of management or is it to be designed to satisfy labour and management?"

Mr. McBride—That is a tough question. I would say that it must be all round. Certainly management has one problem, as far as productivity is concerned, but it is quite true that labour is something that more or less controls a great many factors in managing industry.

This question of wages doesn't affect only one plant. Wages now run toward a pattern. If one industry increases wages this usually spreads right across, and you all know what has happened in the last four or five years. It has been one wage increase on top of another. So satisfying labour is really one of management's first problems. To educate management on how to handle labour is something that probably even the universities would be stumped on. Labour is out to get all it can when it can get it. That is the big problem.

Certainly I am not one who thinks wages should be low. Obviously, our standard of living must keep on a certain standard to satisfy the masses. The only point that must be evident to everybody in this room is that there is only one source of wage increases, and that is productivity. Wage increases must be paid by every working man in the higher cost of the article which he buys. This question, "Should it be designed to satisfy labour?" is something I can't answer.

Dr. Gilbreth—I think we have to realize labour has its own management problems and management has its own labour problems, and as we try to find the likenesses rather than the differences, we are sometimes g e t t i n g somewhere. When you look back not so many years ago, you find it was awfully difficult to find common problems.

In regard to what the colleges and universities are doing in the new courses, and the new schools of labour-management relations, to begin with you are apt to have a group very much divided. When you finish you have a group able to get a common viewpoint. You have management going to the labour group and presenting its viewpoint, and you also have labour presenting its viewpoint to management . . . you are getting a start in the right direction. I agree that we haven't the answer, but I do think we seem to be getting to the point where some answer is coming up.

Turnover Rates in Management

Mr. Peachey—This question has been proposed: "For how many years can a manager keep a fresh approach and a real interest in the welfare of his employees? Should there not be a quicker turnover of managers than at present?" The writer doesn't suggest how to kill them off. It is quite an idea.

Admiral Cotter—I think the propounder of that question has got something. As a matter of fact, I think a survey made in the United States as to the ages of managers in large corporations indicated that the majority fell in the age group of 45 to 60 years. Some were much older and in some exceptional cases some were very much younger. The average age of people in top management is, I would say, between 50 and 60 years.

I think when you reach 60 years of age, or 64, you are getting a little bit old. If you haven't trained somebody to take your job over by that time I don't think you have done the job of managing very well. In other words, I think there ought to be change . . . I don't think one should keep on until he is forced to retire. Give the younger fellows a chance. Provide an incentive to people down the line.

Maybe the answer is that there should be a more frequent turnover of managers. I don't know about that. There is always room at the top for good men. I think if they get out between 60 and 65, and have done their job well they should be ready and willing to turn their jobs over to younger fellows.

Colonel Urwick—As I am tottering on the edge of sixty myself, might I just add a word? I think this is another of these cases where we have got to look at the fighting services. Now, in the British fighting services no man is allowed to hold the same responsible job for more than four years in peace time. That doesn't mean to say the Service spews him out. It merely insists on his changing his job. He goes on the list for re-employment again.

They have learned out of long experience, that a man doesn't keep his freshness in the same job for more than a certain period. As long as we are in business we associate the idea of a man falling out of a particular appointment with the idea that he is falling out of employment. But if you get a big corporation that says "You are employed by the corporation, you have a certain basic salary, but your appointment will be changed from time to time", then there is a healthy turnover that has no unpleasant personal implications. A man falls into the natural slot that his ability commands each four years, and he is assured of a change.

I don't think, particularly in some of the older countries like Great Britain, we have reached that point, and men stay in the job much too long, and it is very uncomfortable for their subordinates.

Public Speaking Training Important

Mr. Peachey—Here is a question of interest. I think Professor Hennessey should answer it: "I would like to suggest that participation in public speaking, debating, etc., is at a very low ebb in Canadian universities, and would like to ask what you think can be done about it."

Professor Hennessey — It must be agreed, I think, that at this time public speaking and debating are at a low ebb. It seems to me that this matter goes in cycles and the cycles are primarily the product of the undergraduates who happen to be at a given university at a given time. What can be done about it isn't too obvious, but I would like to suggest that those of you who have come from the universities and who have an interest in such things might do a great deal to stimulate more active participation by undergraduates if you, as graduates, came back and took your rightful part in those activities.

Mr. Peachey — "Shorter hours suggest more leisure time. Is management training employees to use this time to the best advantage?" This is getting away from our subject but it is a good question. Would anybody like to comment on that?

Dr. Gilbreth — During the last period of unemployment we found that in order to have real value to the individual concerned, he needed to have an interest in it and he had to take the initiative in it, and you could not prescribe or train for recreational facilities and expect to have the motivation you wanted.

Management in industry shares with all other activities, social and otherwise — libraries, community activities, and the like — the need to present interestingly and persuasively all of the opportunities there are to enrich one's life if one has the time to use them. But we must remember, that unless you have a certain amount of economic and emotional security you just are not in a position to take on this sort of thing.

All citizens share in the responsibility of sharing this problem. It is a social problem which goes through every area of life, and in which industry should take its full share. But for industry to say "we are definitely going to take over responsibility for training people or educating people as to what they might do in their free time", at the present state of affairs, would not work out as well as for industry to say "we are an interested, responsible part of the community, and we expect to help in this area in this great responsibility which a whole community faces to furnish opportunities as far and as fast as we can."

Mr. Peachey—It is almost noon, and we must stop. I think the panel could go on for hours, and there are plenty of questions unanswered. It is difficult to sum up a discussion of this sort and we have wandered rather widely.

The thing that sticks in my mind most from listening to the questions and answers is that the problem of education for management is obviously an important one and that its solution should not be left to chance. Every industry, university, organization and individual can usually do something about it. I think if you will all give thought as to what you can do, or what your organization can do, you will find that something should be done and could be done.

I would like to thank the audience on behalf of the panel for their kind attention and their participation by sending in the questions. I also want to thank the members of the panel for so kindly assisting in this discussion. √

THE LOSS OF FREEDOM

"Freedom being a matter of degrees, the great danger for those who have not been immunized by experience is the smoothness of transition to successive degrees of unfreedom. This goes for the whole of our Western civilization. The great catastrophes of history, like the decay of Rome, did not come in one spectacular crash, but by a smooth tobogganing down the slope, which may last centuries or decades.

—Arthur Koestler

The Yogi and the Commissar.

From Month To Month

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

Joint Engineering Conference

On the occasion of the Festival of Britain, a Joint Engineering Conference will be held at the Institutions of Civil, Mechanical and Electrical Engineers in London from Monday, 4 June, to Friday, 15 June, 1951.

The theme of the Conference will be to place on record the contribution to civilization made by engineers during the past 100 years and will afford an opportunity for discussing the future trends in developing the great sources of power in Nature for the use and convenience of Man.

The interdependence of all branches of Engineering and the ever-growing co-operation of the members of the three major Engineering Institutions in Great Britain will be emphasized at the Conference.

The Conference is open to all members of the three Institutions and to members of the Institutions and Societies participating in the Conference of Commonwealth Engineering Institutions or the Conference of the Engineering Societies of Western Europe and the U.S.A. Members of these Institutions and Societies are cordially invited to attend and to take part in the discussions.

In addition to the Technical Sessions there will be a full programme of social events and visits to works and places of interest; the attendance of ladies will be welcomed.

A list of the subjects to be discussed is given at the end of this notice. So that the major portion of each session can be devoted to discussion, papers will be presented at the Conference in abstract. Advance copies of the papers will be available some time before the date of the Conference.

Engineering Institute members interested in the Conference are asked to request further information about the programme, registration fees, etc., from the Headquarters of the Institute at Montreal.

Further announcements regarding the Conference will be made as details are determined.

List of Subjects to be Discussed

Road Transport, Sea Transport, Power, Railways, Aviation, Education and Training (civil, mechanical and electrical engineering aspects).

Telecommunications (civil and electrical engineering aspects).

Mining (mechanical and electrical engineering aspects).

Public Health in municipal engineering.

Water Supply.

Sewerage and Sewage Disposal.

Steelworks plant.

Gas Industry plant.

Technique of electrical measurements.

Television.

Cable manufacture, particularly gas pressure cables.

Electric lighting.

COVER PICTURE

A general view of the Des Joachims Development taken in January, 1950. This development has a total of 580,000 yards of concrete for main dam and powerhouse and an additional 270,000 yards in a control dam.

Note in foreground temporary housing over scroll cases allowing work to proceed under normal conditions.

A Century of Engineering

To mark its 100th birthday in 1952, the American Society of Civil Engineers has sponsored the formation of a non-profit corporation, Centennial of Engineering 1952 Inc., to organize what is expected to be the greatest convocation ever held by the engineering profession. The celebration will be centered in the Museum of Science and Industry in Jackson

Park, Chicago, and will run from July 1st to September 30th, 1952.

Maj. Lenox R. Lohr, president of the Museum, has been elected president of the corporation. He was selected because of his experience as general manager of "A Century of Progress", the Chicago World's Fair of 1933-34, and president of the Chicago Railroad Fair of 1948-49.

The centennial will include a variety of activities for both the general public and the professional engineer. Opening in early June will be a new permanent educational exhibit designed to bring home to visitors the tremendous contributions made by engineering during the past 100 years. There will be appropriate temporary exhibits by engineering and industrial firms and a dynamic stage production of high entertainment value will be presented several times daily during the remainder of the summer to tell the human interest story of technical advancement.

Between September 3rd and 13th, the constituent societies of the Engineers Joint Council, together with the American Institute of Architects, the Engineering Institute of Canada, nearly a hundred other national, international, and regional engineering societies, and the great engineering schools, will unite with A.S.C.E. in its Centennial celebration.

R.C.E. Memorial Scholarships

During the Second World War, Brig. G. Walsh, C.B.E., D.S.O., M.E.I.C., chief engineer of the First Canadian Army in North West Europe initiated the collection of voluntary contributions from all ranks of the Royal Canadian Engineers overseas and in Canada for a memorial to sappers who lost their lives in the War.

As reported in the September 1949 issue of the *Journal* (P. 572) the engineers have wisely chosen to use the fund for the provision of scholarships for engineering students who are members of the Canadian Officers' Training Corps.

The first awards were made last year and the R.C.E. Committee under the chairmanship of Brigadier J. L. Melville, C.B.E., M.C., M.E.I.C., has recently announced the awards for 1950. The following student engineers will each receive the sum of $125.00 in recognition of their academic excellence and the qualities of leadership they have exhibited in the work of the C.O.T.C. and in student affairs generally: J. Claude Lanoie, S.E.I.C., George Walter Jull, S.E.I.C., Jean Paul Bonneau, S.E.I.C., B. R. Bourke, S.E.I.C.

Presentation of the scholarships will be made by distinguished officers or ex-officers of the Corps of Royal Canadian Engineers, after the opening of the fall term at each university. Due to a change in curriculum at the University of New Brunswick no student was eligible for this year's awards.

The Engineering Institute of Canada congratulates these student engineers and wishes them continued success in their efforts.

Result of Ballots for Amendments to By-laws

We, the undersigned, having been appointed scrutineers to canvass the ballots for the proposed amendments to the by-laws, certify that the ballot has been duly counted with the following results:

Total number of ballots received 1,671
Spoiled ballots 14

Ballot No. 1 (Proposed amendments to Sections 13, 14 & 15)

Yes 1,547
No 93

Ballot No. 2 (Proposed amendment to Section 21)

Yes 1,364
No 287

Ballot No. 3 (Proposed amendment to Section 22)

Yes 1,610
No 42

Respectfully submitted.

I. R. Tait, M.E.I.C.,
E. B. Jubien, M.E.I.C.,
Leon A. Duchastel, M.E.I.C.,
Scrutineers.

Nominees for Office

The report of the Nominating Committee, as accepted by Council at the meeting held on September 9th, 1950, is published herewith for the information of all corporate members as required by Section 19 and 40 of the by-laws:

President: Ira P. Macnab, Halifax, N.S.

Vice-Presidents:

*Zone "A" (Western Provinces)	J. W. Sanger	Winnipeg
*Zone "B" (Prov. of Ontario)	C. G. R. Armstrong	Windsor
*Zone "C" (Prov. of Quebec)	J. B. Stirling	Montreal

Councillors:

†Newfoundland Branch	J. W. Morris	St. John's
†Halifax Branch	M. L. Baker	Halifax
†Saint John Branch	D. O. Turnbull	Saint John
†Saguenay Branch	W. P. C. LeBoutillier	Kenogami
†St. Maurice Valley Branch	Milton Eaton	Shawinigan Falls
‡Montreal Branch	H. Gaudefroy	Montreal
	A. S. Rutherford	Montreal
†Ottawa Branch	A. C. Ross	Ottawa
†Kingston Branch	M. G. Saunders	Kingston
§Toronto Branch	E. R. Graydon	Toronto
†London Branch	V. A. McKillop	London
†Border Cities Branch	G. W. Lusby	Windsor
	J. M. Wyllie	Walkerville
†Sudbury Branch	E. R. Eaton	Sudbury
†Lakehead Branch	S. E. Flook	Port Arthur
†Saskatchewan Branch	E. J. Durnin	Regina
†Edmonton Branch	H. W. Tye	Edmonton
†Kootenay Branch	A. H. W. Busby	Trail
¶Vancouver Branch	G. W. Allan	Vancouver
	P. B. Stroyan	Vancouver
†Victoria Branch	R. Bowering	Victoria

* 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 two years each.
¶ One councillor to be elected for one year and one councillor to be elected for two years.

Maritime Professional Meeting

Once again the Maritimes have done it. No matter how successful meetings of the Institute in other parts of Canada may be, the Maritimers usually come along and establish another new record. Maybe it is because they have such lovely places as the Pines at Digby, the Algonquin at St. Andrews, Pictou Lodge, and White Point Beach at which to hold the meetings. Maybe it is because they enjoy such favourable relations with the weather man, or maybe it is just because they are themselves. It could be a combination of them all. No matter what causes it, the fact remains that joint meetings of the Institute with the two provincial associations are always delightful affairs—and none of them more so than the one held at The Pines, Digby, in September.

At any meeting, weather is an important consideration, but particularly so for a Summer meeting. The three days picked out for this occasion were perfect, with warm bright sunshine, and clear invigorating air. Consequently it was to a substantial extent, an outdoor meeting. The temptation to skip the professional sessions was strong but consciences were strong also, and all meetings were attended by capacity audiences.

The technical programme was not too exacting. There were two papers on each of the two mornings, and the afternoons and evenings were free for recreation "as you like it," according to the printed programme.

On Thursday morning after a breakfast programme of an exhilarating nature, the technical programme was opened with an address by Everett S. Lee, executive engineer, consulting laboratory, General Electric Co., Schenectady, N.Y.; a past-president of the American Institute of Electrical Engineers and past chairman of Engineers' Council for Professional Development. He spoke on "Science and Engineering." It was a brilliant talk received by the audience with great enthusiasm. Unfortunately Mr. Lee spoke from notes only and there is no manuscript for publication in the Journal.

The next speaker was J. Rod. Wallace, metallurgical engineer, research department, Dominion Iron and Steel Limited, Sydney, N.S. His subject was "Foamed Slag — a Light Aggregate". This too proved to be an interesting topic, and it is hoped there will be something on it for a later issue of the Journal.

At luncheon L. D. Hopkins, president of the Nova Scotia Association was in the chair. A welcome was extended by G. E. Moorehouse, the mayor of Digby. The speaker was Milton S. Green of Bowaters Newfoundland Pulp & Paper Mills Limited, who spoke on "A Story of Newfoundland"— and did it well. He was introduced by E. L. Baillie, chairman of the Newfoundland Branch of the Institute. Dr. I. P. Macnab spoke also as vice-president of the Dominion Council and the general secretary was asked to speak on behalf of the Council of the Institute in the absence of the president.

The afternoon was given over to golf for the men, putting for the women, and puttering for all those who liked neither of the alternates. This pleasant relaxation was terminated by the call to dinner, which of itself proved to be no dull occasion. The chairman was Dr. E. O. Turner of Fredericton, vice-president of the Institute, and the speaker was L. A. Forsyth, K.C., president of Dominion Steel & Coal Corporation Limited. He was introduced by Harvie W. L. Doane who stated among other things, that he was a long time friend of Mr. Forsyth's and therefore took advantage of the fact. Mr. Forsyth, when his turn came around, announced emphatically that the friendship had been discontinued as of that moment!

Mr. Forsyth spoke at considerable length, but with breadth and depth also. His subject as announced was "Law and Engineering" but at the outset he warned he was going to wander from it. He left a real challenge with the profession, suggesting that in the field of management and labour relations, the engineers were in a unique position to render a great service to the people.

Head table at dinner on Friday, at the Maritime Professional Meeting. Left to right, President James A. Vance of Woodstock, Ont.; Mrs. R. M. Richardson, Saint John; Mrs. R. Flitton, Toronto; Hon. Harold Connolly, Minister of Health of Nova Scotia; L. E. Mitchell, Halifax, general chairman of the Meeting; C. M. Anson, Sydney, N.S.; Mrs. Vance; Lt.-Col. Muiser, of Halifax, Army Chief of Staff, Eastern Command; Mrs. J. D. Fraser, Halifax; Mr. R. M. Richardson, Saint John; Mrs. Anson; Mr. J. D. Fraser, Halifax; and Mrs. G. D. Anderson, chairman of the Ladies' Committee.

After dinner there was the "Grand Ball". It was quite an affair which in various forms seemed to run on well after the advertised hour of closing.

Next day, Friday, breakfast was just normal.

The technical session started at 10 a.m. with a paper by Eric Hinton of Deer Lake, Nfld., hydro-electric manager for Bowaters, on "Hydro Electric Power in Newfoundland". The chairman was Donald O. Turnbull, chairman of the Saint John, N.B., branch of the Institute. The second paper was on "Oil for Canada" presented by Fred C. Mechin, director of Imperial Oil Limited, Toronto. Norman B. Eagles, chairman of the Moncton Branch presided.

At luncheon the speaker was the distinguished Dr. Lillian M. Gilbreth of Montclair, N.J. Her subject was "Does Scientific Management Consider Spiritual Values?" It was a carefully prepared, well delivered, thought-provoking address that brought the audience to its feet in applause. Without in any way criticizing employers she called attention to the real necessity of keeping spiritual values in the forefront of all plans for labour.

The chairman of the ladies' committee, Mrs. G. D. Anderson presented Dr. Gilbreth with a beautiful bouquet of red roses, on behalf of the ladies. It was a delightful tribute to this outstanding engineer.

The chairman of the luncheon was John P. Mooney, president of the New Brunswick Association, and the speaker was introduced by Dr. Ira P. Macnab, who incidentally did a fine job of it.

Again the afternoon was free for relaxation. In the pool there was an exhibition of diving, swimming, and burlesque as staged by a group from the nearby training depot, H.M.S. Cornwallis. Tea was served on the lawn on as perfect an afternoon as any one could wish for.

At the dinner, L. E. Mitchell of Halifax, was in the chair and the speaker was introduced by C. M. Anson of Sydney. The Honorable Harold Connolly who was Minister of Trade and Industry of Nova Scotia when the programme was printed, appeared before the group as the recently appointed Minister of Health and Welfare. He set no title to his talk, which of course gave him plenty of leeway, which

Golf Results at Digby

Men's Golf Tournament

T. A. Somerville	Low gross (42)
Dr. E. O. Turner	Second low gross (44)
M. W. Cunningham	Low net (70) (18 hole basis)
R. N. Fournier	Second low net (71)
E. Hinton (Newfoundland)	High gross (130) (Most honest man in tournament)
O. N. Mann	Low score on the obstacle hole (7)

"Out of the Bag" Golf Prizes

I. R. Tait	Combination bunt and foul ball of No. 15 Tee (a baseball bat)
E. L. Baillie	Hitting Golf Ball too far (a soft ball)
C. D. Martin	A more effective tool for use in the woods (a hatchet)

Women's Putting Tournament

Mrs. W. A. Williamson	Low score (19)
Mrs. F. L. West	Second low score (20)
Mrs. E. O. Turner—Runner-up	Second low score (21)
Mrs. H. A. Marshall	Most honest player (highest score)

(Left) At the Friday luncheon Mrs. G. D. Anderson (left) presented a bouquet to guest speaker Dr. Lillian Gilbreth.

(Right) I. P. Macnab of Halifax (right) is shown here checking up to ensure that President Vance is properly registered.

leeway he pretty well used throughout the session.

Mr. Connolly was bright and witty and unusually frank for a politician. He dealt with situations in Nova Scotia without disclosing anything startling or new, but he did make an impression on his audience when he stated there were no Canadian engineers competent to do a type of work related to the fish industry in which he was interested. Mr. Connolly was a bit mistaken in this but everyone took it good naturedly including Mr. Connolly. He has since been informed of where he can find the desired engineers—in Canada.

After the dinner, an unusually fine programme of entertainment was presented. The artists though few in number were excellent, and most generous.

Saturday morning saw a regional meeting of Council with the president in the chair. There was an excellent turnout and several very fine discussions.

Great credit goes to the committee. L. E. Mitchell was general chairman, but he was ably assisted by his vice-chairmen, J. D. Fraser and E. C. Thomas. Special mention should be made of Ira Macnab for his work as chairman of the papers committee. It was an excellent programme and every member of the committee deserves individual mention for the essential part he played—particularly the ladies under the chairmanship of Mrs. G. D. Anderson.

The "M.P.E." room also was a great success. This is the Maritime version of Muriel's Room. Like the rose called by any other name it was just as popular. The club-like atmosphere of the hotel was an excellent background for this activity.

The attendance was very satisfactory. Every room and cottage was occupied but the overflow to neighboring hostelries was not great. Everything was just right.

Discussion

Paper—Foundations for the Coliseum in Quebec City, by Leon A. Fraikin, M.E.I.C. This paper was published in condensed form in the May issue, Page 366.

Discussion by Mr. W. E. Bonn, M.E.I.C., chief engineer of Canadian Dredge & Dock Company, Toronto.

For this particular structure, it was essential to obtain a foundation condition on which little displacement, elastic or otherwise, could be allowed.

To obtain this condition the designers had to apply a pre-stressing condition which could be relied on to remain in the foundation until such time as the permanent load was placed.

For this reason, a type of pile was selected which permitted the design loading to be imposed during the construction, not only into the material entering into the pile, but also into the ground surrounding the base of the pile. This was accomplished by forcing the concrete into place and compressing the concrete, thus increasing its bearing value to the desired amount.

As this condition of the soil takes place a considerable distance below the ground surface, the prestressing is actually built in, and subsequent loading, up to the design loading, should not cause any appreciable displacement.

The writer knows of no other method of applying pre-stressing than that selected by the engineers responsible for the design of this important structure. He understands they were fully justified by the results obtained on the successful completion of the structure.

Discussion by Mr. Robert Zaborowski, engineer in charge, Roberts & Schaeffer Company, New York City.

The design of the abutment slabs was difficult. For such a wide span, the transverse resistance necessary was very high. The design had to be such that only ½ in. displacement under dead load would result. The final condition showed only ⅜ in. displacement. This project illustrated the importance of complete site exploration by a soil consultant before beginning the design of foundations.

Visitor from England

From time to time the Institute has the pleasure of entertaining distinguished engineers from other parts of the world. Recently Sir Pierson Frank of London, England was at Montreal, and several officers had the privilege of meeting him. Here he is shown with vice-president R. E. Heartz (left) and past-president de Gaspe Beaubien (right). During the second World War Sir Pierson was engineer to the London County Council and in 1947 he retired to join the consulting engineering firm of Coode, Vaughan-Lee, Frank, and Gwyther.

News of Other Societies

Canadian Good Roads Associaiton. — C. W. Gilchrist, O.B.E., formerly director of information services for the Department of National Health and Welfare, was recently appointed managing director of the Canadian Good Roads Association. He succeeds G. A. McNamee of Montreal who founded the Association in 1914.

Mr. Gilchrist's appointment is part of a programme of expanded activity which includes the transfer of the headquarters from Montreal to Ottawa. With the increasing importance of better highways in the peacetime economy of the country—and the vital necessity of adequate road systems in time of war or national emergency, the Association will endeavour to enlist all interested individuals, groups, and organizations in what its retiring president Hon. Errick Willis, Manitoba Minister of Public Works has referred to as "a co-ordinated programme of activity" and "a truly national endeavour".

The Association held its 31st annual convention in Winnipeg in the latter part of September at which meeting, Hon. J. T. Douglas, Saskatchewan Minister of Highways and Transportation was elected president for 1950-51.

The **19th National Exposition of Power & Mechanical Engineering** will be held in Grand Central Palace, New York from November 27 to December 2. It will be under the auspices of the American Society of Mechanical Engineers and will be held in conjunction with the annual meeting of that society for which the dates are November 26 to December 1.

The 30th Annual Meeting of the **Highway Research Board** of the National Research Council (U.S.A.) will be held in the building of the National Academy of Sciences in Washington, D.C. from January 8th to January 12, 1951.

The Annual Meeting of the **American Institute of Chemical Engineers** is scheduled for December 3, to 6, 1950 at the Neal House Hotel, Columbus, Ohio.

Personals

Notes of the Personal Activities of Members of the Institute

J. A. McCrory, M.E.I.C., president of the Shawinigan Engineering Company, Montreal, was recently the recipient of two very high honours.

At the opening meeting of the Montreal Branch of the Institute held at the Windsor Hotel on the evening of September 28, President J. A. Vance presented to Mr. McCrory the Julian C. Smith medal "for achievement in the development of Canada". This award

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

was made to Mr. McCrory and also to Mr. G. A. Gaherty of Montreal at the meeting of Council in December last year. Because he was a Canadian delegate to the World Power Conference in England last July, Mr. McCrory was unable to attend the Toronto Annual Meeting when the presentation was to have been made.

At its Founders Day convocation on October 6th, McGill University conferred on Mr. McCrory the honorary degree of doctor of science. In presenting him to the chancellor for the award, Prof. J. J. O'Neill, dean of engineering, drew particular attention to the contribution made by Mr. McCrory to the development of the immense power resources of the St. Maurice River, which development in turn has made possible so much of the industrial development of the Province of Quebec.

H. Lloyd Johnston, M.E.I.C., who has been, for the past twelve years, works manager of Canadian Industries, Limited, in Windsor, is being transferred to Montreal where he will enter the engineering department at the head office in charge of important expansion work being undertaken in the Montreal area.

Mr. Johnston joined C.I.L. at Montreal in 1936, and in 1938 he was transferred to the Windsor, Ont. plant of the Company. Prior to joining C.I.L., he was with the paper industry. He is a veteran of World War I, where he won the Military Cross and was mentioned in dispatches as a member of the Royal Canadian Engineers and the Royal Garrison Artillery. He also held the rank of major in the 30th Reconnaissance Regiment Reserve during World War II. He is a member of the Windsor Garrison Officers' Mess.

Mr. Johnston is past-president of the Border Cities Branch of The Engineering Institute of Canada.

W. H. Chisholm, M.E.I.C., of Dartmouth, N.S., district sales manager for Northern Electric Company, Limited, Halifax, is

W. H. Chisholm, M.E.I.C.

the chairman of the Halifax Branch of the Institute.

Mr. Chisholm was born at Halifax, and is a graduate of Nova Scotia Technical College, receiving the degree of B.Sc. in mechanical engineering in 1916. He joined the Northern Electric in 1919 working for their sales department.

A. W. F. McQueen, M.E.I.C., general manager of the Niagara Falls engineering firm of H. G. Acres and Company, has been appointed chief engineer of the Grand River Conservation Commission.

Mr. McQueen graduated from the University of Toronto in 1923 and entered the service of the Hydro-Electric Power Commission of Ontario. For three years he was assistant engineer of tests and for another three years he remained with the Commission in charge of various hydrological and hydraulic investigations. In 1927 he became assistant engineer with H. G. Acres and Company, Limited, consulting engineers, Niagara Falls, Ont., and in 1934 hydraulic engineer. He is the author of several papers that have been published in the Journal. In 1932 he was awarded the Past-Presidents' Prize for a paper on "Engineering Education". In 1938 he was the joint author of the paper "The 18-Foot diameter Steel Line of Outardes Falls", which was awarded the Gzowski Medal. He was chairman of the Niagara Peninsula Branch of the Institute in 1939.

W. E. Patterson, M.E.I.C., manager of engineering and development for Merck & Co., Limited, Montreal, was appointed director of publications of The Chemical Institute of Canada at a recent meeting of the Board of Directors of that Institute.

Mr. Patterson's duties will include supervision of the Institute's monthly journal, "Chemistry in Canada", and any of the other activities of the Institute of a public relations nature.

He is a graduate of Queen's University receiving the degree of B.Sc. in chemistry and metallurgy in 1924.

F. W. Taylor, M.E.I.C., is going into the consulting field, with offices, in Toronto, specializing in warm air heating and air conditioning.

During the past four years, Mr. Taylor has served as the Chapter Engineer of the Canadian Chapter, National Warm Air Heating and Air Conditioning Association. Primarily, the position was one of training dealer members of the Association in the understanding and application of the Association's codes and manuals. In this capacity he travelled across Canada four times and instructed some 1800 heating contractors at 40 school sessions.

Mr. Taylor is a graduate of the University of Toronto, and did post graduate work at the University of Illinois, Urbana, Illinois. He is a registered professional engineer in the Province of Ontario, a member of The Engineering Institute of Canada and an associate member of the American Society of Heating and Ventilating Engineers.

In his new position, Mr. Taylor's services will be available for a period to the Canadian Chapter on a part time basis.

R. T. P. Houlihan, M.E.I.C., has been appointed manager of the apparatus division, western district, of the Canadian Westinghouse Company.

He graduated from the University of Alberta in 1941 and joined the Westinghouse Graduate Student Training Course that same year.

Upon his retirement as a lieutenant following service with the Royal Canadian Navy, he joined the staff of Westinghouse Western District at Winnipeg as an apparatus salesman, from which post he assumes his new duties.

G. S. G. Henson, M.E.I.C., has been placed on loan from his permanent employer, The Winnipeg Electric Company, as secretary and costing engineer for The Greater Winnipeg Dyking Board, Winnipeg, Man.

Mr. Henson is a graduate of the University of Manitoba, receiving a B.Sc. degree in electrical engineering in 1935. He served with the Royal Canadian Air Force, Aeronautical Engineering Branch, during World War II.

J. G. Hoba, M.E.I.C., who was with the export division of Ford Motor Company of Canada, has returned to the Kelsey Wheel Company, Limited, Windsor, Ont., as an industrial engineer. In 1941 he was working with Kelsey Wheel on time study, production routing, and cost estimating, and in 1944 he became an industrial engineer for the Company. He joined the Ford Motor Co. of Canada, Windsor, Ont., in 1949.

H. A. Lancefield, M.E.I.C., has joined The Goodyear Tire & Rubber Company of Canada, Limited, as a field engineer for the mechanical rubber goods department.

The duties of Mr. Lancefield's new position will take him from coast to coast in Canada. He is a graduate of the University of Saskatchewan in mechanical engineering. During the war he served for three years in the Aeronautical Engineering Division in the R.C.A.F. and after his discharge was associated with the Mathews Conveyer Company on design and layout conveyer machinery.

H. A. Lancefield, M.E.I.C.

E. L. Miller, M.E.I.C., of Arvida, Que., is now with Sprostons Ltd., Mandeville, Jamaica, B.W.I.

Mr. Miller graduated from McGill University in 1936 with the degree of B.Eng. in civil engineering, and in 1945 went to Jamaica, B.W.I., to work for the Jamaica Bauxite Company. In 1946 he was employed by the Aluminum Company of South Africa, in Pietermaritzburg, South Africa. Upon his return to Montreal, he worked at the Aluminium Laboratories.

A. G. Watt, M.E.I.C., who is with the Saint John Dry Dock Co. Ltd., has been promoted to assistant chief engineer. He was previously chief draughtsman in the structural steel department of this Company.

Major F. D. Gifford, M.E.I.C., has been appointed to the engineering staff of the Department of Resources and Development, Special Projects Branch, Trans-Canada Highways Division, as inspecting engineer with headquarters at Sudbury, Ont.

He was previously resident engineer for the Huntsville Division of the Department of Highways, Ont.

J. L. deStein, M.E.I.C., has been named associate professor of civil engineering at McGill University, Montreal.

Mr. deStein obtained a B.Sc. degree in civil engineering from the University of Saskatchewan in 1939. In 1940 he joined the Aluminum Company of Canada in Montreal. He received his master of engineering degree (civil) from McGill in 1946.

J. E. Armand Dugas, M.E.I.C., formerly president of Power Survey and Equipment Limited, Montreal, Que., is now a consulting electrical engineer, specializing in industrial power applications and costs. Previous to being appointed president of Power Survey and Equipment Limited, he was with the industrial department of the Quebec Hydro-Electric Commission. During the war, Mr. Dugas was with the electrical division of the Works and Buildings Branch of the R.C.A.F. No. 3 Training Command in Montreal.

He graduated from Ecole Polytechnique in 1932, with the degree of B.A.Sc.

J. Haimes, M.E.I.C., chief engineer of Lethbridge, Alta., is retiring from the public service at the end of the year.

Mr. Haimes was born at Barnsley, Yorkshire, where he was educated in the local public and technical schools and served his apprenticeship as a mining engineer in the Wharncliffe Collieries, Limited, Barnsley. He came to Canada in 1911 as an instrument-man for the City of Lethbridge, later becoming office engineer. Then he was appointed to the post of city engineer. During the First World War he served in France from 1916 to 1918. Upon his return to Canada in 1919 he became assistant city engineer at Lethbridge. He was appointed city engineer in 1930.

Edward H. Beck, M.E.I.C., for many years superintendent with E. G. M. Cape and Company, engineers and contractors of Montreal, retired on pension last month in accordance with the Company's retirement plan. Mr. Beck was responsible for many important projects for this Company in Quebec, Nova Scotia and Newfoundland.

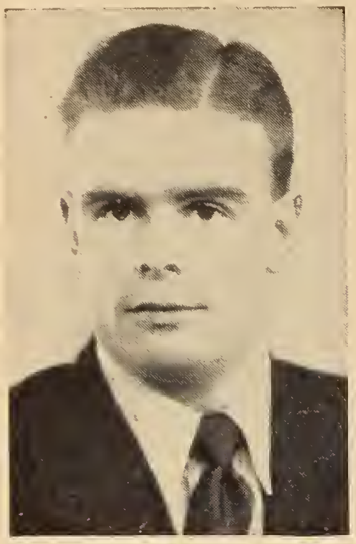
Previous to joining E. G. M. Cape & Co., he was a structural engineer with the National Research Council, Ottawa, Ont.

R. J. Scarabelli, JR.E.I.C., has joined the sales staff of Gardner-Denver Company (Canada) Limited, Quincy, Ill., U.S.A. Prior to this he was employed by the

Department of Public Works of Canada in Ottawa, Ont.

A. E. Benn, S.E.I.C., is now working for Wallace A. Mackey Limited in Weston, Ontario. He was previously with the Highway Location Survey at Whitehorse, Y.T.

He graduated from Queen's University in civil engineering in 1948.



F. Squires, S.E.I.C.

Frank Squires, S.E.I.C., sales engineer of Ferranti Electric, has been assigned to the central district sales division (Ontario), serving both the meter and transformer division of the Company.

Mr. Squires graduated from University of Toronto in 1949 with a degree of B.Sc. in electrical engineering.

Prior to graduation and joining Ferranti Electric Limited, he did considerable radio work in Oshawa, Stratford, Winnipeg, and Vancouver.

Visitors To Headquarters

M. J. Marshall, U.K. Trade Commission, Montreal, Aug. 14, 1950.

W. V. Nickelson, Jr.E.I.C., Trail, B.C., Aug. 30, 1950.

M. Glover, M.I.C.E., London, England, Aug. 30, 1950.

W. H. Bateman, M.I.Mech.E., London, England, Aug. 30. 1950.

A. A. Swinnerton, M.E.I.C., Ottawa, Ont., Sept. 7, 1950.

C. J. Oliver, M.E.I.C., Rio de Janeiro, Brazil, Sept. 8, 1950.

J. A. Van den Broek, M.E.I.C., Ann Arbor, Mich., U.S.A., Sept. 15, 1950.

R. K. Wills, M.E.I.C., Fredericton, N.B., Sept. 16, 1950.

W. L. Saunders, M.E.I.C., Owen Sound, Ont., Sept. 20, 1950.

J. F. Wickenden, M.E.I.C., Three Rivers, Que., Sept. 20, 1950.

W. R. Kennion, A.M.I.E.E., London, England. Sept. 20, 1950.

L. Dougherty, Montreal, Que., Sept. 20, 1950.

A. C. M. Davy, Commodore (E) R.C.N., M.E.I.C., Ottawa, Ont., Sept. 27, 1950.

Obituaries

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

S. C. H. Hill, M.E.I.C., of Shawinigan Falls, Que., died on September 4, 1950, after a short illness.

Mr. Hill was born at Richmond, Que., and received his engineering education at McGill University, Montreal, Que., where he graduated in 1921. After a short period of work for other firms he joined the Shawinigan Engineering Company in 1923. He worked on the power developments in Shawinigan Falls and La Gabelle. In 1924 he was transferred to the Shawinigan Water & Power Company, and moved to the Relay Department in Montreal. On March 1, 1938, he was transferred to Victoriaville, Que, as superintendent No. 4 district, operating department of the Shawinigan Water & Power Company. On January 1, 1950, he was transferred to Shawinigan Falls as assistant to the superintendent, substation division, generating and transmission department of the Shawinigan Water & Power Company, and held this position at the time of his death.

Mr. Hill was an associate member of the American Institute of Electrical Engineers, a member of The Corporation of Professional Engineers of the Province of Quebec, and the Canadian Electrical Association. He joined the Institute as a Student in 1919, transferring to Associate Member in 1930 and to Member in 1940.

John C. Holden, M.E.I.C., civil engineer of Winnipeg, Man., died on August 23, 1950, after a long illness.

Mr. Holden was born at St. John, N.B., in 1876, and graduated from the Royal Military College, Kingston, in 1896. That summer he worked on military reconnaissance for the Canadian Government. He joined the Canadian Pacific Railway in 1896 where he remained till his retirement in 1941.

He became an Associate Member of the Institute in 1908, transferred to Member in 1919, and was elected to Life Membership in 1946.

E. L. Thorne, M.E.I.C., construction engineer with Standard Construction Company Limited at Halifax, died on August 6, 1950, after an illness of almost a year.

Born in Dartmouth in 1886, he was educated in Dartmouth schools and St. Andrew's College, Halifax, from which he graduated with a B.Sc. degree in civil engineering in 1910. After graduation he worked on designing and installation of sewage disposal, water supply, and electrical plants in Saskatchewan. In 1912 he was town engineer for Rouleau, Sask., and in 1913 he became assistant engineer for Pier 2 of Halifax.

Subsequently he was construction engineer for the Eastern Trust Company, resident engineer on construction for the late C. A. Fowler, architect, and in 1940 he joined the Standard Construction Company in Halifax.

Mr. Thorne joined the Institute as a Member in 1945.

G. E. Treloar, M.E.I.C., formerly chief engineer for the Sarnia Bridge Co. Ltd., Toronto, Ont., died September 11, 1950.

Mr. Treloar was born at Toronto in 1893. He was a graduate of the University of Toronto, receiving a degree of B.A.Sc. in 1914, and a M.A.Sc. in 1915. Joining the Dominion Bridge Co. Ltd., in 1916, he was connected with design work until 1926. During the following ten years he was active as a consulting engineer. In 1934 he joined the Sarnia Bridge Company as branch manager and became chief engineer in 1940. He retired from this latter position in 1949. Mr. Treloar was also president of the T. Tomlinson Foundry Co. Ltd., which post he held at the time of his death.

He was a member and past president of the Engineers Club of Toronto and a past president of the Canadian Institute of Steel Construction. He was also a member of the Association of Professional Engineers of Ontario. He joined the Institute as a Member in 1946.

H. A. Morrison, M.E.I.C., of Amherst, N.S., passed away suddenly on August 10. 1950.

Mr. Morrison was born at Halifax, N.S., in 1882, and started his engineering career in 1905, being associated with the firm of MacKenzie and Mann, Toronto, working in Nova Scotia and Northern Ontario. He was later with the Hydro-Electric Co. in Ontario for eight years.

He joined the engineering staff of the N.S. Department of Highways 20 years ago and was transferred to Amherst as divisional engineer for Cumberland eight years ago.

He became a Member of The Engineering Institute of Canada in 1940.

M. B. Atkinson, M.E.I.C., of St. Catharines, Ont., died September 4, 1950.

Mr. Atkinson was born in Westmount, P.Q., in 1879. He graduated from McGill University in 1904 receiving a B.Sc. degree in mining.

Formerly associated with the Dominion Bridge Company, Montreal. Mr. Atkinson had been retired since 1947. He had worked with the Canadian Government on bridge construction throughout Canada and at one time was on loan from the Dominion Government as a consultant to the British Government. He was bridge engineer for the Welland ship canal during its construction and a staff member until his retirement.

He joined the Institute in 1904 as a Student, transferring to Associate Member in 1909 and to Member in 1918.

News of the Branches

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

Cornwall

J. A. Sarjeant, jr.e.i.c.
Secretary-Treasurer

A. A. B. McMath, m.e.i.c.
Branch News Editor

On September 6th, members of the Cornwall Branch Executive met with Chairman G. G. M. Eastwood, at his summer cottage. Those attending included D. Ross-Ross, R. H. Wallace, F. E. Trewartha, R. H. Nasmyth, A. A. B. McMath and Branch Secretary J. A. Sarjeant. An expression of appreciation was made to Mr. Sarjeant for taking over the duties of Secretary, after the departure of L. H. Snelgrove for England.

Plans for the fall season were discussed. To close the evening, a social period was spent with Mr. Eastwood and members of his family.

Saguenay

F. E. Hogg, m.e.i.c.
Secretary-Treasurer

On Friday, September 8, 1950, following the annual business meeting, a programme was given which was of great interest to members of the Saguenay Branch. The new chairman, Mr. J. F. Braun, m.e.i.c., presided. Forty members attended.

E. N. Coulthart, m.e.i.c., introduced the speaker, Karl Roestad, resident engineer for the Aluminum Company of Canada during the construction of the new building which houses Aluminium Laboratories' staff in Arvida.

Mr. Roestad said it was an honour to be the first of a long list of speakers who would be using the facilities of this new auditorium; there are comfortable chairs, excellent acoustics and other luxurious appointments. He stated that there were a few odds and ends to finish but that the building was already occupied and in use. The experience with extensive utilization of aluminum in constructing this building has shown its great possibilities as a building material. Those working on the building are enthusiastic about similar applications of aluminum in the future. There is a steel framework but the outside of the building is entirely aluminum extrusions and castings. In addition, many tons of aluminum were used in the fabrication of conduits, ducts, cables, etc.

Mr. Roested illustrated his talk using short lengths of extrusions to show how the walls and corners were fitted together.

Mr. W. F. Campbell, m.e.i.c., the retiring chairman of the Branch, thanked Mr. Roestad on behalf of the Branch.

An extensive question period followed which showed the interest of the members in the talk.

The formal meeting was adjourned at 9:30 p.m. on a motion by Mr. E. W. McKernan, m.e.i.c., after which the members were taken on a tour of the building arranged by Mr. H. L. Collins, assistant director of research, Aluminium Laboratories, Arvida.

Sarnia

F. Belshaw, jr.e.i.c.
Chairman — Publicity Committee

Following is a report of the meetings held by the Sarnia Branch from January to June of this year:

President's Visit

On Monday, January 24, President Armstrong, accompanied by Mrs. Armstrong, President-Elect Vance and Mrs. Vance, visited the Sarnia Branch and addressed a well attended dinner meeting of members and their ladies at the Sarnia Golf Club.

Following his introduction by Mr. G. R. Henderson, the President gave a very informative account of the affairs of the Institute, after which a lengthy question period covered such current topics as emigration of young engineers to the United States. Mr. Armstrong was thanked on behalf of the Branch by Mr. H. Gordon Foucar.

Prior to the evening meeting, an informal noon luncheon was held at the Dow Chemical Company Staff House, during which the President and Mr. Vance discussed proposed changes to the by-laws and current institute activities with the local executive.

February Meeting

On Thursday, February 23, the Sarnia Branch was honoured by a visit from Dr. Lillian M. Gilbreth, noted industrial engineer and author of Montclair, New Jersey. The Branch played host to the local Branch of the Chemical Institute of Canada and members of both organizations and their ladies, numbering over 300, listened to an address by Dr. Gilbreth in Johnston Memorial School auditorium.

Dr. Gilbreth, introduced by Mr. C. P. Sturdee, Vice-President of the Branch, chose as her subject "Some Problems that Challenge Us Today", and dealt with current questions in industrial relations.

Before the general meeting, the local executive and their ladies were hosts to Dr. Gilbreth at dinner in the Vendome Hotel.

March Meeting

On Tuesday, March 28, a business meeting and smoker were held at the Sarnia Golf Club. A large turnout discussed local and national institute affairs, after which coloured sound movies, dealing with Canada's wild life, were shown under the sponsorship of the Caring Conservation Club.

April Meeting

Colonel F. J. Lyle, Director of the Trade and Industry Branch of the Department of Planning and Development of Ontario, addressed the Sarnia Branch at a dinner meeting held in the Lutheran Church on Tuesday, April 18.

Mr. F. F. Dyer, Councillor of the local Branch, introduced the guest speaker, who gave a very interesting and informative address on the industrial growth and future industrial expansion of Ontario.

May Meeting

On Monday, May 15, at a dinner meeting in the Lutheran Church, Sarnia, Mr. Lane Knight, Vice-President and General Manager of the Master Builders Company Limited of Toronto, addressed the local members on "Concrete Facts", dealing with modern practices in the design and use of concrete.

Introduced by Mr. R. A. McGeachy, Mr. Knight traced the history of concrete up to the present day and described his thesis on modern concrete practices with the aid of descriptive models. The speaker was well received by a large turnout of members.

June Meeting

The Junior members of the Branch were hosts at a dinner meeting in the William Pitt Hotel, Chatham, Ontario, on Wednesday, June 28. Following a descriptive address by Mr. F. DeBanke of the International Harvester Company, the members made a field trip through the Chatham Works of the Company.

With members of the Company staff as guides, over sixty engineers viewed the assembly of large and small International trucks, and the plant visit, lasting two hours, proved to be most informative and educational.

Employment Service

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

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

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

Situations Vacant

CHEMICAL

CHEMICAL ENGINEER required in Ethiopia to help in installing facilities for dehydration of alcohol and applicant must be an expert with full technical knowledge of the latest methods of dehydrating alcohol. Apply to File No. 1571-V.

TWO CHEMICAL ENGINEERS, recent graduates to act as development engineers, required in Province of Quebec. Duties to consist of technical problems in chemical plant operations. Apply to File No. 1572-V.

CHEMICAL ENGINEER required in Province of Quebec to act as plant chemist. Age 27 to 35 years. Duties to consist of supervision of the control laboratory and in chemical plant operations. Apply to File No. 1572-V.

CHEMICAL ENGINEER required in Province of Quebec, to act as production supervisor, with approximately 10 years experience in chemical plant production. Duties to consist of production supervision in a chemical plant. Apply to File No. 1572-V.

CHEMICAL ENGINEER required in Ontario to act as plant supervisor. Applicant should have four to eight years experience in chemical plant operations or allied industry. Age 30 to 40 years. Duties to consist of supervision of operations in coal tar distilling and extraction of coal tar chemicals. Salary open. Apply to File No. 1572-V.

CHEMICAL ENGINEER, recent graduate, required in Ontario to act as development engineer. Duties to consist of the solution of technical problems in connection with chemical plant operations. Apply to File No. 1572-V.

CHEMICAL ENGINEER, recent graduate, required in Montreal to act as production engineer in the production planning of chemical plant operations. Apply to File No. 1572-V.

YOUNG CHEMICAL ENGINEER required by chemical manufacturer in Montreal. Applicant would be obliged to spend one or two years in office then sell to the paint and rubber trade. Apply to File No. 1581-V.

YOUNG CHEMICAL ENGINEER required by varnish and insulator manufacturer located in Ontario. Duties include quality control work and some plant engineering. This is a new position and offers excellent opportunities. Apply to File No. 1589-V.

CIVIL

CIVIL ENGINEER required by firm of inspection engineers in Montreal for land surveying and instrument work on airports and general building constructions. Apply to File No. 1565-V.

CIVIL ENGINEER with at least five years experience in structural design and draughting required by large architectural office in Montreal. Salary according to qualifications .Apply to File No. 1574-V.

YOUNG CIVIL ENGINEER required by large organization in Montreal with some experience in reinforced concrete design. Apply to File No. 1576-V.

ELECTRICAL

FOUR JUNIOR ELECTRICAL ENGINEERS with radar experience required by large firm in Montreal. Apply to File No. 1556-V.

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

GRADUATE ELECTRICAL ENGINEER required in the Province of Quebec as sales engineer for established wire and cable company. Experience in power field desirable. Salary open. Apply to File No. 1570-V.

GRADUATE ELECTRICAL ENGINEER required in Montreal for inspection work. Applicant should have some experience in the manufacturing industry and must be bilingual. Age range to 35 years. Apply to File No. 1573-V.

SENIOR ELECTRICAL DESIGN ENGINEER required to head up electrical design in West Coast pulp and paper mill, including hydro electric station and townsite. Previous paper mill experience desirable but not a requisite. Applicant should have at least five years responsible industrial experience and must be capable of assuming all responsibilities for the complete electrical engineering of all projects. Starting salary about $5,060.00 commensurate with experience. Apply to File No. 1582-V.

ELECTRICAL ENGINEERS with experience in electronics and radar for positions in Ottawa. Salaries open. Apply to File No. 1588-V.

ELECTRICAL DESIGN ENGINEER required by manufacturer of industrial equipment, in Toronto. Applicant should have about five years experience. Apply to File No. 1590-V.

MECHANICAL

JUNIOR MECHANICAL ENGINEERS required by automotive industry in Ontario interested in administrative training, prior to tentative selection for overseas service in subsidiaries. Also openings in general engineering department. Apply to File No. 1567-V.

MECHANICAL ENGINEER, recent graduate, to act as development engineer in chemical plant located in Ontario. Duties to consist of technical problems as assigned in the manufacture of fibre conduit and impregnated fibre pipe products. Apply to File No. 1572-V.

MECHANICAL ENGINEER required by public utility company located in Toronto, for inspection during manufacture of hydraulic turbines and associated power plant equipment. Not less than five years shop experience required and engineering training preferred. Must be willing to travel extensively. Duties commence immediately. Salary commensurate with experience. Apply to File No. 1575-V.

MECHANICAL DESIGN ENGINEERS required by West Coast pulp and paper mill. Previous pulp and paper experience desirable but not necessary and consideration will be given to all applicants with industrial experience. Salaries from $3,600.00 upwards commensurate with experience. These are permanent appointments in a well established mill. Apply to File No. 1582-V.

METALLURGIST

METALLURGIST required in Province of Quebec. Applicant should have some knowledge of foundry practice, heat treating and die designing. Apply to File No. 1580-V.

MISCELLANEOUS

ENGINEER, required versed in the mining and milling of iron ore (magnetite). The ore is presently in an open pit, grinding to about 200 mesh and electrical separation as concentrates for the manufacture of sponge iron. Location Ontario with excellent working conditions. Age about 35 years. Apply to File No. 1557-V.

PLANT ENGINEER required in Ontario with a thorough knowledge of tooling and be familiar with hot and cold forming dies, cold drawing dies, etc. Applicant should be familiar with all mechanical, electrical and chemical devices and processes throughout the plant. Apply to File No. 1559-V.

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

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

CITY ENGINEER required in Western Canada Work includes the operation of the pumping and filtration plant, sewage disposal plant, incinerator and cleansing branch, asphalt plant, and the construction by the department of street paving, concrete curbs and sidewalks, and sewer and water mains and the building inspection department. Preference will be given to applicants possessing a wide engineering experience, especially in municipal engineering. Applicants should state age, qualifications, salary required and previous experience with details of duties involved and accompanied by copies of testimonials. Apply to File No. 1562-V.

ENGINEERS required by large automotive industry in Ontario, for their production engineering department. Experience on methods, process, layouts, specifications and installation is desirable. Apply to File No. 1567-V.

PROCESS ENGINEERS, draughtsmen and tool and die designers required by automotive industry in Ontario. Applicants should have preferably experience in the automotive industry with a knowledge of heavy layout. Apply to File No. 1567-V.

ENGINEERS required by automotive industry in Ontario for their time standards and methods department. Senior personnel must be competent in methods and must have experience in developing standard data on machine tool and other operations. Junior personnel will undergo training period on monthly induction programmes. Apply to File No. 1567-V.

RESEARCH AND DEVELOPMENT ENGINEER with first class theoretical and practical knowledge of mechanical engineering and physics, full qualified to plan and administer industrial research work on domestic appliances, especially refrigerators, some design experience preferred. Permanent position, good salary, excellent opportunity for advancement. Reply stating experience, age and salary expected. Apply to File No. 1568-V.

PRODUCTION SUPERVISOR to train for the position of works manager of small operation in Western Canada. Some experience in manufacturing required. Applicant should have a preference for administration of a small operation rather than technical. Age 30 to 40 years. Apply to File No. 1572-V.

Industrial Engineering Superintendent

Required by sulphate pulp mill in Northern Ontario. Preference to man age 25 to 35 with degree in mechanical engineering, business administration or industrial management. 3 or more years of general industrial experience preferably in industrial engineering. Duties will consist of analysis of present organizations followed by man-methods planning and development of recommendations relative to equipment, material and product design and standards, process, cost variations; also supervisor training along similar lines. Salary range open. Apply fully in writing stating age, education, marital status, experience, availability and telephone number to

File No. 1584-V.

FRENCH FIRM well known in Canada for its first class CEMENTED CARBIDE PRODUCTS

DIAMETAL and DIAFERID DIES and TOOLS

Wants commission representative

SPECIALITIES

Tips for tools, tipped tools, wire and tube drawing dies, wearing parts, etc.

Write to:

Agence Havas Dijon (France) No. 40326

Apply to File No. 1578-V

PLANT ENGINEER required in Ontario, with a minimum of five years experience in chemical plant or paper mill maintenance and engineering supervision. Age 30 to 40 years. Duties to consist of supervision of maintenance and plant engineering. Salary open. Apply to File No. 1572-V.

TECHNICAL SUPERVISOR required in Ontario with degree in chemistry or chemical engineering, with four to eight years experience in control laboratory and chemical plant operations. Age 30 to 40 years. Duties to consist of supervision of control laboratory and technical operating problems. Salary open. Apply to File No. 1572-V.

DESIGN ENGINEERS required by large industrial organization in Montreal. Must have some experience in hydraulic and reinforced concrete design. Apply to File No. 1577-V.

FRENCH FIRM well known in Canada for its first class cemented carbide products: diamental and diaferid dies and tools, wants commission representative. Specialties, tips for tools, tipped tools, wire and tube drawing dies, wearing parts, etc. Write to Agence Havas Dijon (France) No. 40326. Apply to File No. 1578-V.

SALES ENGINEER required by manufacturer in the Province of Quebec. Applicant would be obliged to estimate contracts and have some metallurgical knowledge. Apply to File No. 1580-V.

PATENT LAWYER required by automotive industry in Ontario, with engineering background, for trade mark and patent work. Apply to File No. 1583-V.

TOOL ENGINEER required by large automotive plant. Mechanical preferred. Senior position as supervisor in tool engineering department. Age 30 to 45 years. Apply to File No. 1583-V.

ENGINEERS AND DRAUGHTSMEN required by automotive industry in Ontario. Openings in field staff, foundry design, mechanical design, piping design, electrical design, construction design. Junior and Senior personnel required. Salaries open. Apply to File No. 1583-V.

INDUSTRIAL ENGINEERING SUPERINTENDENT, required by sulphate pulp mill in Northern Ontario. Preference to man age 25 to 35 years with degree in mechanical engineering, business administration or industrial management. Three or more years of general industrial experience preferably in industrial engineering. Duties will consist of analysis of present organizations followed by man methods planning and development of recommendations relative to equipment, material and product design and standards, process, cost variations; also supervisor training along similar lines. Salary range open. Apply fully in writing stating age, education, marital status, experience, availability and telephone number to File No. 1584-V.

CITY ENGINEER required by city located near Montreal. Applicant must be bilingual. Position will offer opportunity for promotion to city manager. Apply stating age, qualifications and salary expected to File No. 1585-V.

TECHNICAL DIRECTOR wanted for paper company producing from 100% rag to 100% sulfite papers. Applicant should be a graduate chemist or chemical engineer and must be bilingual. Surroundings are ideal and living conditions very good. Mills located near Montreal in the Laurentian Mountains. Apply to File No. 1586-V.

GRADUATE CHEMICAL OR MECHANICAL ENGINEER required in Montreal. Applicant should have about 5-10 years experience. Some experience in construction, together with the installation of equipment, piping, etc., estimating, layout of equipment, flow sheets and design of individual pieces. Applicant should also be familiar with the engineering procedures covering job cost control, together with the preparation of specifications. Apply to File No. 1587-V.

SALES ENGINEER required in Montreal for the sale of scaffolding material. Payment on commission basis only. Permanent position or part time employment offered. Must be bilingual. Apply to File No. 1591-V.

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

CHEMICAL

CHEMICAL ENGINEER required in Montreal to act as project engineer. Applicant should have a minimum of 3 to 5 years experience in installation work and plant engineering, involving estimating layout, process equipment design, requisitioning and job cost control. Apply to File No. 1530-V.

CHEMICAL ENGINEER recent graduate, is needed for process development or production work by a chemical and synthetic resin manufacturing firm situated in the Province of Quebec. Some experience in chemical production or synthetic resin manufacture would be advantageous. Apply to File No. 1535-V.

CHEMICAL ENGINEER required in Montreal for research and development work in inorganic chemistry. Apply to File No. 1540-V.

CIVIL

CIVIL ENGINEER with about 5 years experience in concrete building design, detailing and estimating of reinforcing bars. Location Western Canada. Applicant would be obliged to take control

Research and Development Engineer

With first class theoretical and practical knowledge of mechanical engineering and physics, fully qualified to plan and administer industrial research work on domestic appliances, especially refrigerators, some design experience preferred. Permanent position, good salary, excellent opportunity for advancement.

Apply stating experience, age and salary expected — Apply to File No. 1568-V.

of this department. Salary would be commensurate with experience offered. Apply to File No. 1517-V.

ELECTRICAL

FULLY EXPERIENCED ELECTRICAL ENGINEER required by textile industry located outside Montreal. Applicant must have some real practical experience, about 15 years in a manufacturing plant, preferably textile mill. Excellent opportunity offered. Apply to File No. 1418-V.

ELECTRICAL ENGINEER, required in Montreal capable of making surveys of complete electrical installations in existing plants, recommending improvements, of designing, ordering and preparing drawings for complete electrical installations in new plants. Applicant would be the electrical engineer for company and its subsidiaries. Salary open. Apply to File No. 1458-V.

GRADUATE ELECTRICAL ENGINEER, required by firm located in Ontario. Applicant must be capable of both sales and development work. Development work would involve the preparation of schematic and actual wiring diagrams and field service work. Apply to File No. 1500-V.

GRADUATE ELECTRICAL ENGINEER with at least 10 years experience in distribution field work and planning. Applicant would design, make economy studies of distribution extensions and reconstruction of the system in Brazil. Age 35-45 years. Apply to File No. 1525-V.

ELECTRICAL ENGINEER required in the Maritimes to take charge of the electrical maintenance and construction. Mill is completely electrified and power generated by means of a steam turbo generator. Apply to File No. 1523-V.

MECHANICAL

MECHANICAL ENGINEER required for layout and design of plumbing and heating equipment, location Montreal. Salary open Apply to File No. 1252-V.

CHIEF MECHANICAL ENGINEER with extensive design and applications, required to supervise an engineering department for design and development of hoisting machinery and construction equipment, pumps, transmission equipment and general engineering products; develop product applications with customers. Applicants with Canadian experience and associates in this field preferred. Apply to File No. 1508-V.

MECHANICAL ENGINEER required in Montreal by large firm. Applicant should have about 4 or 5 years pulp and paper experience, preferably in the actual making of paper. Apply to File No. 1512-V.

MECHANICAL ENGINEER required by large mining company to act as plant engineer located in Ontario. Applicant should have at least 10 years experience. Reply giving full details of previous experience and salary desired to File No. 1522-V.

MECHANICAL ENGINEER required by large chemical company in Province of Quebec. Applicant should be bilingual and have preferably one or two years experience in refrigeration, steam and brine. Reply giving full details of qualifications and experience. Apply to File No. 1534-V.

TWO YOUNG MECHANICAL ENGINEERS required in Ontario. Recent graduates would be considered. Excellent opportunities to gain experience and good prospect for promotion. Apply to File No. 1537-V.

YOUNG MECHANICAL ENGINEER required by a large firm in Montreal. Applicant should have some industrial experience. Duties include sales and service work. Apply to File No. 1538-V.

MECHANICAL DRAUGHTSMAN with engineering status preferred, thoroughly acquainted with the design and shop detailing of dust collecting systems, including layout and proportioning of ducts and selection of equipment, required in Ontario. Field experience would be advantageous. Apply giving full particulars of experience to File No. 1544-V.

TWO JUNIOR MECHANICAL ENGINEERS OR DRAUGHTSMEN required by firm in Ontario. Applicants would be required to work on design and installation drawings for pulp and paper machinery, piping, etc. Engineers should have at least ten years experience on machinery, and equipment, design and layout, not necessarily in the pulp and paper industry. Draughtsmen should have 2-5 years draughting experience. Salaries $250.00 to $350.00. Apply to File No. 1547-V.

MISCELLANEOUS

PATENT ATTORNEY, preferably graduate in electrical or engineering physics, capable of preparing and prosecuting electrical and mechanical patent applications, for patent law firm located in Toronto. Applicant should frunish full particulars of qualifications and experience to File No. 1400-V.

MECHANICAL OR CIVIL ENGINEER, required for Toronto office of firm located in Montreal with three to five years industrial experience to include background of welding knowledge. Work includes process development and promotion in welding field. Salary open. Apply to File 1415-V.

LONG ESTABLISHED CANADIAN MANUFACTURER offers an attractive opportunity to an experienced sales engineer. Equipment handled, overhead cranes and allied equipment. State experience in full first letter. Apply to File No. 1448-V.

A CHIEF for the department of resources and development at Ottawa. Details and application forms at Civil Service Commission offices, National Employment Service Office and Post Office. Salary $5 700.00 to $6,300.00. Apply to File No. 1505-V.

SENIOR DESIGN ENGINEER required in Ottawa. with a degree in mechanical or chemical engineering. Applicant should have a minimum of 5 years experience in mechanical design particularly with reference to chemical plant equipment and process. Apply to File No. 1507-V.

ENGINEERS WANTED

for

PROCESS and PROJECT STUDIES

Location principally Montreal, although
other locations also involved.

SENIOR ASSISTANTS

FIVE TO TEN YEARS' EXPERIENCE

Chemical, civil, electrical and mechanical engineers

•

JUNIOR ASSISTANTS

UP TO FIVE YEARS' EXPERIENCE

Chemical, civil, electrical and mechanical engineers

•

WORKS STAFF VACANCIES

Technical and Production Staff Opportunities are also Available to Chemical, Civil, Electrical and Mechanical Engineers, Experienced Men Preferred but not Essential.

Apply in writing giving full details to

STAFF UNIT

CANADIAN INDUSTRIES LIMITED

P.O. Box 10, Montreal, Que.

A CITY ENGINEER is required in Southern Alberta, applicants to state age, marital status, technical education, submitting detailed statements of experience, salary expected and photo. The applicant must be a registered professional engineer of Alberta. Apply to File No. 1509-V.

ASSISTANT to the city manager required in Southern Alberta. Applicant should state age, marital status, technical education, salary expected and submit a photo. Preference will be given to an electrical or mechanical engineer. Apply to File No. 1509-V.

CIVIL AND MECHANICAL ENGINEERS, required by pulp and paper mill in Ontario. Applicants should be experienced in pulp and paper industry. Salaries open. Apply to File No. 1514-V.

STRUCTURAL STEEL DETAILERS and checkers required in Vancouver, B.C., by large steel fabricating firm. Must be experienced. Salaries open. Apply to File No. 1518-V.

SALES ENGINEER required, recent graduate in electrical engineering, for Province of Quebec. Applicant should have definite sales aptitude and be able to converse in French. Car provided. Short training period in plant located in Ontario. Apply to File No. 1519-V.

CANADIAN SUBSIDIARY of a world renowned British engineering company located in Toronto, requires engineer to prepare quotations. Eventual prospects unlimited. Wide engineering knowledge and experience in filtration, fan engineering, compressors, prime movers, etc., an asset. Write giving fullest details, salary required, when available and if car owner. Apply to File No. 1520-V.

JUNIOR SALES ENGINEER required for Toronto office of large electrical manufacturing company. Products range from generation equipment to domestic appliances. Candidates must be able to prepare own schemes and quotations and generally deal with technical correspondence. Apply to File No. 1523-V.

A CANADIAN UNIVERSITY wishes to receive applications from engineering graduates preferably civil, mechanical or electrical, under thirty years of age to teach engineering problems and drawings. Applications should be sent to File No. 1527-V, Engineering Institute of Canada and should give applicants age, university and experience. The salary offered is $1,500.000 to $2,000.00 for the session depending on qualifications.

DEVELOPMENT ENGINEER

Nuclear Engineering Branch requires an Engineer to do experimental and development work in the field of mechanical engineering related to the design of atomic energy reactors and associated equipment. Applicants should have an engineering degree with high academic standing and five or more years engineering development experience. Please quote file 9A, National Research Council, Atomic Energy Project, Chalk River, Ontario.

McGILL UNIVERSITY requires graduate mechanical engineers for sessional appointment as instructors and demonstrators for 7 months from 1st October, 1950 in the department of mechanical engineering. Apply to File No. 1529-V giving all qualifications and salary required.

PRESSURE VESSEL, safety and fire protection engineer required in Montreal. Electrical or mechanical engineer with experience in electrical engineering. Recent graduate or up to 3 years plant experience. Knowledge or special training in pressure vessel inspection, safety engineering in fire protection an asset. Apply to File No. 1530-V.

AN ENGINEER (Electrical and Power) and an engineer (Construction Design) up to $5,700 for the department of National Defence (R.C.A.F. at Ottawa). Details and application forms at Civil Service Commission Offices, National Employment Service Offices and Post Offices. Apply to File No. 1532-V.

ENGINEERING DEPARTMENT, of two machine newsprint mill requires the services of a design engineer and daughtsman. Applicant should be between 30 and 40 years of age, hold a degree in mechanical engineering from a Canadian University and have at least 10 years experience in design work. Paper mill experience not absolutely essential but would be desirable. In reply send complete details, references and recent photo. Apply to File No. 1533-V.

MECHANICAL OR ELECTRICAL ENGINEER required by large firm in Montreal. Duties include co-ordination of construction activities with special reference to electrical and mechanical equipment. When construction completed applicant would be plant engineer. Plant experience necessary. Salary according to qualifications. Apply to File No. 1539-V.

LECTURER IN CIVIL ENGINEERING for University in Central Ontario required. Applicant will be obliged to give lectures in mechanics of materials and elementary structural theory to the second year and to assist with the work in the materials laboratory. Term end of September to end of April. Salary $350.00. Apply to File No. 1546-V.

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

ENGINEER REQUIRED by construction company, in Montreal with about 3 or more years of general construction experience. Permanent position. Applicant must be able to accept responsibilities and be able to meet clients, architects, etc. Work combines both outdoor and indoor services. A knowledge of French would be helpful. Salary range $300.00 per month. Apply to File No. 1551-V.

NATIONAL RESEARCH COUNCIL REQUIRES organic and physical chemists, to assist in the synthesis of organic compounds isotopic tracers, also the investigation of catalyst activity in the oxidation of ethylene. Chemical Engineers, to assist in plant operation. At least honour in B.Sc. preferably M.Sc. in chemistry or chemical engineering required. Initial salary $2,400.00 to $2.640.00 depending on qualifications and experience. Apply to File No. 1552-V.

ASSISTANT DYKING COMMISSIONER required by department of lands, Victoria, B.C., to assist in administration and management of dyking and drainage districts in Fraser Valley. Must be Civil engineer graduate, eligible for full registration in B.C. At least 3 years practical experience as registered engineer in responsible charge of engineering projects, preferably related to dyking and drainage. British subjects, not over 45 years, except ex-service men, who are given preference. Salary $5,373.00 rising to $5,976.00 per annum Apply to File No. 1553-V.

A LARGE ORGANIZATION is offering the position of Scientific Editor at a salary up to $3,960.00. Applicants should have a degree in science or engineering; they should have some knowledge of editing, and the writing and compiling of scientific research manuscripts. Further information may be obtained by writing Box No. 1274 Station B, Ottawa, Ontario. File No. 1554-V.

ATTENTION, MEMBERS

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

This will result in a better service to everyone concerned.

TELEPHONE PLateau 5078 Except in special cases all interviews will be arranged between the hours of 9 and 12.

Situations Wanted

MECHANICAL ENGINEER (Sask. 1947). Age 28, married, family 1. At present employed near Montreal, desires position, with good future, in Western Canada. Five years varied experience including sound background in maintenance engineering. Interested in plant or shop design, engineering and development or sales and service. Willing to undergo training period with Eastern company with good prospect of eventual employment in Western Canada. Apply to File No. 60-W.

GRADUATE CIVIL ENGINEER AND LAND SURVEYOR with proven ability to carry out responsibilities. Available on short notice. Over 23 years of wide experience on four continents. Experience includes design layout and field supervision of: roads, dams, buildings, drainage, irrigation works. Veteran C.R.E. and E.A.E., married, bilingual. Situations held in Canada: Chief of survey — parties, resident engineer. Abroad: as district and assistant chief engineer for over 19 years in the British, Turkish, Iraqi, Govvernment Services. Apply to File No. 489-W.

ELECTRICAL ENGINEER, S.E.I.C., McGill University 1950 (Power Option). Four years service with R.C.A.F. as radar mechanic and technical officer. Experience during summer; inspector of high-speed production lines in Canadian Factory and Civil Service inspector of watt-hour meters. Desire work in power or communications fields. Age 30, single. Location preference Montreal or southern Ontario. Available immediately. Apply to File No. 821-W.

CIVIL ENGINEER, 23 years, McGill 1950. Have had one summer on road construction and two on hydro-electric development. Now employed but seeks change. Desires position in industry or construction anywhere in Canada. Apply to File No. 1234-W.

DETAILER-CHECKER in structural steel, reinforced concrete. Available for immediate employment on hourly, per diem, or month basis. Permanent position as structural engineer desired. (M.E.I.C. P.Eng.). Location and starting salary are secondary factors only. Apply to File No. 1935-W.

HEATING AND VENTILATING ENGINEER, P.Eng., M.E.I.C. Many years experience in heating, ventilating and plumbing design. Available this fall for short term employment or consultation. Location preferred Eastern Ontario. Apply to File No. 2091-W

INDUSTRIAL CHEMICAL ENGINEER, M.E.I.C., B.Eng. (McGill 1936), M.B.A. (Harvard 1938) P.Eng. (Ontario). Veteran R.C.A. Married. One child. Age 36. Seeking employment in Nova Scotia only. Presently employed as general manager and sole executive of small business comprising seventy employees. Other experience includes teaching of industrial management and cost accounting in University. Would prefer similar employment or in larger organization as production manager, labour director, or comptroller. Present income based on profit and willing to work on same basis. Willing to purchase or invest in small business. Willing to accept temporary employment and to travel to Nova Scotia at own expense for interview. Apply to File No. 2584-W.

GRADUATE MECHANICAL ENGINEER (Jr.E.I.C., P.Eng. Quebec), desires part time employment with consultant or others in mechanical or structural fields. Interested in designing, checking, estimating or draughting. Available evenings and week-ends in Montreal district. Apply to File No. 2909-W.

MECHANICAL ENGINEER, P Eng., McGill 1944. 8 years industrial experience, shop fabrication experience, wage incentive installation, timestudy, production and cost control, plant supervision, excellent experience in welding field, methods, cost estimating, design. Sound business background and organizing ability in volume production and job contract. Desire industrial, sales, or plant engineering. Available four weeks. Apply to File No. 2920-W.

MECHANICAL AND INDUSTRIAL ENGINEER, graduate 1944, Jr.E.I.C., P. Eng. production and cost anlysing experience Ontario. Seven years varied engineering, in building products, basic steel foundry and machinery manufacturing. Desires permanent position in lines of industrial engineering or general maufacturing administration. Available on short notice. Apply to File No. 2955-W.

GRADUATE ELECTRICAL ENGINEER, McGill 1950. Age 23, single, bi-ingual. Presently employed but desires position with good future in Montreal. Diversified experience in telephone line, road and building construction. Available on short notice. Apply to File No. 3166-W.

METALLURGICAL ENGINEER, M.E.I.C., P.Eng. of Ontario. McGil '39. Age 32. Married. 4 years steel mill production and sales. Four years Canadian Army Overseas (R.C.E.M.E.), 2½ years sales engineer non-ferrous alloys. Sound business background. Interested in broadening experience in metallurgy and business administration. Preferably permanent position with large, well-established organization. Available on reasonable notice to present employer. Apply to File No. 3308-W.

MECHANICAL ENGINEER, Sask. 1944, P.Eng. Age 29, married, desires position with responsibility and opportunity for advancement. Experience includes four years supervising maintenance and construction in the pulp and paper industry, one year in the Engineering Department of a large textile mill and two years as a supervisor for a contracting firm in the oil fields and oil refineries. Have speaking knowledge of French. Apply to File No. 3313-W.

CHEMICAL ENGINEER, Jr. E.I.C., P.Eng., Queen's 1944, age 30, single. Experienced in technical and control work in pulp, fine and coated paper manufacture, and in synthetic fibre field. Specialized training in statistical quality control, work simplification, human relations in management. Some experience as production foreman and in conference leading and public speaking. Seeking broader experience and more congenial job relations. Willing to undertake any work for which experience and training would qualify. Present salary over $4,000 per year. Apply to File No. 3314-W.

CIVIL ENGINEER desires part time employment, evenings and weekends. Design, detailing and draughting in reinforced concrete and steel. Apply to File No. 3315-W.

CIVIL ENGINEER, S.E.I.C. Fluent French and English, desires part time employment, evenings and Saturdays. Surveying, draughting, estimating, etc. Apply to File No. 3317-W.

ELECTRICAL ENGINEER, S.E.I.C., graduated from U.N.B., May 1950, desires permanent employment. Veteran, single, age 26. Three years experience as wireless mechanic, R.C.A.F.; summer experience in dielectric heating as applied to the wood working industry, Forest Products Laboratory of Canada, Ottawa. Interested in employment in electronics field, will also consider power or appliance production. Location in Eastern Canada preferred. Available on three weeks notice. Apply to File No. 3318-W.

CHARTERED MECHANICAL ENGINEER, A.M.I.Mech. E., seeks position of interest. Monetary considerations of first importance. Wide, varied experience covering mining and steelworks, aeronautical research, design of logging, pulp and paper mill machinery. Five years in British Civil Service. Excellent references. Apply to File No. 3319-W.

ELECTRICAL ENGINEER, M.E.I.C. graduated 1942, age 37, married, no children, 3 years experience in erection of industrial plants and 8 years in design and construction of transformer substations and switchgears in Canada and Europe. Desires position with responsibility in electrical power field. Available in one month notice. Location no object. Apply to File No. 3321-W.

ELECTRICAL ENGINEER, Laval '49, experienced in sales, draughting, repair of motors, wiring of ships, electrical and mechanical design of electric motors; desires a position, preferably in sales. Apply to File No. 3323-W.

CHEMICAL ENGINEER, age 21, graduate McGill University '50. Western Canadian now in Montreal would like position in Winnipeg or vicinity. Available immediately. Apply to File No. 3327-W.

ELECTRICAL ENGINEER, Queen's 1949, S.E.I.C. Seek change to the design, draughting or production engineering in the electrical or electronic field. Experience includes, prewar: watthour meters, industrial control and switchgear apparatus; post war: electronic development in research laboratory. Age 32, married. no dependents. Will consider any location offering opportunity for advancement. Apply to File No. 3328-W.

ELECTRICAL ENGINEER, S.E.I.C. Graduated in May 1950 from University of Manitoba. Age 25 and single. Two years experience with R.C.A.F. electrical and radio equipment. Two summers experience in electrical power distribution field. Also experience in aircraft mechanical overhaul field. Desires position in power or communications field. Available immediately. Apply to File No. 3329-W.

CIVIL ENGINEER (Man.) 1948 Jr.E.I.C. with experience in topographical surveying, airport runway construction, and hydrology, desires position in hydraulics or with construction firm. Apply to File No. 3336-W.

ELECTRONIC ENGINEER, P.Eng. N.S., P.Eng. Quebec. M.E.I.C., A.M.I.E.E., Executive ability in technical field. Wide experience in design, installation and maintenance radar, communication and electronic instruments. Broad experience in production, plant layout, staff management and control. At present production manager and engineer in charge of plant aircraft installation and maintenance departments. Married. Available on reasonable notice. Apply to File No. 3339-W.

CIVIL ENGINEER, B.Sc., Jr.E.I.C., P.Eng. (Quebec), age 25, married, with car. 3 years experience including design, detailing, and estimating concrete and structural steel with architects, steel fabricators, concrete fabricators and engineers and contractors also liaison work with customers, architects and contractors. Desires relocation offering opportunity for design and liaison work with responsibility. Western provinces preferred. Available within three weeks of notification. Apply to File No. 3340-W.

ELECTRICAL ENGINEER, S.E.I.C., Manitoba, 1950. Married veteran, age 29, temporarily employed in electronic development, desires more permanent position, preferably in industry of communications Experience includes four years in the wireless trade R.C.A.F. and four summer's work on electrical substation installation. Will work anywhere in or beyond Canada.. Apply to File No. 3341-W.

EXPERIENCED CHEMICAL ENGINEER from Sweden, specializing in manufacturing of macrocellular building material such as blocks, slabs, girders, insulating boards, etc., wishes to make contacts with manufacturers of research institutions who are interested to exploit and/or research the raw materials such as ashes from power station, oil shale, washery slagg, etc.; using lime as basic component. Apply to File No. 3343-W.

MECHANICAL ENGINEER, S.E.I.C., at present employed in Montreal would like part time employment evenings and weeks-ends. Designing, draughting, estimating, etc. Apply to File No. 3344-W.

ELECTRICAL ENGINEER, S.E.I.C., B.E. N.S.T.C. 1950. Age 32, married. Pregraduation experience; four years power house installation, operation and maintenance. (Diesel driven generators). Supervised installation and maintenance of refrigeration equipment in modern cold storage plants. Two summers general field engineering work with a large construction company. One year as Assistant Utilities Superintendent (water, power, sewage & refrigeration) in connection with airport maintenance. Available immediately. Apply to File No. 3346-W.

ELECTRICAL ENGINEER, S.E.I.C. University of New Brunswick, 1949. Completed Canadian General Electric test course in spring of 1950. Married. Age 23. Interested in design or production engineering, preferably around Toronto. Apply to File No. 3347-W.

ELECTRICAL HEATER SPECIALIST, graduate engineer, formerly employed by United States Company, designing and supervising the manufacture of electrical heaters, desires position with electrical concern doing similar work. Apply to File No. 3348-W.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

BOOK REVIEW

HAMMOND'S COMPLETE WORLD ATLAS:

C. S. Hammond. New York, 1950. 376 pp., 6½ x 10 in., cloth, $6.75.

In one sense, this is the handy atlas a number of people have been awaiting. It is only 10 in. high, and can sit on a bookshelf as a normal volume. Its title, however, is misleading. Of a total of 66 pages of useful gazetteer information, 32 are devoted to the United States.

Of 150 clear well printed maps giving considerable details of roads and railways, and some including good large scale insets, 95 are devoted to the United States. However, this is merely an aspect to be borne in mind, which will be far outweighted, for most people, by the compactness of the volume and the usefulness of the information. Besides this Map section, which includes maps of climate, vegetation, religions, languages, and a host of other subjects, there is a gazetteer of the world, place index, air line distances, in fact, this Hammond Atlas is just full of bits of information which combine to create a useful volume for the library, office desk, or private bookshelf. E.K.

SELECTED ADDITION TO THE LIBRARY

TECHNICAL BOOKS, ETC.

A Code for Sewerage Practice. Recommendations and Information on Sewerage, Building Drainage and Sewerage Treatment:

The Contractors Record and Municipal Engineering, 1950. 73 pp., cloth.

An Introduction to Experimental Stress Analysis:

George Hamor Lee. New York, Wiley, c1950. 319 pp., illus., cloth.

Descriptive Geometry. Essential Principles and Applications for Students of Engineering and Architecture, 3rd ed.:

Floyd A. Smutz and Randolph F. Gingrich. New York, Van Nostrand, 1950. 142 pp., illus., cloth.

Diesel Engine Fuels and Lubricants:

Edward Wright and H. F. P. Purday. London, Constable, 1950. 153 pp., illus., cloth.

Electric Resistance Welding. A Practical Guide to Spot, Seam, Projection, and Butt Welding Methods:

London, Newnes, 1950. 182 pp., illus., cloth.

Electrical Communication, 3rd ed.:

Arthur Lemuel Albert. New York, Wiley, c1950. 593 pp., illus., cloth.

Fundamentals of Powerplants for Aircraft:

New York, Gerard E. Haagens, c1950. Illus., cloth.

Heat and Temperature Measurement:

Robert L. Weber. New York, Prentice Hall, 1950. 422 pp., illus., cloth.

Industrial Instrumentation:

Donald P. Eckman. New York, Wiley, c1950. 396 pp., illus., cloth.

Integrated Power System as the Basic Mechanism for Power Supply:

New York, McGraw-Hill, 1950. 157 pp., illus., cloth.

Physical Mechanics. An Intermediate Text for Students of the Physical Sciences:

Robert Bruce Lindsay. New York, Van Nostrand, c1933. 436 pp., illus., cloth.

Principles of Nuclear Chemistry:

Russell R. Williams. New York, Van Nostrand, c1950. 307 pp., cloth.

Properties of Metals at Elevated Temperatures:

George V. Smith. New York, McGraw-Hill, 1950. 401 pp., illus., cloth.

The Technology of Aluminium and Its Light Alloys:

Alfred von Zeerleder. Slough, Bucks,

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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.

England, High Duty Alloys Ltd., c1948. 451 pp., illus., cloth.

The Theory and Design of Gas Turbines and Jet Engines:

E. T. Vincent. New York, McGraw-Hill, 1950. 606 pp., illus., cloth.

YEARBOOKS, ETC.

ACI 20-Year Index (1929-1949) Journal of the American Concrete Institute:

American Concrete Institute, Detroit, c1950. 256 pp., paper.

Report of the Work of the Tin Research Institute, 1949:

Tin Research Institute, Greenford, Middlesex, 1950. 16 pp., paper.

Annual Report, 1949-1950, British Welding Research Association:

British Welding Research Association, London, 1950. 50 pp., paper.

TECHNICAL BULLETINS, ETC.

American Society for Testing Materials. Specifications:

Steel Flat Products.

. . . Special Technical Publications:

No. 52-A—Data on Corrosion-and-Heat-Resistant Steels and Alloys—Wrought and Cast. No. 94—Symposium on Accelerated Durability Testing of Bituminous Materials. No. 104—Symposium on Dynamic Stress Determinations. No. 93—Symposium on Evaluation Tests for Stainless Steels.

. . . Standards:

Rubber Products. Electrical Insulating Materials.

British Electrical and Allied Industries Research Association. Technical Reports:

No. G/T240—Indexing and Filing System for Engineering Drawings Showing Details of Sub-Station Design, G. Meiners. No. L/T221—Properties of Slow Electrons in Polar Materials, H. Frohlich and others. No. O/T6—Electrolysis and the Bond Strength of Reinforced Concrete; The Effect of Direct Current, Supplementary Report, G. Mole.

British Welding Research Association. Memoranda:

Recommendations for the Design and Fabrication of Arc-Welded Structural Steelwork, Built-Up Girders and Compression Members.

CCH's Consolidation Canadian Income Tax Act, 16th ed., June, 1950:

CCH Canadian Ltd., Montreal, 1950. 328 pp., paper.

Canada. Department of Resources and Development. Forestry Branch. Lists of Publications:

List of Publications, Forest Products Division, Ottawa and Vancouver Laboratories.

Contractors Record and Municipal Engineering. Hydraulic Diagrams:

No. 3—Design of Surface-Water Sewers, Frequency of Rain-Storms.

Georgia Institute of Technology State Engineering Experimental Station. Circulars:

No. 28—The Solvent Extraction of Oilseed, An Informational Survey, E. P. Cofield.

Institution of Mechanical Engineers. Papers:

Metal Transfer from Piston Rings to Cylinders during "Run-IN", C. D. Strang and J. T. Burwell.

Manitoba. Department of Mines and Natural Resources, Mines Branch. Regulations:

Regulations Under the Mines Act, 1940 R.S.M. Ch. 36. For the Disposal of Mining Claims and Placer Claims in Manitoba.

United States Department of Agriculture. Circulars:

No. 837—Streambank Erosion Control on the Winooki River, Vermont, Frank C. Edminster and others.

United States Highway Research Board. Bulletins:

No. 24—Section 1: Zoning for Parking Facilities.

Current Road Problems.

No. 13-R—Use of Air-Entrained Concrete in Pavements and Bridges.

PAMPHLETS, ETC.

Manufacturing With Men:

L. K. Sillcox. Yale University, 1949.

What We Have Learned in a Year:

L. K. Sillcox. Yale University, 1949.

Coal. A Concise Authoritative Survey in Usable Form:

Harold J. Rose, New York, Interscience Encyclopedia, 1949.

Abstracts on Agricultural and Horticultural Engineering No. 1, 1950:

National Institute of Agricultural Engineering, Wrest Park, Silsoe, Bedfordshire, 1950.

BOOK NOTES

Prepared by the Library of The Engineering Institute of Canada

BRITISH STANDARDS:

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

B.S. 340: 1950 — Precast Concrete Kerbs, Channels, Edgings and Quadrants. 2/6.

This standard includes tests and limits for transverse strength and water absorption. The tests are intended to serve as indirect methods of assessing the resistance of kerbs to frost and impact, as it is not yet possible to apply direct tests for these qualities.

B.S. 1127: 1950 — Circular Screwing Dies and Hexagon Die Nuts. 1/–.

Provision was made for nine outside diameters of circular dies, applicable to all sizes of thread up to 2 in., B.S. Pipe (Parallel) thread, any particular thread being associated with not more than three diameters of die.

CONDENSATION IN THE HOME:

National Research Council, Ottawa, 1949. 24 pp., illus., paper. 10c. (Better Building Bulletin No. 1.)

The Division of Building Research of the National Research Council has announced the first of its publication in a new series. In addition there are available several publications in the same field, issued earlier by the Research Council. Persons interested in these matters may secure a complete list of all publications by writing to the Division of Building Research. The new series is identified as "Better Building Bulletins". Number one is titled "Condensation in the Home". It deals with condensation in walls, roofs and floors, pointing out the damage that can follow, and methods for overcoming it. The entire series is to be devoted to the interests of the small home owner and builder.

ESTIMATING MANUAL FOR HEATING AND PIPING SYSTEMS, WITH TABLES OF TIME PERIODS FOR VARIOUS JOB OPERATIONS:

Harry A. Erickson. New York, Plumbing and Heating Journal, 1949. 112 pp., cloth. $3.75. (Canada-Maclean-Hunter, Toronto.)

The aim of this manual is to provide practical labour data to those who are concerned with estimating the cost of assembling, fabricating and/or installing the material required for the construction of heating and piping systems in the building industry. The book is based on the experience of the author and of others engaged in the heating and piping industry. It is expected to prove of value as a guide in estimating the time required for the construction of heating and piping systems in the building industry.

FOREMAN'S MANPOWER JOB:

John E. Gagnon and R. W. Vervey. New York, National Foremen's Institute, c1950. 184 pp., illus., cloth. $2.25. (NFI Standard Management Practice Series.)

Mr. Gagnon leads off the first section, entitled "Manpower Management", with a brief history of the foreman's position in industry, in the past and nowadays. Separate chapters are given over to the foreman's manpower job with respect to selection, placement, training, promotions, etc. "On-The-Job-Manpower Management" is the title of the second Section, by R. W. Verney. He describes various types of supervisors, discussing four undesirable types, and four desirable types of foremen. The whole book is divided in short chapters and is easily assimilated.

FOREMAN'S PLACE IN MANAGEMENT:

T. G. Newton and Bleick von Bleicken. New York, National Foremen's Institute, c1950. 154 pp., illus., cloth. $2.50. (NFI Standard Management Practice Series.)

Mr. Newton's portion of the book is entitled "Professional Foremanship". He demonstrates the foreman's direct responsibility in regard to quality, cost and service within the company. He shows how five of America's most successful companies, by name, have converted the foreman from the role of "gang supervisor" to a managerial supervisor. Von Bleicken, in his section, "The Foreman's Human Relations Job", introduces Labour-management problems of a fictional company gathering, composed of the president, plant manager, personnel director, a foreman, and a worker. Each gives his own version of the problems involved in human relations, and how they might be solved.

FOREMAN'S PRODUCTION JOB:

A. L. Kress and T. O. Armstrong. New York, National Foremen's Institute, c1950. 153 pp., cloth. $2.50. (NFI Standard Management Practice Series.)

The first section, by Kress, develops a picture of what a modern factory organization looks like, how it operates, and what part the foreman should play. The foreman is shown in his relationship with each department, what he can expect and what is expected of him. The second section is "A Check List for Effective Foremanship",

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NATION-WIDE SERVICE THROUGH BRANCHES, WHOLESALERS and PLUMBING AND HEATING CONTRACTORS

by T. O. Armstrong. Points covered include: organizational responsibilities, production responsibilities, quality standards, incentive plans, accident prevention and industrial relations.

FRICTIONAL PHENOMENA:

Andrew Gemant. Brooklyn, Chemical Publishing Co., 1950. 497 pp., illus., cloth. $12.00.

In this volume, Frictional processes in all fields of engineering such as gaseous viscosity, acoustic absorbents, viscosity of liquids, colloids and gels, plastic flow, internal solid friction and external friction are treated in a clear and logical manner. The treatment of frictional phenomena is based on the physical processes underlying them. The book proceeds step by step from simple to more complicated cases and although mathematics is used where necessary, it is readable and its understanding does not require an advanced mathematical background. Since the author's research activities embraced the fields of sound absorbing materials, liquid viscometry, structural viscosity of oils, ionic conduction in solids, etc., the interpretation is unique and original.

HANDBOOK OF AERIAL MAPPING AND PHOTOGRAMMETRY:

Lyle G. Trorey. Cambridge, University Press, Toronto, Macmillan, 1950. 178 pp., illus., cloth. $4.75.

Dr. Trory has written a book for the man who wants to make maps from air photographs. It is a book for the drawing office. That is to say it is a manual, not a text-book. He describes in detail methods which have been tried, and which have been found to work. Formulae are quoted, though not necessarily proved; those who are interested in the proofs can find them elsewhere. Although Photogrammetry and stereoscopy can be difficult to comprehend, the author has set out here a very clear treatment of the problem by breaking it down into a number of small comprehensive processes, each of which is fully explained.

INDUSTRIAL ORGANIZATION AND MANAGEMENT, 2nd ed.:

Lawrence L. Bethel. New York, McGraw-Hill, 1950. 851 pp., illus., cloth. $6.65.

This text offers a comprehensive treatment of basic management principles as applied to all the major functions of an individual enterprise. The primary purpose of the book is to develop understanding and appreciation of the specialized activities of any industrial organization, large or small, their interrelationships, and the guiding principles used by management to co-ordinate and control them. In order to accomplish this, the book depends in each chapter upon: brief fundamental statements of the background and operating principles pertaining to the function in question, case examples, consideration of controversial issues, and case problems.

LE CALCUL D'HEAVISIDE. EXPOSE ELEMENTAIRE ET APPLICATIONS A L'ELECTROTECHNIQUE:

T. H. Turney. Paris, Dunod, 1950. 140 pp., illus., cloth. 680 fr.

This work is an initiation to Heaviside's method of calculation. Applications of this method are nowadays being put in use in many fields of physics, and especially in electrotechnology. They will be useful to engineers tackling problems in mechanics and thermics, as well as problems related to accoustics and magnetism. This work is recommended for engineers and students interested in transitory phenomena and impulsions.

OUT OF MY LATER YEARS:

Albert Einstein. New York, Philosophical Library, c1950. 282 pp., cloth. $4.75.

Always an independent and uncompromising thinker, Dr. Einstein attempts to clarify in these papers the position of man unencumbered by traditional prejudices, inhibitions and limitations in the world of today. The various parts of the volume deal with personnal credos, politics, education, the Jewish issue, war and peace and also the fundamental principles of physics. This book indicates that Albert Einstein's life and work are not confined to the problems of science alone, but that he is endowed with the awareness of the most urgent questions of modern society.

PLASTICITY OF CRYSTALS; WITH SPECIAL REFERENCE TO METALS:

E. Schmid and W. Boas. London, F. A. Hughes, 1950. 353 pp., illus., cloth. 35s.

This book, with its lucid exposition and wide range, is cited as the first reference in innumerable metallurgical papers, and became a classic within a year or two of its publication. The present publication is addressed to a large circle of readers. The Experimental data which it presents in classified form, and which it attempts to interpret, should assist the physicist to evolve a theory of plasticity. It is hoped that all those who are studying the plasticity of crystalline materials will be helped by this book in their choice of experimental techniques and methods of research.

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. BOOK OF STANDARDS, 1949, INCLUDING TENTATIVES:

Part 1. Ferrous Metals. 1400 pp. $10.00.
Part 2. Non-Ferrous Metals. 1170 pp. $8.00.
Part 3. Cement, Concrete, Ceramics, Thermal Insulation, Road and Waterproofing Materials, Soils. 1370 pp. $8.00.
Part 4. Paint, Naval Stores, Wood, Adhesives, Shipping Containers, Paper. 1320 pp., $8.00.
Part 5. Textiles, Soap, Fuels, Petroleum, Aromatic Hydrocarbons, Water. 1780 pp. $10.00.
Part 6. Electrical Insulation, Plastics, Rubber. 1410 pp. $10.00.

American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 1949-1950. Illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $54.00 per complete set of all six Parts.

Now covering more than 1550 specifications, tests, etc., this new combined edition contains all of the standards, adopted and tentative, as of the present date. In order to accommodate the increased number of items, the present edition is in six volumes instead of five. Each volume is complete with detailed subject index, both classified and numerical lists of standards, and arranged to provide technologists and others with as usable a book as possible.

A.S.T.M. STANDARDS ON PAINT, VARNISH, LACQUER AND RELATED PRODUCTS:

Prepared by Committee D-1; Specifications, Methods of Testing, Definitions of Terms. December, 1949.
American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 671 pp., illus., diagrs., charts, 9 x 6 in., paper, $4.85.

Some 200 standards are included in this compilation of specifications, test methods, and lists of definitions for pigments; drying oils, paint driers, and thinners; shellac, varnish, and varnish materials; lacquer and lacquer materials; naval stores, etc. Traffic paint service tests and paint weathering tests are covered. New material includes some twenty-four tests and specifications not previously published.

AUTHOR'S GUIDE FOR PREPARING MANUSCRIPT AND HANDLING PROOF:

John Wiley & Sons, New York; Chapman & Hall, London, 1950. 80 pp., diagrs., charts, 9¼ x 6 in., linen, $2.00. ($2.60 in Canada).

This book instructs the author in the efficient preparation of manuscript and illustrations, and explains the publishing procedure from the time the manuscript is submitted until the book is printed. The best and most economical methods of handling proof are described, and there is a glossary of terms.

THE DESIGN, CONSTRUCTION AND MAINTENANCE OF DOCKS, WHARVES AND PIERS:

By F. M. Du-Plat-Taylor. 3 ed. rev. & enl. Eyre & Spottiswoode, Publishers, Ltd., 15 Bedford Street, Strand, London, W.C.2, England, 1949. 543 pp., illus., diagrs., maps, charts, tables, 11 x 8½ in., cloth, 105s.

The new edition of this well-known work incorporates a mass of new data acquired during the past fifteen years. The historical section has been retained, but each one of the practical chapters has been revised and extended to cover modern examples. The organization and administration of ports are fully discussed, and the incidence of air service is considered, including the design of flying boat harbours. Special attention is paid to dock machinery, dredging, concrete work, and excavation methods.

DIAMOND TOOL PATENTS III, TRUING OF GRINDING WHEELS:

By W. Jacobsohn. Industrial Diamond Information Bureau, Industrial Distributors (Sales) Ltd., 32-34 Holborn Viaduct, London, E.C.1, December, 1948. 87 pp., diagrs., tables, 9½ x 7¼ in., paper, 12s. 6d.

Some 500 abstracts are given of British, American and German patents referring to the design, arrangement, or use of a particular truing device. The years from 1916 to 1946 are covered. The patents are classified and the abstracts are printed in numerical order by countries. Succeeding publications will similarly abstract patents in other fields of the diamond industry.

DIAMOND TOOL PATENTS IIIs. TRUING OF GRINDING WHEELS, Supplement, 1949, by W. Jacobsohn:

Industrial Diamond Information Bureau, Industrial Distributors (Sales) Ltd., 32-34 Holborn Viaduct, London, E.C.1, England, 1949. 45 pp., diagrs., tables, 9½ x 7¼ in., paper, 7s. 6d.

This is a supplement to a recent survey which contained relevant British, American and German patents issued from 1916 to 1946. It considers patents issued in 1947 and 1948 and also some which were issued prior to this period and not included in the earlier survey. Some French, Australian, Swiss and Canadian patents are also abstracted although the patent literature of these countries is not exhaustively dealt with.

ECONOMIC MINERAL DEPOSITS:

By A. M. Bateman. 2 ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1950. 916 pp., illus., diagrs., charts, maps, tables, 9¼ x 6 in., cloth, $7.50.

A comprehensive text for both elementary and advanced courses, this book deals with mineral deposits, how they are formed, what they are, how and when they occur, and what they are used for. Basic knowledge of general geology and mineralogy is assumed. In this edition, revised sections include material on contact metasomatism, replacement and cavity filling, hydrothermal processes, sedimentation, and residual and mechanical concentration. References covering up to the end of 1949 are also included.

ELECTRICAL COMMUNICATION:

By A. L. Albert. 3 ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1950. 593 pp., illus., diagrs., charts, maps, tables, 9¼ x 6 in., cloth, $6.50.

This textbook covers the whole field of wire and wireless transmission of code, speech and music. The basic subjects of acoustics, electroacoustic devices, networks, lines, cables, wave guides, and electronics are grouped in the first part of the book. Telephone, telegraph and radio systems are dealt with in the later chapters. Major revisions in this edition have been made in the material on radio systems and dial telephone systems. Television is only briefly considered. Extensive lists of references are included.

ELEMENTS OF HEAT TRANSFER AND INSULATION:

By M. Jakob and G. A. Hawkins. 2 ed. John Wiley & Sons, New York; Chapman & Hall, London, 1950. 230 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $4.00.

Although still restricted to basic principles and their applications, a number of somewhat more difficult methods and details have been added in the process of revision. Other changes of particular note are expansion of the chapter in radiation, the insertion of graphical and numerical methods in the same chapters in which the corresponding analytical methods are presented, and the addition of a section on heat transfer and fluid friction on plane surfaces.

ENGINEERING STRUCTURES, Colston Papers based on a Symposium promoted by the Colston Research Society and the University of Bristol in September, 1949:

Academic Press, New York; Butterworths & Co. (Canada) Ltd., Toronto. 260 pp., illus., diagrs., charts, tables, 10 x 7½ in., cloth, $4.50.

A special supplement to the British magazine "Research", this symposium contains fifteen articles on topics drawn from a wide range of structural applications; carrying capacity of beams; buckling; plasticity; deformation of structural elements under load; riveted joints; etc. Attention was concentrated on problems associated with non-linearity in structural behaviour. Reference lists accompany most of the articles.

FUNDAMENTALS OF POWER-PLANTS FOR AIRCRAFT:

J. Liston, reproduced by photo-offset and distributed by Tri-State Offset Co., 817 Main St., Cincinnati 2, Ohio, 1950, paged in sections, illus., diagrs., charts, tables, 11¼ x 8½ in., linen, $5.50. ($8.25 in Canada).

Written as a text for undergraduate students in aeronautical and mechanical engineering, this book treats all types of aircraft powerplants that recently have been, are now, or are likely to become important in the near future. The characteristics, advantages, limitations and possibilities of each type are presented. Utilization of available energy, fuels, charge handling, cylinder phenomena and performance are some of the characteristics which are discussed in detail. Many diagrams, charts and photographs are included.

HEAT AND TEMPERATURE MEASUREMENT:

By R. L. Weber. Prentice-Hall, Inc., New York, 1950. 422 pp., illus., diagrs., charts, tables, 8½ c 5¾ in., cloth, $6.65.

This book describes measurement methods and includes the theoretical principles necessary for their appreciation, intelligent use and extension. Emphasis is on experimental methods rather than on thermodynamic theory. Part I presents the physical principles. Part II outlines the procedures for 29 laboratory experiments and includes brief discussions of the theory and photographs of typical arrangements of apparatus. The Appendix contains data tables.

INDUSTRIAL INSTRUMENTATION:

By D. P. Eckman. John Wiley & Sons, New York; Chapman & Hall, London, 1950. 396 pp., diagrs., charts, tables, 8½ x 5½ in., cloth, $5.00.

This book reviews the principles of the methods of measurement employed in industrial processing and manufacturing. Primary emphasis is given to the method rather than to the mechanism, and the fundamentals of physics pertaining to the problems of measurement are reviewed. Methods of applying instrumentation to processes are presented with the arrangement and selection of instruments, process analysis, and supervision of equipment. Mechanical, chemical and electrical applications are covered, including spectrographic, strain gage, and high vacuum instrumentation.

THE INELASTIC BEHAVIOUR OF ENGINEERING MATERIALS AND STRUCTURES:

A. M. Freudenthal. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1950. 587 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $7.50.

This book provides a fundamental approach to the subject with main emphasis on the physical response of engineering materials to forces, time and temperature. Following an examination of basic concepts, the structural and phenomenological framework of the theory of elasticity is developed. The remaining sections are devoted to selected problems of the mechanics of the inelastic continuum, to the design of engineering structures and to mechanical testing.

INFLUENCES ON CONCRETE:

A. Kleinlogel, translated from the German (Einfluese auf Beton) by F. S. Morgenroth. Frederick Ungar Publishing Co., New York, 1941. 281 pp., diagrs., charts, tables, 10¼ x 6¾ in., cloth, $7.50.

An English translation of the 1941 German edition, this volume is an encyclopedia of the chemical, mechanical and other affects of air, water, acids, bases, oils, steam, earth, vibrations, storage and the like on cement, mortar, concrete, and reinforced concrete. Measures to decrease and prevent these influences are briefly noted.

THE INTEGRATED POWER SYSTEM:

By P. Sporn. McGraw-Hill Book Co., New York, Toronto, London, 1950. 157 pp., illus., diagrs., charts, maps, tables, 8¼ x 5½ in., linen, $5.20.

This book is intended to present the basic principles, economic advantages and disadvantages, and limitations of the integrated power system as the basic mechanism for power supply. The several chapters deal respectively with social-economic objectives, technical bases and requirements, components and tools, co-ordinating personnel, interconnections between systems, and economic problems. No detailed technical discussions are included, but an existing system is considered in the light of the principles set forth in the book.

INTRODUCTION TO INDUSTRIAL METALLURGY:

L. Aitchison. Macdonald & Evans, 8 John St., Bedford Row, London, W.C.1, 1949. 456 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, 30s. (available in America from the American Agent, Edward W. Sweetman, 1 Broadway, New York 4).

This book is intended to provide a complete picture of the structure, organization, operation and control of a metallurgical plant. Emphasizing executive and management problems, it deals with both simple and complex production set-ups, supervision, personnel relations, plant layout, incentives, process and quality control, and the evaluation of productivity.

KENT'S MECHANICAL ENGINEERS' HANDBOOK. (Wiley Engineering Handbook Series):

Vol. I. Design and Production Volume, edited by C. Carmichael.

Vol. II. Power Volume, edited by J. K. Salisbury.

John Wiley & Sons, New York; Chapman & Hall, London, 12th ed. paged in sections, 1950. illus., diagrs., charts, tables, 8½ x 5½ in., leather, $8.50 per volume.

Volume I now primarily directed toward the engineers who design and manufacture machinery, appliances, mechanical equipment and other engineered products, this edition provides a summary of the essentials of the field together with pertinent data. The six main sections cover selection of materials, design principles, design and selection of machine components, production processes, production plant equipment and mathematical tables. References are included in the text and at the ends of many of the chapters.

Volume II, thoroughly revised and rewritten, covers the entire field of heat-power engineering and transportation as well as the important aspects of fluid flow. The first four sections treat power processes. The service functions, pumping and piping, are dealt with in the next two sections. Power-producing equipment, refrigeration, heating, ventilating, air conditioning, transportation and electric power are then discussed. The remaining sections are devoted to atomic energy, instrumentation, power test codes and mathematical tables.

MANUAL ON FATIGUE TESTING. (Special Technical Publication No. 91):

Prepared by American Society for Testing Materials, Committee E-9, 1916

Race St., Philadelphia 3, Pa., 1949. 82 pp., diagrs., charts, tables, 9 x 6 in., paper, $2.50 (cloth, $3.15).

Written by some of the leading authorities in this field, this manual provides information for those setting up new laboratory facilities, aids in the proper operation of the equipment, and offers advice on the presentation and interpretation of data.

METAL CUTTING TOOL HANDBOOK:

Metal Cutting Tool Institute, 405 Lexington Ave., New York, 1949. 647 pp., illus., diagrs., charts, tables, 9¼ x 5 in., cloth, $6.50.

This handbook presents complete and up-to-date information on various types of metal cutting tools, their operation and maintenance. There are sections on twist drills, reamers, counterbores, taps, dies, milling cutters, hobs, gear shapes, cutters, and broaches. Each section contains pertinent data on speeds, feeds, operating conditions, sharpening, and maintenance instructions. There are also tables of commercial sizes of each type. An engineering data section is also included.

MINE PLANT DESIGN:

W. W. Staley. 2 ed. McGraw-Hill Book Co., New York, Toronto, London, 1949. 540 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $8.50.

This book is a practical presentation of the methods and procedures for selecting and designing mine plant equipment and simple structures covering surface and underground equipment and buildings. Noteworthy features of this new edition include four new chapters on design principles, ore bins, skips and cages, and safety catches. The chapters on roof trusses, headframes and mine ventilation are almost completely rewritten. Data are included on the use of diesel locomotives and amplidyne control.

POCKET ENCYCLOPEDIA OF ATOMIC ENERGY:

Edited by F. Gaynor. Philosophical Library, 15 East 40th St., New York, 1950. 204 pp., diagrs., charts, tables, 8¾ x 5½ in., linen, $7.50.

This book presents a comprehensive collection of brief explanations and definitions of concepts and terms in the field of nuclear physics and atomic energy. In addition, brief biographical sketches of outstanding workers in the field are included as well as description of important nuclear research laboratories, power plants, and installations. German equivalents are given for a great many of the terms defined.

PRIMARY BATTERIES:

By G. W. Vinal. John Wiley & Sons, New York; Chapman & Hall, London, 1950. 336 pp., illus., diagrs., charts, tables, 8½ x 5½ in., cloth, $5.00.

This comprehensive work covers the history, theory, materials, chemical reactions, manufacture, and operating characteristics of primary batteries. New types of special-purpose batteries are covered, such as for low-temperature conditions, large current production, etc. Practical material is presented on silver oxide and chloride batteries, mercury oxide batteries, and perchloric and fluoboric acid batteries. There is a separate chapter on standard cells.

PRINCIPLES OF ELECTRIC AND MAGNETIC CIRCUITS:

W. B. Boast. Harper & Brothers, New York, 1950. 367 pp., illus., diagrs., charts, tables, 9½ x 6¼ in., linen, $4.25.

This text is designed for use in an introductory course in electrical engineering. Parts I and II cover basic concepts of simple electric and magnetic circuits; Part III deals with electro-magnetic induction; Part IV presents methods of electric network analysis; and Part V treats important supplementary aspects: conduction circuits with irregular boundaries, capacitance as a circuit element, and systematic methods of writing equations for circuits containing resistance, inductance and capacitance. The rationalized MKS system of units is used, although the English units of magnetic potential gradient and flux density are also emphasized. More than 300 problems are provided.

PROPERTIES OF METALS AT ELEVATED TEMPERATURES:

By G. V. Smith. McGraw-Hill Book Co., New York, Toronto, London, 1950. 401 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $8.50.

This book collects and correlates the results of twenty-five years of research work on the effect of temperature on the properties of metals. The initial chapters deal with the nature of plastic deformation and fracture of metals from a metallurgical viewpoint. Next, the test apparatus and test procedures employed in evaluating metals for service at elevated temperatures are described. The effects of such variables as chemical composition, manufacturing practice, and heat treatment are then discussed. The questions of sealing and changes in micro-structure are also considered. A final chapter deals with the problem of design for service at elevated temperatures. Numerous illustrations, an appendix with useful data and an extensive bibliography are also included.

RADIO OPERATOR'S LICENCE Q & A MANUAL:

Milton Kaufman. New York, Rider, c1949, 608 pp., illus., cloth. $6.00.

This book is based upon the latest Study Guide and other FCC releases. It incorporates "Discussion" sections for most of the questions, in order to present much important background material. Each question is divided into two separate sections: a short, but complete answer, and a discussion. A complete section of the book is devoted to the Amateur Radio License questions and answers, and rules and regulations. Amateurs will benefit additionally by cross references made to answers and discussions in the Commercial License section.

SALES ENGINEERING:

By B. Lester. 2 ed. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1950. 226 pp., diagrs., 8½ x 5½ in., linen, $3.00.

Sales engineering is defined as the art of selling equipment and services which require engineering skill in their selection, application and use. The author discusses the field of sales engineering, describes the work of the sales engineer under current conditions and indicates the training and development of the sales engineer.

DER STAHLBETONBAU, Werkstoff, Berechnung und Gestaltung:

By R. Saligner. 7th ed. Franz Deuticke, Vienna, 1949. 644 pp., diagrs., charts, tables, 10 x 7 in., paper, 66 Sw. Frs.; bound, $15.18.

Intended for use both as a textbook for civil engineering students and a handbook for practising engineers, this book considers the materials, calculations and construction principles of reinforced concrete. It contains detailed discussions ranging from the production of concrete to the design and construction of bridges and buildings. Numerous charts provide useful data, and a bibliography is included.

STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING, 2 Vols.:

Adopted and published by the American Association of State Highway Officials, 1220 National Press Building, Washington, D.C. 6th ed., 1950. Part I, 231 pp.; Part II, 414 pp. Illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $6.00 per set, not sold separately.

Part I contains 94 specifications broadly classified under the following headings: hydraulic cement; bituminous materials; soils; 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. Part II contains 120 test methods under the same headings except that the paint, sewer pipe, and reinforcing steel classifications are not represented, and a group under concrete has been added. In each volume numerous deletions, combinations, revisions, and additions have been made in line with current practice.

SYMPOSIUM ON EFFECTS OF LOW TEMPERATURES ON THE PROPERTIES OF MATERIALS. (Special Technical Publication No. 78):

American Society for Testing Materials, Philadelphia 3, Pa., 1950. 62 pp., illus., diagrs., charts, tables, 9 x 6 in., paper, $1.50.

This symposium of four papers and discussions brings together some of the existing knowledge of the low temperature use of plastics, elastomers such as rubber, non-ferrous metals, and metal welds. Suggestions for future work in this field are outlined.

SYMPOSIUM ON TESTING OF CAST IRON WITH SR-4 TYPE OF GAGE. (Special Technical Publication No. 97):

Presented at the Fifty-Second Annual Meeting, American Society for Testing Materials, Atlantic City, New Jersey, June 29, 1949. 92 pp., illus., diagrs., charts, tables, 9 x 6 in., paper, $1.65.

This symposium covers the analysis of stresses in automotive cylinder blocks; the strain testing of machine parts; strain-gage tests on Diesel cylinder blocks, heads and pistons; and stress-strain testing of cast iron machine parts particularly for textile machinery, railroad service, and tractors.

TECHNOLOGY OF ALUMINIUM AND ITS LIGHT ALLOYS:

A. von Zeerleder, translated from the third German edition by J. J. Stevens. High Duty Alloys Ltd., Slough, Bucks, England, 1948. 451 pp., illus., diagrs., tables, charts, 9¼ x 6 in., cloth, 21s.

This book is an English translation of third German edition. Some two-thirds of the text is revised, and the new material added covers recent developments and knowledge. The list of German patents in the original third edition is omitted, but the bibliography is included with all foreign titles translated.

BABCOCK pumps of this type are suitable for heavy continous duty with heads to 300 feet and are ideal for handling clear water or other clear liquids of low viscosity in waterworks, mill supply, condenser circulating and similar service.... Their standard design is so adaptable that they may be used, with modifications, for installations requiring special location of branches, or for vertical operation.

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Business & Industrial Briefs

A Digest of Information received by The Editor

New Equipment and Developments

Water Tower.—On one of the housing projects of the London County Council, a 140-ft. cylindrical water tower has been erected to a design and finish intended to make it attractive. The tower forms part of the project's central heating system and is encased in attractive green glass with aluminum frames treated to retain their brightness.

•

U.K. Aluminum Mill.—A new $4,500,000 aluminium mill, with an annual capacity of 60,000 tons, has been built in South Wales (Great Britain). It will increase by one-third Britain's production of aluminium and is one of the biggest industrial projects to be completed since the war.

•

Monsanto Wood Brand.—Monsanto Chemical Company has registered a brand to identify construction lumber and other wood items preserved against decay and insects with Monsanto's penta.

The brand, "MP" for maximum protection, will be licensed to plants qualified to treat by the vacuum-pressure process in accordance with specifications being established by the Company. The identifying mark, a pentagon containing penta content and other information, is to be indelibly stamped onto each piece meeting specifications. Penta is an oil-borne wood preservative accepted as standard by the American Wood Preservers Association.

•

Canada-UK. Trade.—Canada's imports of British goods during August showed a big rise over the previous month's figures. Total imports were worth $34.1 million as against $29.3 million in July. Outstanding feature of the August figures was the purchase of non-ferrous metals and manufactured items.

•

Spot Welder.—Increased power, faster welding, easier handling, automatic switch control, and greater versatility are claimed as features of a new self-contained portable spot welder—model BW—now being manufactured by Greyhound A.C. Arc Welder Corp., 606 Johnston Avenue, Brooklyn 6, New York.

To meet the demand of metal-working shops which require a new floor-type as well as a portable spot welder, this new welding tool can easily be converted into a stationary model. The new welder weighs about 33 pounds, it can weld up to ¼ in. combined thickness of mild or stainless steel, or 2 pieces of 16 gauge galvanized metal with a combined thickness of ⅛ in. This capacity is claimed to be almost double that of present models. For further details, communicate with the manufacturer.

•

[British-made locomotive

British Diesel Engine Sold. — First British-made locomotive of its kind in Canada is the Mark 165DE Ruston-B.T.H. 28 tons diesel electric switching locomotive just produced by Ruston & Hornsby Limited of Lincoln, England, for use in a Toronto factory-yard. The order was obtained in the face of strong U.S. competition.

Special features incorporated to meet Canadian requirements include radiator, louvres controlled from the driver's cab; M.C.B. "E" type automatic couplers; handrails and steps for rider; and provision for carrying a snowplow, to be supplied through the Ruston organization in Canada.

The locomotive weighs 28 long tons, has an 0-4-0 wheel arrangement, and is capable of speeds from 2.5 to 17.0 miles per hour, with a tractive effort from 15,000 to 1,100 pounds, a drawbar pull of 14,580 to 680 pounds and maximum haulage capacities from 972 tons to 139 tons, from level-track operation up to a grade of 1/30.

A Ruston 6VPHL six-cylinder vertical diesel engine, with constant rating of 155 b.h.p. at a speed of 1,250 r.p.m. is direct-coupled to a B.T.H. direct current self-excited generator, type RTB 6034, whose electrical output can in no circumstances exceed the rated engine horsepower. Servicing is through Ruston & Hornsby Spares and Service Depot. Toronto, in conjunction with the B.T.H. agents.

•

Demagnetising Coil.—An improved design of demagnetizing coil is available from the special products section of Canadian General Electric Company. This instrument is highly effective in demagnetizing materials and stabilizing magnetic flux.

The device can be used to eliminate undesirable magnetic flux from tools, drills, punches, small tools and any machined parts which may have become magnetized. The demagnetizer is also useful in equalizing and stablizing magnetic flux in permanent magnet assemblies that are used in electrical instruments and control devices. The G-E demagnetizer is shipped complete and ready for use. It consists of an air-core coil built in a frame which can be mounted on any table or bench. Complete information may be obtained from any Canadian General Electric office.

•

HARNESSING WATERPOWER

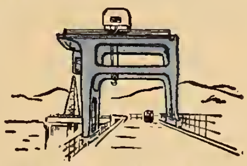
Impression of closure gate at the great Des Joachims Power Development of the Ontario Hydra.

FOR MORE THAN 50 YEARS Dominion Bridge Company has been associated with the task of harnessing water power and during this period has contributed largely to the development of Canada's vast hydro-electric system.

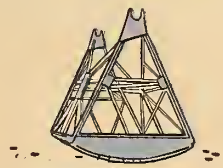
Besides designing and fabricating most of the regulating gate equipment now in use, the Company is the leading manufacturer of overhead and gantry cranes, penstocks, scroll cases, structural steel and many other special items.

DOMINION BRIDGE COMPANY, LIMITED • HEAD OFFICE: LACHINE, QUEBEC

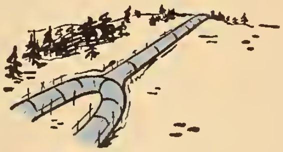
SLUICE GATES



GANTRY CRANE



TAINTER GATE



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No matter what business you are in, it will pay you to attend the 1951 Trade Fair. Ask your trade association, or write for an informative illustrated booklet to The Administrator, Canadian International Trade Fair, Toronto.

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TORONTO MAY 28 - JUNE 8, 1951

DEDICATED TO THE PROMOTION OF INTERNATIONAL TRADE BY THE GOVERNMENT OF CANADA

Saran-lined Valves.—Dow Chemical of Canada Ltd., Toronto, announces the development of saran lined Grinnel-Saunders Diaphragm Valves for handling corrosive fluids and gases.

Special castings designed for the purpose are lined with B-115 saran, the same material used in saran line pipe and fittings. They are furnished normally with diaphragms of saran rubber, but diaphragms of natural rubber, neoprene, butyl, hycar and white neoprene are supplied optionally for special conditions. For extreme corrosive conditions and for high temperatures, diaphragms of Kel-F can be furnished at extra cost.

The valves are available in sizes 1 in. to 6 in. inclusive with flanged ends and are usually equipped for hand-wheel operation. Quick-opening lever operators, electric motor and air motor operators are readily available.

●

Temperature Recorder.—A continuous record of actual temperatures in refrigerated trucks, railway cars, warehouses, ships and retail stores' units is provided by the new Minicorder, a self-contained recording thermometer developed by the Tagliabue Instruments Division of the Weston Electrical Instrument Corporation. With this new instrument, an accurate check of storage space temperatures is available to those engaged in the shipment, storage or merchandising of commodities requiring refrigeration. The Minicorder requires no connection to any power supply, yet it records temperatures over a period as long as seven days without attention. A specially-developed shock-proof mechanism makes it particularly satisfactory for use in trucks, trailers, railway refrigerated cars and ships, where it can be installed with the cargo, without shockproof mounting, and depended upon to record an accurate graph of ambient temperatures over a seven day period.

The recorder is available in various models within the limits of minus 30 deg. F. to plus 165 deg. F. Charts are available for 24-hour, 72-hour, 3-day and 7-day recording. Special two-pen models are made for on-off recording of related equipment. The instrument measures 5¾ in. by 5¾ in. by 4¼ in., and weighs 3½ pounds. Complete details about this instrument—model No. 8475 Minicorder, can be had from Tagliabue Instruments Division, Box 414, Weston Electrical Instrument Corp., 614 Frelinghuysen Avenue, Newark 5, N.J.

●

Carboloy Drills Tested. — Carboloy masonry drills were given a thorough test by J. L. E. Price and Company at the work on the new Bank of Nova Scotia Building in Toronto. On each floor it is necessary to drill 3000 ⅝-in. holes in reinforced concrete to facilitate the fastening of baseboards and ceiling trim to the various office walls. An ingenious arrangement is used to obtain constant positive pressure during the drilling of the holes at the ceiling level, by means of 2 in. by 4 in. levers, working from a "hinged" joint. The actual drilling time for a hole 2 in. deep is 5 seconds. 150 holes of 25 feet of drilling, are done between regrinds of the drill. About 6000 holes per drill are obtained and the operator has two on hand all the time, alternating them when they become too hot for further work. A total of 40,000 holes has already been drilled and only ten Carboloy drills have been used.

●

Mine Surveying Instrument.—A new instrument which, it is claimed, simplifies the work of surveying in mines has been developed by a firm in London, England. Known as the "Microptic Transit", it is claimed to combine accuracy with simplicity and has been found suitable for elementary surveying work both in the collieries and at the surface. Construction of the new instruments follows general theodolite principles. The upper portion encloses the optical and mechanical parts and consists of a single aluminium casting. To the right hand side is a platform holding two spirit levels, one at 90 deg. to the other, and devices to prevent disturbance. The reading microscopes are self-contained units, which slide into fitted tubes and can be locked into position. Among other features are a new type of sighting device and various design refinements which enable the instrument to be adapted, to such work as underground traverse-surveying, surface trigonometrical levelling and magnetic orientation. For further details, communicate with the United Kingdom Information Office, 10 Albert Street, Ottawa, Canada, and refer to item No. 174.

●

Civil Defence. — Establishment of a liaison Committee on civil defence by the Canadian Construction Association was announced recently by the President of the Association, Robert Drummond. Mr. Drummond said: "The C.C.A. has long pledged its unrestricted co-operation to the government on all defence matters and after consultation with Major General Worthington, coordinator of civil defence, we have asked all affiliated local builders' exchanges throughout Canada to set up local committees to deal with the construction phases".

"While the question of civil defence in Canada is still largely in the planning stage" said Mr. Drummond, "it is obvious that the construction industry must be prepared to play a leading part in reconstruction work following an attack." As examples he cited debris clearance and demolition work, the restoration of public utilities and lines of communication, assisting in the rescue of victims trapped in basements and shelter erection.

The Chairman of the liaison committee is Colonel G. E. Crain, general contractor of Ottawa, who reported at a meeting of the C.C.A. Management Committee held in Ottawa on September 14th, that builders' exchanges in fifteen cities have already responded to the C.C.A. appeal.

●

Gas Turbine Ship Engine.—Plans are nearing completion in Great Britain for the world's first gas turbine ocean-going merchant ship. The vessel is the tanker "Auris", 12,000 tons.

●

Pulp Mill Waste Treatment.—A new process for the treatment of kraft pulp and paper mill wastes which promises reduced pollution of streams in paper mill areas was described to engineers at a regional meeting of the American Institute of Chemical Engineers, Minneapolis, on September 13th. The speak-

In the mineral-rich wilderness of Quebec and Labrador . . . in the timber lands of Ontario . . . in the booming oil fields of Alberta . . . wherever new development promises new prosperity for Canada, you'll find the airborne technicians of The Photographic Survey Corporation at work.

Before the job of the engineer and the construction worker can begin, there must be exploration, reconnaissance, mapping . . . an inventory of the features and potential resources of the territory. That's the job of P.S.C. and its affiliated companies . . . to provide the planners of Canada's future with the information they need, gathered by the aerial camera, the airborne magnetometer, and all the amazing post-war tools of air survey.

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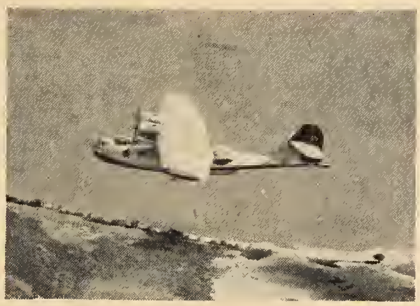

NEWFOUNDLAND: Aeromagnetic Surveys Limited, an associate company of P.S.C., carries out a search for possible ore deposits, covering 5000 square miles with the airborne magnetometer.

ONTARIO: Photographic Survey Corp. aircraft complete flying operations on a giant photography and base mapping assignment for Department of Lands and Forests ... nearly 150,000 square miles covered in five years.

ALBERTA: Aircrews of P.S.C. and Photographic Surveys (Western) Limited engaged on the second phase of a four year programme to complete the photography and mapping of the entire province.

LEARN HOW the tools and techniques of modern air survey can save time and money in *your* operation. Write (on company letterhead, please), for any or all of these helpful, FREE brochures:

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GROUND PROFILES BY RADAR — useful data on the new PSC Airborne Profile Recorder.

We will also be pleased to add your name to the mailing list for the PSC AIR SURVEY NEWS, a periodical publication to keep you up to date on new developments in a fast-growing field. Write to: Dept. "K".

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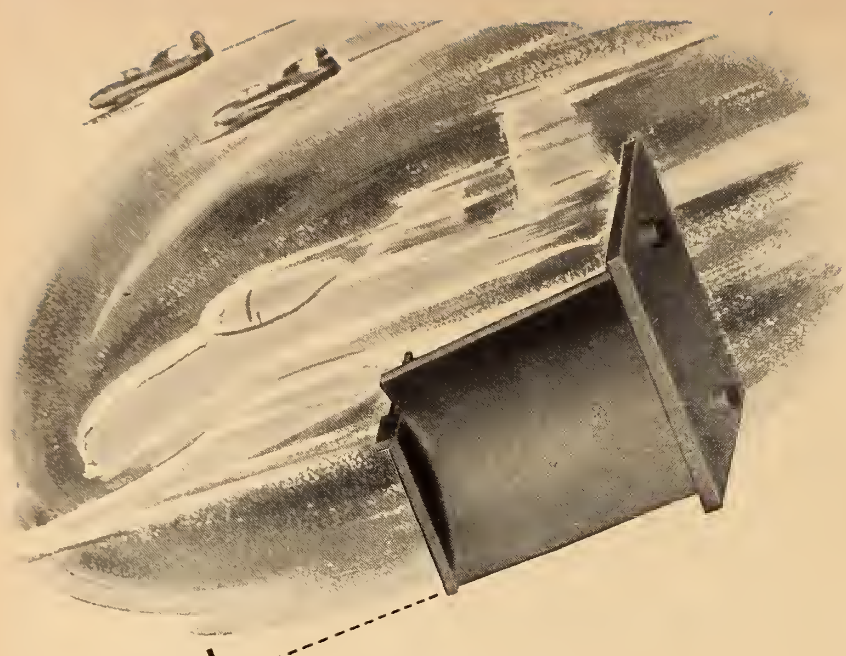

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- PRECISION INVESTMENT CASTING IN MANY ALLOYS

ers were W. A. Moggio and H. W. Gehm of the national council for stream improvement.

In the new treatment, kraft mill waste is seeded with a biological seed which is developed from the waste itself or from domestic sewage. Nutrients are added to the waste in the form of nitrogen and phosphorous salts to supply microorganisms with minimum amounts necessary for metabolism. The biological seed sludge is reused continually, much in the same manner as in the treatment of domestic sewage at municipal disposal plants.

●

Shipyard Orders. — On September 22 the Right Hon. C. D. Howe announced that contracts totalling $43,250,000 have been awarded to Canadian shipbuilding yards for the construction of eighteen vessels required by the Royal Canadian Navy. These vessels will be in addition to contracts, valued at $28,200,000 placed earlier this year.

Four anti-submarine escort vessels, valued at $32,000,000 will be constructed by the Burrard Dry Dock Co. Ltd. of North Vancouver, B.C.; Canadian Vickers Ltd., Montreal, Que.; Marine Industries Ltd., Sorel, Que.; and Halifax Shipyards Ltd., Halifax, N.S. Four gate vessels, valued at $2,000,000 will be constructed by Victoria Machinery Depot Co. Ltd., Victoria, B.C.; Burrard Dry Dock Co. Ltd., North Vancouver, B.C.; Geo. T. Davie & Sons Ltd., Lauzon, Levis, Que.; and Pictou Foundry & Machine Co. Ltd., Pictou, N.S.

Ten influence type minesweeping vessels, valued at $9,250,000 will be constructed by Yarrows Limited, Victoria, B.C.; Victoria Machinery Depot Co. Ltd., Victoria, B.C.; Port Arthur Shipbuilding Co. Ltd., Port Arthur, Ont.; Midland Shipyards Ltd., Midland, Ont.; Canadian Vickers Ltd., Montreal, Que.; Davie Shipbuilding & Repairing Co. Ltd., Lauzon, Levis, Que.; Geo. T. Davie & Son Ltd., Lauzon, Levis, Que.; Marine Industries Ltd., Sorel, Que.; and the Saint John Dry Dock Co. Ltd., Saint John, N.B.

●

Industrial X-Ray Equipment.—A new service plan designed to enable Canadian industry to cut costs, perform research and control product quality, without investing in equipment, has been announced by General Electric X-Ray Corp. Ltd. For the first time in the history of X-Ray manufacturing, according to executives of the Company, industry will be offered not merely an X-ray apparatus, but a packaged X-ray service, complete with equipment, maintenance, repair parts, tubes and instruction. All this will be covered by one monthly charge.

It was pointed out that the plan follows a "trend in the industrial field toward service-and-rental systems designed to help industry obtain cost-reduction benefits without investment in capital goods. Among outstanding examples of these are: machine tools, packaging machinery, shoe machinery, business machines, postage meters, telephone service.

According to a Company statement, the plan is known as "Maxiservice" because it provides the customer with maximum service. Those wishing to obtain further information about this new service may do so by writing to offices of General Electric X-Ray Corp. Ltd. in Montreal, Toronto, Winnipeg, Edmonton or Vancouver.

●

Ontario H.E.P.C. Plants.—The Richard L. Hearn Generating Station, Toronto, and the J. Clark Keith Generating Station, Windsor, being erected by the Hydro-Electric Power Commission of Ontario will employ the latest Aerotect series mechanical-electrical dust collectors supplied by T. C. Chown Ltd., Montreal.

Such plants burn great amounts of pulverized coal, much of the ash from which is collected by Aerotect cast aluminium tube mechanical type collectors. However, the remainder, approximately 10 per cent, will now be almost entirely removed by the electrical precipitators. In each station, Canadian General Electric Company will furnish the electrical equipment for the electrostatic fly ash precipitators which will ensure a total collection efficiency in excess of 97.5 per cent of all fly ash.

●

Saskatchewan Power Line. — Service over a new high tension power line from Prince Albert to Melfort is now in operation, according to information received from Saskatchewan Power Corp.

The newly constructed power line crosses the south Saskatchewan river at a point about 12 miles southeast of Prince Albert and follows a straight cross-country route from there to Melfort. The line has been constructed to carry 69,000 volts but will operate for a short time on a lower voltage.

●

New D.C. Welder.—Canadian Westinghouse Co. Ltd. announces a new d-c welder of three phase rectifier type. This new welder, it is claimed, combines the economic advantages of single phase a-c welders with the desirable characteristics of the rotating d-c welder. It meets a need that has been apparent in the industry for some years. A solution has been sought from time to time through the application of rectifiers without permanent practical results. Progress in design and manufacture of Westinghouse selenium rectifiers combined with the development of a quiet, stepless type, three phase reactor for use in the three phase transformer secondary has brought this desired development to a successful conclusion in the new Westinghouse rectifier welder, which is offered in 200-300 and 400 ampere, 60 duty cycle ratings.

●

"Explosion Proof" Motors. — The following information has been received by the Canadian Electrical Manufacturers Association, 126 Davenport Road, Toronto—"It has been drawn to our attention that motors, which are constructed for Class II, Group G, hazardous locations, are sometimes called "explosion proof motors". It should be pointed out that the use of the term "explosion proof" refers only to motors constructed in accordance with Class I, Group D, requirements.

Some manufacturers supply motors which are rated for Class II, Groups F and G locations.

An explanation of the locations which the Classes and Groups mentioned refer to is given below:

Class I, Group D—atmospheres containing gasoline, petroleum, naptha, alcohols, acetone, lacquer-solvent vapours and natural gas.

Class II, Group F—atmospheres containing carbon black, coal or coke dust.

Class II, Group G—atmospheres containing grain dust.

It should be noted that Class II motors are "dust-tight" and are not "explosion-proof" in the sense of being proof against a dust explosion started within the motor frame. It is not practicable to make such a motor hence they are made "dust-tight" i.e. to prevent the entrance of dust. It is true, however, that some motors enjoy both a Class I and Class II rating. Such motors are "proof" against an explosion of a specified gas-air mixture and are also "tight" with respect to specified dust.

●

Saskatchewan Power Plant.—A steam turbo-generating unit destined for the Saskatchewan Power Corporation plant at Estevan, Man., was delivered at Churchill, Man., late in September. This shipment from the United Kingdom, comprises equipment totalling 200 tons, heaviest piece weighing 34 tons. The new 15,000-kilowatt generating unit was transhipped from Churchill to Estevan via Canadian National Railways.

Officials expect to have the generating unit operating early in 1951.

●

Oil Storage Tanks.—Installation of 20 new storage tanks with a total capacity of three million barrels will be started at Imperial Oil's Sarnia refinery this fall, according to information released by J. L. Huggett, general superintendent.

Construction of the new tanks is one of several projects which will enable Ontario refineries to use Alberta crude oil. Others include the 1,126-mile pipe line being built by the Interprovincial Pipe Line Co. to bring oil from Edmonton to Superior, Wis., two new lake tankers to carry the crude from Superior to Ontario refineries and new terminal facilities at Sarnia. The new Sarnia tanks are being built to store crude for the winter months when navigation is closed.

Each tank will be 150 ft. in diameter, 48 ft. high and will weigh 500 tons. Almost three miles of 20-inch main pipe line will be required to move the crude from the ships to the tank farm and more than one mile of 16-inch auxiliary lines will be required in the storage area, to be made of Canadian and British steel. Contracts for erecting the tanks have been awarded to the Horton Steel Company of Canada and to the Toronto Iron Works Ltd.

●

New Bulldozer.—A new, large capacity, U-shaped bulldozer, designed for universal use in a variety of earthmoving applications with the Caterpillar Diesel D8 track-type Tractor, has been added to the heavy earthmoving equipment line of Caterpillar Tractor Company.

The new design permits long-haul pushing of loose material with minimum end spillage when bulldozing straight ahead. It is an excellent tool for stockpiling, handling large capacity loads and allowing good manoeuvrability. The U-shaped bulldozer does smooth finishing, quick backfilling, and pioneering and side hill work. In addition its U-shaped blade makes it a convenient tool for felling trees.

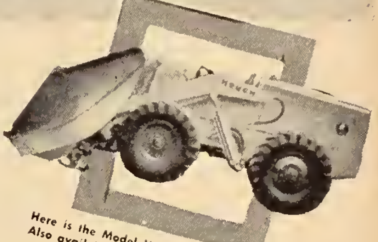
●

In the Winter -- a drift-busting brute for the Snow Belt . . it's a Model HM "PAYLOADER" equipped with "V" or Reversible Blade Plow.

In the Spring, Summer and Fall — with regular bucket it's an all-around excavating, earthmoving, loading and bulk materials handling tool.

The Model HM as a snow plow has the power, traction and speed ranges to crawl through heavy drifts or swoosh through lighter snows at speeds up to 16 mph. Four, big, pneumatic-tired wheels *with power on all four* provide the push that puts snow in its place — off the highway. Powerful hydraulic control exerts up to 3 tons of lifting capacity for "break-out" or tremendous down-pressure to dig in fast. Power-boosted rear wheel steering is easy and responsive . . four speeds in reverse as well as forward assure slow or fast action in either direction. All-weather cab is optional.

For summer or snow, for all-season *go* the HM "PAYLOADER" is a year-round tax saver Get the full facts from your Hough "PAYLOADER" Distributor



Here is the Model HM with "V" Snow Plow. Also available with Reversible Blade Plow.

Equipped with regular bucket, the Model HM is a fast snow loader. Interchange of bucket and plow is quickly accomplished.

CATALOGS on the big 1½ yard Model HM or the four smaller sizes of "PAYLOADERS" are available, without obligation.

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Stainless Steel Mill.—Demand for the production of Canada's first mill for the hot rolling of stainless steel sheet has been so far beyond expectation that Atlas Steels Limited has ordered a Cold Reduction Mill to expand its ability to supply a wider range of sheet products. To meet the demand it has been necessary to put the Hot Mill on a three-shift, 24-hour basis. Sheet is shipped as rapidly as it is rolled, finished, inspected and packed.

The present equipment produces hot rolled, annealed or ground and polished sheet in several finishes. The Cold Reduction Mill will be of a size complementing the production of the Hot Mill.

Ground has been broken for an addition to the north plant at Welland to accommodate the new machinery. Installation is expected to be completed within six months with production scheduled as soon as test runs show production of satisfactory and commercial quality.

●

Synthetic Rubber Plant Expansion.—A major expansion of the Government's synthetic rubber plant, operated by the Polymer Corporation at Sarnia, Ontario, had been authorized on the recommendation of the Corporation's board of directors. Involving an expenditure of upwards of $6,600,000.00 the programme will result in an expansion of between 20 and 25 per cent in productive capacity.

Built in 1942-3 to supply vitally needed rubber, the Company has achieved outstanding success in marketing its output. Increased diversification and constant improvement in quality has enabled its products to become increasingly aggressive competitors with crude rubber, while an active sales programme throughout American and Western Europe has developed markets for its entire production.

Although the plant is currently operating at a rate of approximately 130,000,000 pounds of rubber per year, the high price for crude rubber which has prevailed since early in 1950 and additional military requirements have resulted in a demand for the Company's products, from both domestic and foreign sources, far in excess of the Company's present productive capacity.

Work will get under way as soon as process engineering and design plans can be completed. It is expected that the expansion of the Butyl and Styrene plants will be completed within eight months and the Butadiene and Copolymer plant extensions within twelve months.

The expansion programme will enable the producion of Butyl rubber, used largely for inner tubes and mechanical goods, and Polysar S type rubbers, used largely for tires, wire, cables, and footwear, to be increased to 36,000,000 pounds and 126,000,000 pounds a year, respectively.

The expansion programme will be financed by the Company out of its reserves for depreciation and obsolescence and current earnings.

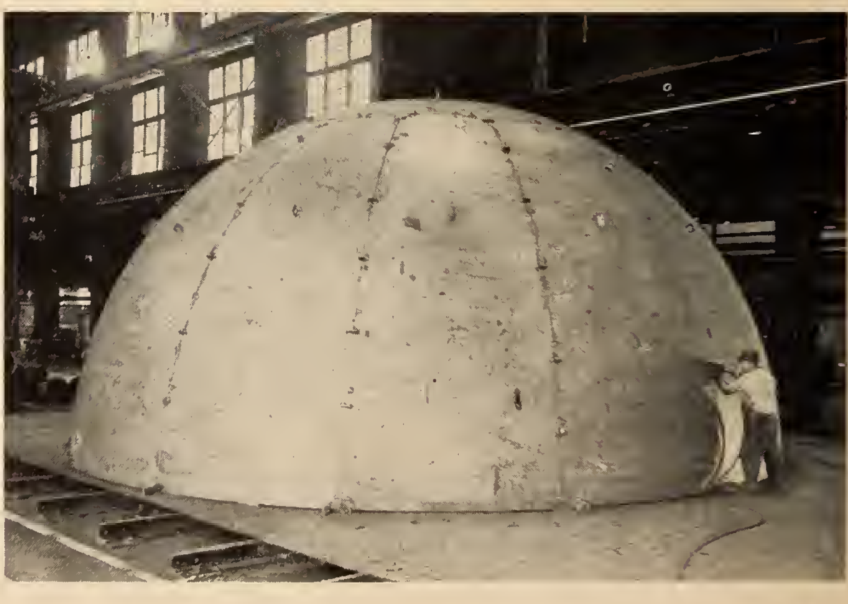
●

Lightweight Drill.—A new lightweight utility drill for plant maintenance crews has just been announced by Gardner-Denver Company of Quincy, Illinois. The S17 Utility Drill comes in a handy carrying case with a complete kit of drill accessories, including a 14-in. drill steel and three assorted size rock bits, a star drill adapter and 25 feet of air hose. The drill weighs only 19 lbs. It will drill either concrete, brick or stone with standard drill steel, and a star drill adapter furnished with the drill accommodates standard star drills. A special stop-rotation feature converts the S17 to a lightweight chipping hammer or pick.

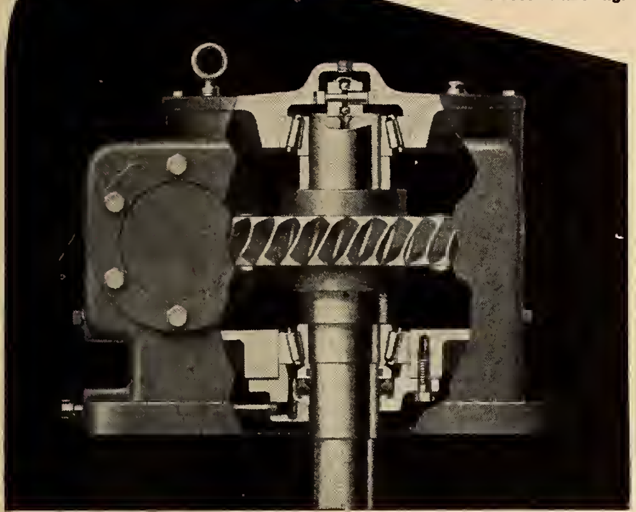
●

ROUND AS AN IGLOO

This spherical head being constructed for the Argentine Government by Bethlehem Steel Company at its plant at Steelton, Pennsylvania (U.S.A.), is temporarily check-assembled in the fabricating shop. The head, constructed of steel plates .41 in. thick, will become part of a capsule-shaped gas holder 205 feet long. The Argentine order calls for 10 of the gas holders, each with a capacity of 500,000 cubic feet, to be supplied by Bethlehem Steel Export Corporation. Diameter of the head is 34 feet.



Cutaway section to show tapered roller bearings on gear shaft, positive face-type oil seal, unique lubricating pump and oil drain at base of housing.



A new series of Cleveland Vertical Speed Reducers

● NU and ND worm gear units—in seven sizes each (50 to 500) are ready for prompt delivery. They are particularly suited to such equipment as agitators and mixers, and for use in connection with supplementary low speed spur gear drives, without requiring outboard bearings.

Exterior view of the new Cleveland Type ND unit. NU unit (not shown) has slow-speed shaft extending up.

Outstanding features which insure that these new vertical drives will deliver long and trouble-free service are:

Extra heavy tapered roller bearings on gear shaft.

Continuous lubrication of top bearing by positively driven pump mounted on upper end of gear shaft (on lower end in Type NU).

Positive face-type oil seal below lower gear shaft bearing to prevent leakage.

Heavy base flange extends around all four sides. All parts liberally oversized and precision built.

Write for Bulletin 125 for full description of Types NU and ND, including capacity charts and dimension data. The Cleveland Worm & Gear Co., 3287 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication.
In Canada: Peacock Brothers, Limited.

CLEVELAND
Worm Gear
Speed Reducers

STELCO
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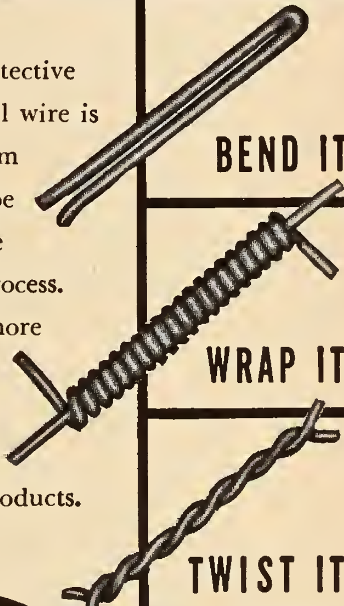
ZINC TIGHT
GALVANIZED
WIRE
THE STEEL CO. OF CANADA LTD.

a wire
THAT PASSES
THE TOUGHEST TESTS!

The best metallic protective coating today for steel wire is zinc. The most uniform zinc coating that can be applied is done by the electro-galvanizing process. No manufacturer is more experienced in this modern process than STELCO—the leader in the field of wire products.



BEND IT!

WRAP IT!

TWIST IT!

ELECTROLYTIC ZINC COATING WILL NOT FLAKE, CRACK NOR PEEL

- Smooth finish
- Absolutely uniform coat
- Unadulterated coating 99.99 pure zinc
- More ductile coating

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J. C. PRATT & CO. LIMITED
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Appointments and Transfers

New C.S.A. Building.—J. G. Morrow, Chairman of the Canadian Standards Association, announced that, with the purchase of its own building at 71-77 Florence Street, Toronto, the reorganization of the CSA Approvals Division and its independent operation has been completed.

The administrative and engineering staff and the Laboratories of the CSA Approvals Division, both electrical and fire hazards branches, will be located at the new headquarters, which is a modern three-storey building with approximately 20,000 square feet of floor space.

The executives are Gerry Moes, general manager; J. D. Barnes, secretary; F. W. Whatmough, chief engineer; and N. A. Cockburn, chief inspector.

Improved efficiency in the approvals work and the lowering of costs will be the direct results of this reorganization. In addition, some manufacturing member firms are donating equipment for use in the testing laboratory at Florence Street, which will be one of the most up-to-date in Canada.

•

New C.I.L. Department.—The establishment of a separate department to handle sales of Du Pont Tetraethyl Lead anti-knock compounds, and other gasoline and lubricating oil additives, to the Canadian oil refining industry, was announced on September 8th by Canadan Industries Limited.

Officially known as the "tetraethyl lead sales department", the new unit will have its headquarters in the Victory Building, Toronto, with a branch office in C-I-L House, Montreal. An additional sales office is expected to be set up in western Canada later. Complete technical, laboratory, medical, and safety services covering the use and handling of these products will also be maintained.

Department manager will be Milton A. Dewey, formerly of Wilmington, Delaware, who has been occupied with petroleum chemicals research and sales work with the Du Pont Company for the past 13 years.

•

Vokes Address Change. — Although they have been established in Canada for a few months only, Vokes (Canada) Limited announce that, in order to keep pace with the rapid expansion of their business, they have found it necessary to move into larger quarters in a self-contained building located 3801 Dundas Street West, Toronto. Vokes (Canada) Ltd. offer a wide range of filters and fan engineering equipment.

•

Imperial Oxygen.—R. C. Holbrook, president of Wall Chemicals Canadian Corporation Limited, has announced that on October 1st, the Company name

(*Continued on page 948*)

GREENS OF WAKEFIELD *for Economisers*

Photograph—Copyright; Wakefield Express

KIRKTHORPE
WAKEFIELD · ENGLAND

The very name Kirkthorpe, on the outskirts of Wakefield, derives straight from the Danish invasions. This old almshouse, nestling near the church, is typical of Wakefield's past. Now Wakefield is a bustling industrial centre, too, where Green's Economisers are made.

E. GREEN & SON LIMITED · WAKEFIELD · ENGLAND
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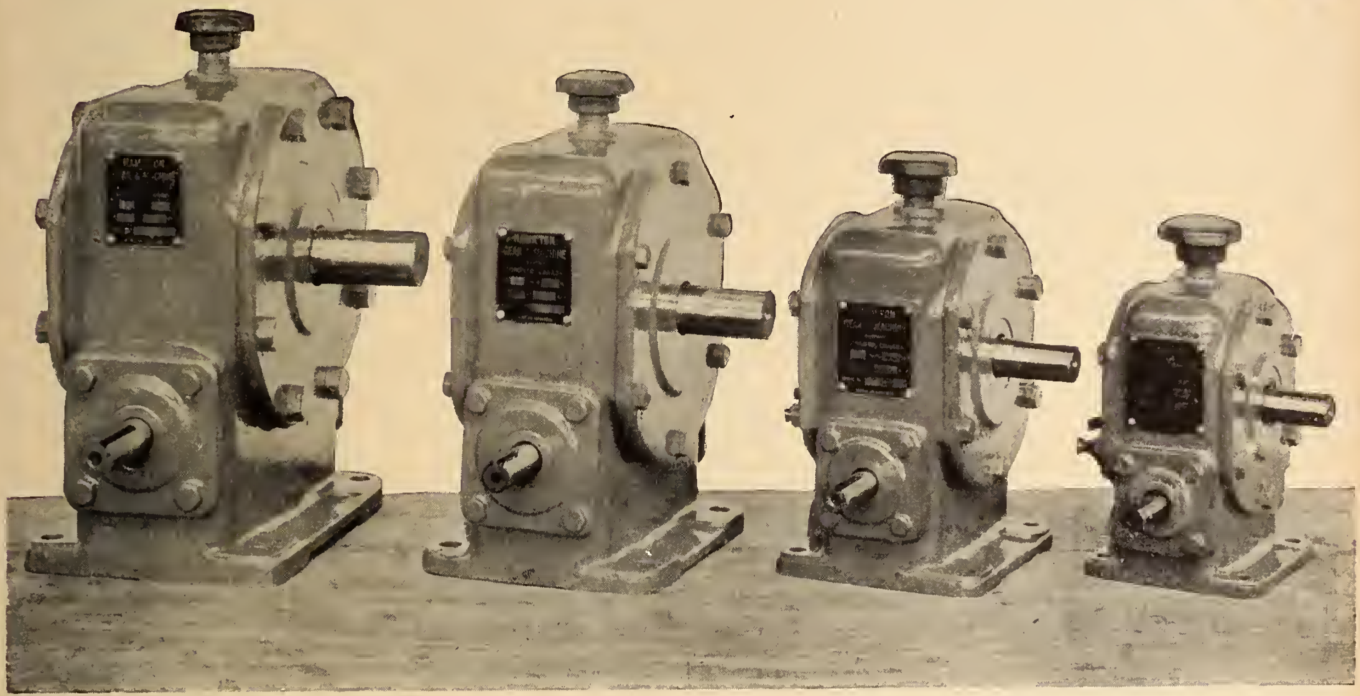
GE 68

Worm Gear Speed Reducers
for Continuous Service

CUT GEARS



Immediate Delivery from Full Stock of Parts

Small worm speed reducer units, five inches and less between centers of shafts, are made with one-piece housings, as in the above illustration. All the working parts are of the same design and of the same quality specification as in our larger units, — the best there is in steel, bronze and workmanship. Get Catalog No. 106C.

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President

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Limited

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British Columbia
B. C. Conveying Machinery Co.
Geo. B. Simpson, Manager
3300 Fraser St., Vancouver, B.C.

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 940*)

has been changed to Imperial Oxygen Limited. This change in name does not, in any way, affect the ownership, management or personnel of the company.

The change was made because it was felt that it would be more descriptive of the Company's operations as suppliers to the welding trade. The former name "Wall Chemicals" in some cases, created the impression that the Company supplied a wide range of chemical products for general industrial use. Under the new name "Imperial Oxygen Limited", the Company will continue to operate as Canadian division of the Liquid Carbonic Corporation. The head office will remain at 8400 Decarie Blvd., Montreal, with branch offices in Toronto and Windsor and distributors located at strategic points from coast to coast.

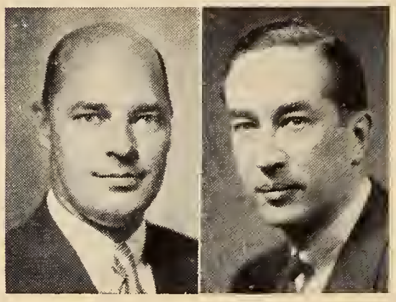
In addition to supplying hospitals with oxygen and oxygen therapy equipment, the Company supplies oxygen, acetylene and other compressed gases, as well as a complete line of "Gasweld" equipment for Oxy-Acetylene welding and cutting.

Minneapolis-Honeywell Expansion. — Minneapolis-Honeywell Regulator Co. has purchased the MICRO SWITCH Company, Freeport, Illinois, it was announced recently by W. H. Evans, vice-president and general manager of Minneapolis-Honeywell Regulator Co. Ltd.

Mr. Evans stated that MICRO precision snap switches are made in hundreds of different types for various applications on aircraft, machine tools, automatic machines, thermostatic and pressure controls, or wherever a small mechanical motion is required to make an electrical contact. Application engineering and sales will be handled through Minneapolis-Honeywell branch offices across Canada.

Robertson-Irwin Appointments.—The following executive changes have been announced by T. A. Irwin, president, Robertson-Irwin Limited. W. A. Barnes has been appointed general sales manager of the Company, coming to Hamilton from Montreal where he has been in charge of the Montreal District office for many years. W. G. Enouy has been appointed manager of the newly-formed eastern division of the Company, with headquarters in Montreal.

W. A. Barnes **W. G. Enouy**



W. Edwards & Co. Representation.— W. Edwards & Co. (London) Ltd. have announced that owing to the enthusiastic reception accorded their range of high vacuum equipment which was exhibited at the Toronto fair, new, improved distribution arrangements have been made. The headquarters of the Canadian distributing organization will be Scientific Exports (Great Britain) Ltd., Canadian Division, Odeon Buildings, 20 Carlton St., Toronto, where showrooms will be maintained. Physical Enterprises, 62 Dundas St., London, Ontario, have been appointed exclusive Ontario distributors. In addition to the technical services which are already available, F. J. Pearce, who has been with the Company for twenty years, will be on hand at the Sciex (Canada) Offices, with the immediate object of developing the interests of the Company in Canada and appointing additional agents and setting up additional distributing centres.

R. G. Rogers.—Alexander Murray & Co. Ltd., Montreal, recently appointed Robert G. Rogers as general sales manager. He takes over his present duties after wide experience in the executive and sales end of the building materials field and in practical engineering and construction. His headquarters will be in Montreal.

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for Quality and Satisfaction

We manufacture all kinds of Springs, large and small, for every purpose.

Our eighty-one years' experience is your guarantee of superior quality and workmanship.

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C. M. Lovsted & Co. (Canada) Limited, Vancouver

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Canadian Pacific Express
TRAVELLERS CHEQUES

F H. Fargey.—Fraser H. Fargey has joined the staff of Brown Boveri (Canada) Limited in Montreal in the capacity of sales engineer. A graduate of the University of Manitoba, Mr. Fargey has had fourteen years of practical experience in the electrical and mechanical engineering fields with several Canadian firms.

F. H. Fargey

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.

Recording Gauges.—The Bristol Company of Canada Limited has released Bulletin G621—a most comprehensive 32-page bulletin describing the Bristol Series 500 recording gauges. The new bulletin is profusely illustrated with photographs, diagrams and drawings showing methods of application, as well as many topical charts.

Bulletin G621 is a complete guide for the use of gauges in every industrial process involving liquids and gases. Copies may be obtained from the Bristol Company of Canada Limited, 71-79 Duchess Street, Toronto.

Worm-Gear Drives. — Worm Gear Drives of three basic types, each available in 10 different sizes, for fractional or larger horsepower, and in speed ratios of 3⅝ to 1 up to 8000 to 1, are illustrated, described and tabulated in a new 80-page Book No. 2324 released by Link-Belt Company.

Features enumerated for these enclosed right-angle drives are—compact design; anti-friction bearings; automatic splash lubrication; high ratios in small space; operation at high input speeds; quiet performance; and their availability for vertical or horizontal driving.

A copy of the publication will be forwarded to any interested reader on request. The address of the Company is: Link-Belt Limited, Eastern Avenue at Leslie and Keating Streets, Toronto 8, Ont.

Electrodes Assemblies.—The complete line of Leeds & Northrup pH Electrodes Assemblies for both industrial and laboratory applications is now presented for the first time in a new, 28-page catalogue, "pH Electrodes, Assemblies, Parts and Accessories". This publication is designed to help present users of L. & N. pH equipment in ordering replacement parts and to guide new or prospective users in selecting the proper electrodes to solve their pH problems. For a copy of this publication, write to Leeds & Northrup Company, 4934 Stenton Avenue, Philadelphia 44, Pennsylvania, and ask for Catalog EN-S5.

Asbestos Bonded Pipe.—A new illustrated folder by Armco Drainage and Metal Products Inc., tells how Armco Asbestos bonded pipe overcomes the problems of structural failure and corrosion.

(*Continued on page 954*)

JUST ONE REPAIR IN 10 YEARS OF USE!

"U.S." Electric Plants are Dependable!

This 15-KW "U.S." unit has operated approximately 6,500 hours in a garage in Hadley, Mass., with just one minor repair—the replacing of a coupling bolt! Another proof that "U.S." simple design and rugged construction pay off. There's a "U.S." unit to fit your needs. Write for information.

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Ensure

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- Lower Maintenance Cost.

DART UNION CO., LIMITED, TORONTO

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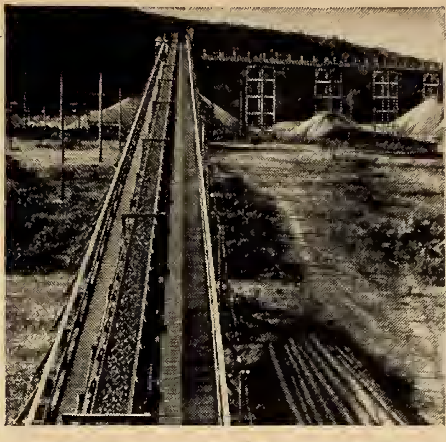
Coal unloading tower, designed by United Steel for large Canadian steel manufacturing company.



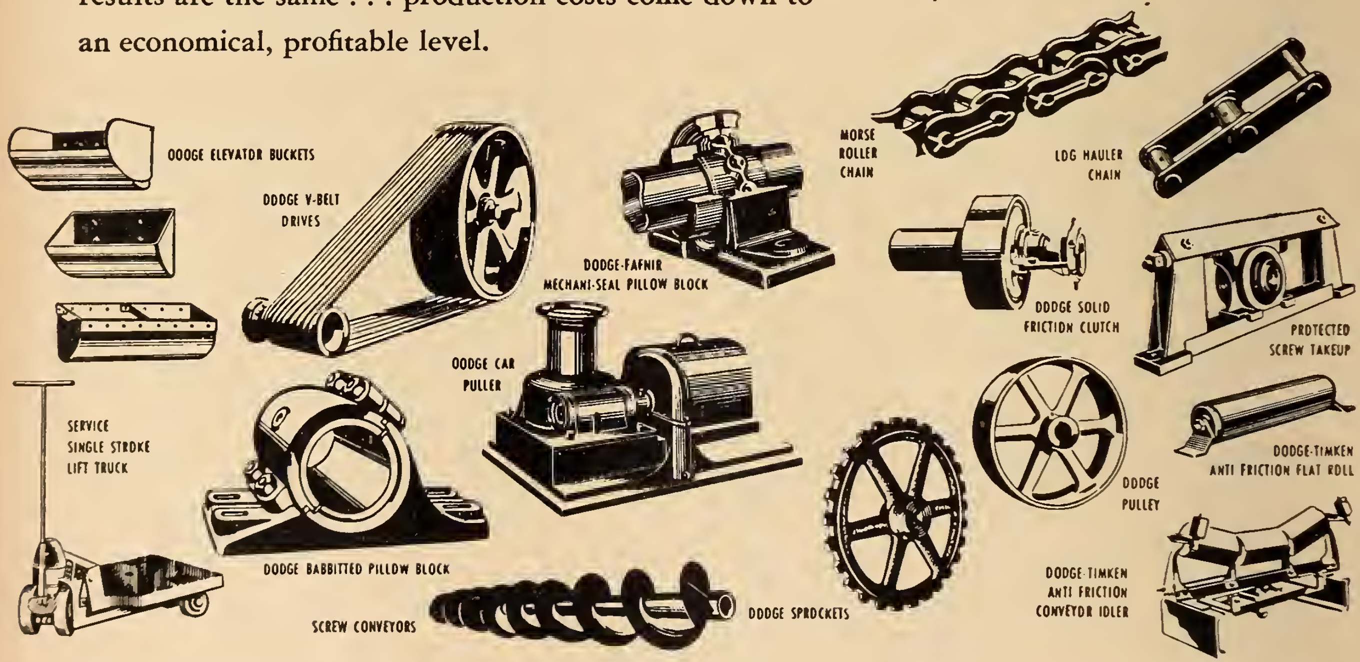
Designed for the job, 24" Belt Conveyor carrying crushed rock to stockpile in Northern Quebec development.

Recent installation at Ontario Brick plant for handling raw materials increases production and efficiency.

Overall production costs go down as general plant efficiency increases. United Steel engineers have proved this beyond all doubt with modern power transmission and materials handling equipment in thousands of industrial operations. United Steel have the experience, facilities and equipment to deal with either standard or special requirements quickly and efficiently. Whatever your needs, when United Steel goes to work in your plant the results are the same . . . production costs come down to an economical, profitable level.

Write for catalogue and information.

Mining Machinery • Contractor's Equipment • Grain Elevator and Mill Equipment • V-Belt Drives • Pulpwood Handling Equipment • Sewage and Sanitation Systems • Pulleys of all types • Belt Conveyors • Screw Conveyors • Excavating Buckets • Bucket Elevators • Trippers • Conveyor Idlers • Steel Rolling Mill Equipment • Gears • Sprockets • Chains • Hoists • Elevators • Hoppers and many other types of mechanical equipment for industry.



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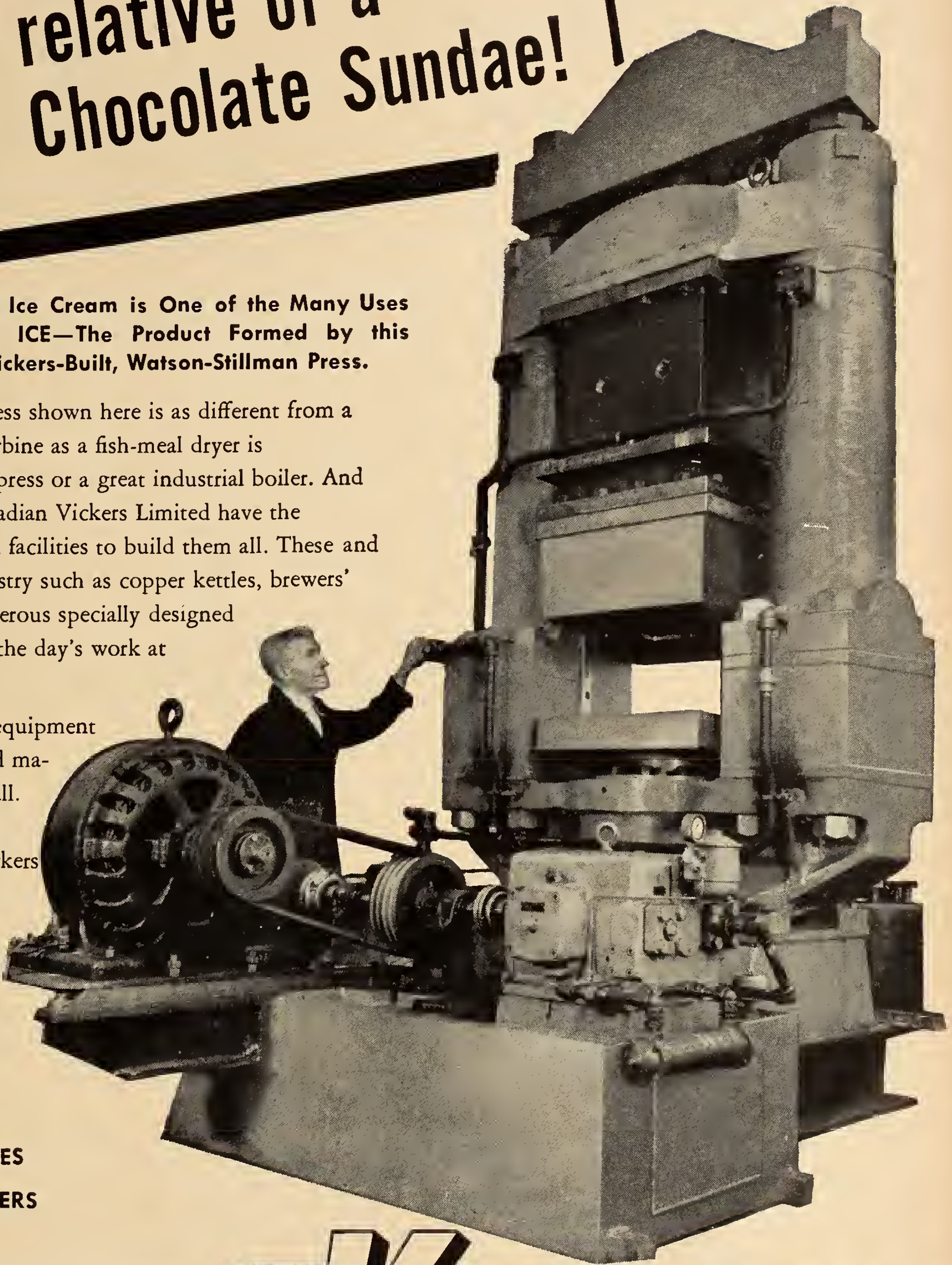
Packing Ice Cream is One of the Many Uses of DRY ICE—The Product Formed by this Giant Vickers-Built, Watson-Stillman Press.

The huge dry ice press shown here is as different from a vertical hydraulic turbine as a fish-meal dryer is from an embossing press or a great industrial boiler. And yet, the men of Canadian Vickers Limited have the skill, experience and facilities to build them all. These and other items for industry such as copper kettles, brewers' equipment and numerous specially designed machines, are all in the day's work at Canadian Vickers.

If you need new equipment or specially designed machinery, give us a call. No matter what you need—Canadian Vickers can build it.



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BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 951*)

Asbestos-Bonded Pipe combines the strength of corrugated metal pipe with positive protection against extreme corrosion that greatly extends its serviceable life. Copies of this folder, which describes the drainage structure that gives extra protection and eliminates costly replacements, can be obtained from Armco Drainage & Metal Products, Limited, Guelph, Ont.

●

Foamglas Hand-book. — For the first time there is now available to the building industry one single complete reference on Normal Temperatures application of Foamglas rigid insulation.

Titled "PC Foamglas, the Long Life Insulation", the Pittsburgh Corning Corporation, makers of Foamglas, have brought together in thirty-six pages the whole story of the material embracing physical properties, installation techniques, accessories and answers to the many popular questions about this cellular glass insulation. Hobbs Glass Limited are distributors for PC Foamglas insulation and requests for the publication should be addressed to them at P.O. Box 695, London, Ont.

●

Liquid Level Gauges.—Jerguson Gage & Valve Company, of Somerville, Mass., manufacturers of Liquid Level Gauges, valves and other specialties, have an extensive range of literature which is offered to Journal readers. For copies apply to Messrs. Peacock Brothers Limited, 260 St. Patrick St., Montreal 32.

●

Heat Transfer Equipment.—The Patterson Foundry & Machinery Co. (Canada) Ltd. has published a new catalogue entitled "Process Applications of Heat Exchangers." This book explains the Patterson standard line of heat transfer equipment and its appllcaiton to the petroleum, chemical, petrochemical, and process industries. It deails the services available in the design and application of process equipment through the process engineering division of the Company. The catalogue outlines a number of Patterson standard heat exchangers and gives some of the factors to be kept in mind when setting up a heat transfer operation. Copies may be obtained by applying to the Patterson Foundry & Machine Co. (Canada) Ltd., Toronto, Ont.

●

Electrical Magazine.—Canadian Ohio Brass Co. Ltd., Niagara Falls, Ont., publish, at regular intervals, a publication entitled "Haulage Ways". The August 1950 issue contains a description of the new form H and form J electrical taps which are manufactured by the Company. To be placed on the mailing list for this publication, or to obtain the August issue, please communicate with the Company at the address given above.

●

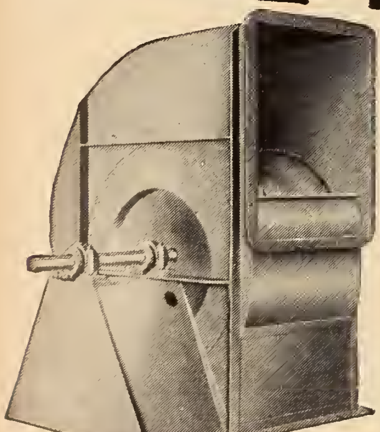
Ventilating Fans. — Keith Blackman Ltd., a British firm represented in Canada by Vokes (Canada) Ltd., Hermant Bldg., 21 Dundas Square, Toronto, have issued a folder in which it describes their "Extravent" Fans. These fans have been especially produced for Toronto and district with its peculiar electrical supply—single phase 25 cycles 110-115 volts. The manufacturer offers immediate delivery of these fans from Toronto stock. For copies of the bulletin apply to Vokes (Canada) Ltd.

●

Dewatering Prevention. — A 62-page catalogue showing Moretrench Wellpoints at work is available to engineers from George W. Crothers Limited, Leaside, Toronto, Ont. This 62-page publication illustrates the various uses of the Moretrench Wellpoints System, which, it is claimed, is a reliable means of dewatering, stabilizing and preventing mass movement of wet soil during excavation.

●

LARGE FANS



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HIGH EFFICIENCY (over 80% on test) makes this large general purpose fan worth investigating.

NON-OVERLOADING HORSEPOWER self-limiting design. Maximum reached within usual range of operation.

REDUCED POWER CONSUMPTION because of increased mechanical and static efficiency.

QUIET OPERATION results from streamlined inlets, improved housing.

WHEEL DESIGN non dust-loading, allows many dust handling installations.

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DRYING OVENS

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Modern quick-drying ovens call for an outer covering of SPUN ROCK WOOL BLANKETS, N.L. Type. Operating at both high temperatures and high speeds, such equipment could not function economically without highly efficient insulation. The result is always maximum production at a substantial fuel saving. Write for name of your nearest contractor, blanket sample and engineering data. MADE IN CANADA.

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HYDRO ELECTRIC PLANT

Complete unit dismantled and available at railhead for prompt shipment. Consists of two C.G.E. vertical type ATB generators driven by Vickers "Leffel" type turbines designed to operate at 55 foot head. Together with transformers, sub-station equipment, etc.

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

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L. AUSTIN WRIGHT, M.E.I.C.
Editor

W. D. LAIRD, M.E.I.C.
Assistant Editor

L. F. GRANT, M.E.I.C.
Field Secretary
236 Avenue Road, Toronto.

E. J. BLANDFORD
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Engineering Education and the Employer

A panel discussion held at the Sixty-Fourth Annual General and Professicnal Meeting of The Engineering Institute of Canada, and the Annual Summer Meeting of the American Society of Civil Engineers, at Toronto, July, 1950.

Moderator

C. R. Young, Hon.M.E.I.C., *Toronto, Ont.*

Dean Emeritus, Faculty of Applied Science and Engineering, University of Toronto.

Panel

K. F. Tupper, M.E.I.C., *Toronto*

R. M. Hardy, M.E.I.C., *Edmonton*

A. M. Reid, *Montreal*

I. R. Tait, M.E.I.C., *Montreal*

E. O. Turner, M.E.I.C., *Fredericton*

Dr. Young—This afternoon is to be devoted to a panel discussion of Engineering Education and the Employer. The gentlemen who are at this table will act in the role of introducers of topics to be indicated presently, but there will be an opportunity for written questions from the audience.

Unfortunately, two of those who had hoped to take part in the discussion are unable to be here today, namely S. W. Andrews, senior partner of H. G. Acres & Company; and D. M. Stephens, Deputy Minister of Mines and Resources of the Province of Manitoba. We have five here, however, who are thoroughly competent to uphold and defend such theses as they may advance.

In order that we may have at the outset a fair outline of topics that will be submitted to discussion, I am going to ask that the first speaker cover a number in which he is especially interested. Before I call upon him to speak I am going to make you acquainted with those who are here with me. K. F. Tupper is dean of the Faculty of Applied Science, University of Toronto; A. M. Reid is general supervisor of management development for The Bell Telephone Company at Montreal; R. M. Hardy is dean of the Faculty of Engineering of the University of Alberta; I. R. Tait is chief engineer, Canadian Industries Limited, Montreal and E. O. Turner is dean of the Faculty of Engineering, University of New Brunswick.

Dean Hardy is to introduce the discussion this afternoon, and the topics that he proposes to present to you in some outline and with such detail as may be appropriate to this discussion are:—

(1) Should there be a lengthening of the undergraduate engineering courses to five years?

(2) What should be the attitude of the engineering schools to training in industry after students have left the university?

(3) What should be done with a student who presents himself for admission to an engineering school and who, while good in mathematics and science, is notoriously bad in English, in other languages, and in non-technical subjects? Should there be a substitution of history for a language other than English, if a student has very little capacity for languages?

(4) Is post graduate work really useful from the employer's point of view?

(5) Considering that a great many students change from the branch of engineering in which they graduated to other branches to find their life's work, should we abolish or greatly reduce the number of departments and branches of engineering in which students graduate?

Mass-Produced or Custom-Built

Dean Hardy—I think the universities in Canada are inclined to be ultra-conservative, perhaps rightly so. We make haste very slowly, and if this discussion can hasten our thinking by a few seconds per hour, perhaps it will have served a very useful purpose.

I find myself frequently thinking that what we are really doing in the universities is attempting to fit a student to a mould. We want to turn out three thousand Fords or Chevrolets every year; no Cadillacs, no Packards. That, to me, presents a problem. In turning out a Ford or a Chevrolet perhaps we are turning out a very fine product, but it is a mediocre product. It won't give the performance of the more expensive and more carefully built models. I think it is a mistake for us in Canada to gear our educational system to a mass-production scale at the expense of producing only a few custom built models.

A Five-Year Course?

The first of the specific questions that have been proposed is: "Should undergraduate courses in engineering be lengthened to five years and based on a senior matriculation standard of entrance, thus giving more time for professional and general studies?" My answer to that is yes. We should go to a five-year course, but I do not think we should go to a five-year course by spending an extra year following senior matriculation . . . we should back up a year.

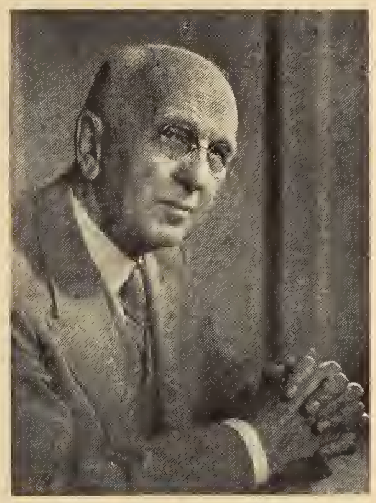
I entered university the same way a good many of my generation did, perhaps following seven years in elementary school, three years in intermediate school, or junior high school, as it was called sometimes, and two years in senior high school. I entered a pre-engineering year, which was in the Faculty of Arts, and then I took a four-year engineering course.

I found myself confused recently when students stated that they had taken Grade XIII. The programme that I took and that so many of you took, involved eleven years to university entrance and twelve years to entrance to the standard four-year engineering course. Now we find students applying for admission to engineering schools after having spent thirteen years. We don't have Grade XIII in Alberta. They have it in British Columbia. I understand they have it in Ontario. We do find in Alberta that some students spend four years in high school and others spend only three.

The mechanism, as I understand it after a certain amount of careful enquiry, by which this Grade XIII has originated, has been that students, frequently on advice, have been taking two years in Grade XII. At the present time in the Province of Alberta about half of the matriculants at the Grade XII level have spent two years there. When you get much more than fifty per cent spending two years in a year, it is an obvious administrative detail to split it into two years and thereby get Grade XIII. By so doing you delay the entrance of the student to university by a year. That has been going on in the country, and I would suggest it has been going on without proper consideration of the general policy. It has just grown on us.

I suggest that we would be better advised to look for our extra year in engineering by backing up into the high schools, rather than by adding another year on the end which in fact, would mean the addition of two years to the educational course of the young lad who was entering engineering practice, as compared to the situation twenty years ago.

The professional educationalists at the high school and elementary school level are rather critical of the universities. They maintain that we hog-tie them. We insist on a certain



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standard of academic achievement, and it is being contended all over this continent, that this standard is not the best for the young person who is not going to university, but who expects to go into industry at the end of high school. I wonder if it is? The substitutes that are being instituted for the academic courses are shop courses and various other kinds of projects that are being introduced into the schools.

We find ourselves now in the University of Alberta requiring a greater percentage of students to withdraw from the university at the end of their first year than has ever been the case in the last twenty years. We say to the student, "You haven't the ability to take engineering — you are a misfit in engineering", and we are saying that to students who represent the top fifty per cent, or at least their standing in the matriculation examination in the Province of Alberta places them in the top fifty per cent of the graduating class at that particular level.

I suggest that we are not on sound ground when we say to that type of selected student that, simply on the basis of academic standing alone, he is incapable of taking an engineering course and an engineering degree. What has been happening is that there has been a gradual change going on in which the quality of the academic training in the high schools has been changing. We are getting students now into the first year of university who have been taught a philosophy of mathematics, not how to solve an algebraic equation.

The students we want in the engineering courses are those who have a certain amount of facility in handling their basic science material, and we want to build on that. We are not too concerned whether or not they have a philosophy of mathematics. That is perhaps better taught at the university level. We are not too concerned whether they understand all the principles of atomic physics. We are more concerned whether they can handle their basic mathematics and sciences.

So, to repeat, I think we could use the extra year to good advantage in the engineering curriculum, not to include more technical courses but to include the courses in the humanities that so many people think serve a very useful purpose. Get them in at the university level. That is the place they should be put, not at the high school level. I think we would be well advised to consider backing up and taking our students at an earlier age, rather than extending the course at the end of the present four years.

Reduce Instruction in Techniques?

The second question is: "Should undergraduate instruction in professional techniques be reduced and students advised to acquire these in outside work or industry training courses?"

I would answer that, categorically, no. The reason for that, as has been pointed out on many occasions, is that in the engineering schools on this continent we are being fairly successful, I think, in training students in a particular method of approach. It has been called the engineering approach. We are teaching them how to attack problems that arise in industry and in business in a certain way. To those of you who are employers, I would put this question to you: Do you find that the honours graduate, say, in physics or chemistry, has as good a training for your purpose as has the graduate in engineering?

My own opinion is, and you will realize that I am perhaps on one side of the fence, that we have been producing a type of graduate who is better qualified to attack practical problems if he has taken an engineering course than is the student of the classical courses in the faculties of arts and science.

Languages and History for Engineers

The third question: "Should a student be admitted to a professional school of engineering if, while producing an excellent standing in mathematics and science, his record is very poor in his own language, in another language and in history?" Well, at the risk of being completely swamped on this point, I say yes, he should, and in saying so, I would go back to my earlier comment, that we should not make our main aim to produce a Chevrolet or a Ford. We should be willing to produce, and spend a certain amount of time producing, the special case, the custom built job.

Such a student might come through with something that the Ford or the Chevrolet wouldn't come through with, and to the extent that we can accommodate ourselves in the engineering faculty to that type of student, I think that we are going to find it well worth our while to do so. So I am not too concerned about admitting to an engineering school the student who has some very low marks in a foreign language, or even history or biology.

The next question is: "Would it be desirable in Canada, in fixing admission requirements, to substitute senior matriculation history for a language other than English?" My answer to that, while I don't feel as strongly on it as on some of the other points, is yes. In my opinion, if the student is willing to spend enough time he can acquire facility with the language. I am not too concerned about the freshman who hasn't shown any marked ability with the English language.

Perhaps my remarks are really conditioned on a situation that exists in Western Canada that perhaps is not so common in the East. We have a much larger percentage of students of foreign extraction. Some come from areas where English is not spoken in the home nor used extensively in the business or social life of the community. That is a problem that perhaps is local, but in my experience we can't judge the student's ability or we cannot adequately assess whether or not he has the ability to master the English language on what his achievements may have been in high school, if he has come from a background such as that.

I would admit, however, if we do take a student of that type that we should be willing to accept a certain amount of responsibility in improving his facility with the language, rather than simply to turn him loose on the employer without an adequate knowledge.

Post-Graduate Studies

The next question is: "How useful is post graduate work to the practising engineer, and what proportion should take it?" Unfortunately, that cannot be answered "yes" or "no". Those of you who are familiar with the graduate programmes on this continent will recognize two types of programme; one, a programme in which the student acquires a certain fundamental background in his undergraduate course and goes on to specialize in meticulous detail, perhaps, in a particular field. The other type is the type that is more common in Canada where we give a more restricted group of courses and demand a thesis or a certain achievement in research.

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As I understand it, the latter is the British tradition. Personally, I am inclined to favour the first type of course, and, if we are to attempt at the universities in Canada to make any real contribution to the advancement of knowledge, I think we should be concentrating more on the type of graduate course where the student is carried well beyond the level he reached in his final year of his undergraduate career.

I haven't been too impressed in many cases with the type of graduate programmes that we have been assigning to our students at the Canadian universities. Again, I would criticize, first of all, the work we have done at the University of Alberta.

How Much Specialization

The final question is this: "In view of the fact that a substantial proportion of the graduates do not practise in the branch of engineering in which they graduated, should the universities consider doing away with all or most of the specialized branches and turning out just graduate engineers?"

My answer to that is no, we shouldn't abolish specialized degrees, but I would admit that perhaps the situation is not the same in all parts of Canada. Perhaps it is a mistake for us in Canada to attempt to stereotype our courses and to have every university in Canada give precisely the same curriculum in each branch. I think there is room for a considerable variety of curricula, even within the specialized degree courses we now give.

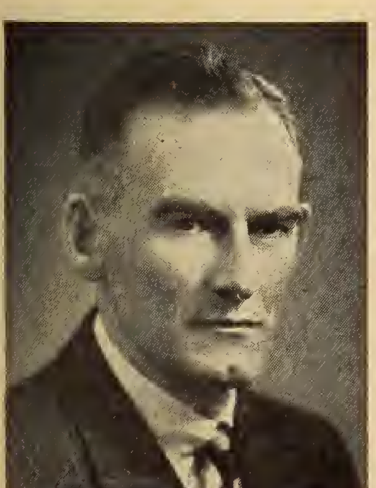
To speak directly to the question, our experience in Alberta is this: the larger employers are inclined to pick their men on the basis of achievement, native ability, and personality. They don't worry too much about what particular specialty they may have taken in their undergraduate course or what particular label is tagged on to them at graduation.

A. M. Reid

On the other hand, we find locally that the firm employing only one or two graduates has no training scheme. They cannot afford to put in a scheme; they want a man because the senior officers are overworked. The manager is overworked, the president is overworked. They want a man or two to come in and help them. Unless the graduate can make a contribution in the specialized work of that firm right away, not two years hence, then he will not be hired.

I think a larger proportion of our graduates in the West are finding themselves being interviewed by such employers than is the case here in the East. We had an interesting experience in connection with our studies in establishing a degree course in petroleum engineering at the University of Alberta. The largest employer of petroleum engineers in the area took the attitude: We don't care whether you put on a course in petroleum engineering or not. We want a good type of graduate, and we want him to have attained a background in mathematics, chemistry and physics. We will teach him to be a petroleum engineer. On the other hand, the smaller firms without exception were interested in the man with some specialized training in the field of petroleum engineering.

What are we doing? We give the label "Petroleum Engineer" to the so-called specialist. The curriculum we finally adopted, after studying every petroleum engineering curriculum we could get our hands on from universities on this continent, involves only two and a half courses in specialized work in petroleum engineering. The remainder of the courses involve a particular sequence of other fundamental and allied engineering courses that were already available on the curriculum. And when we speak about turning out a graduate engineer, I would suggest this: the fundamental background of engineering is too large to be covered within the range of the four-year programme, or be it a five-year



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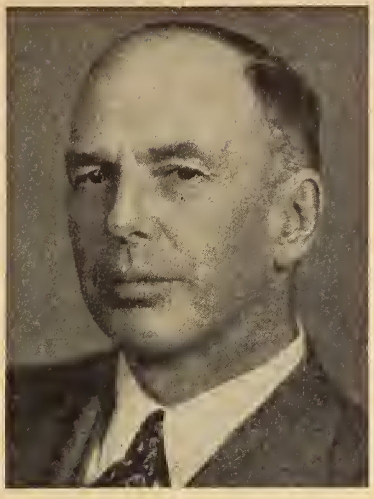

E. O. Turner, M.E.I.C.

programme. We must select the fundamental material we are going to give our students unless we are prepared to expand our programme beyond all reason.

A. M. Reid—When my old friend, professor, and dean asked me to speak on several of these questions together, it seemed to me that if I treated them in sequence there might be some repetition and overlapping, whereas if I used one as a text, say on the question of defects in engineering graduates from the employer's standpoint, I might go from there to the others in some kind of a pattern.

I would like to put it in perspective by saying this: after all, the company which I have the honour to represent does hire some 70 per cent of its total graduates from engineering groups. So you might argue that the engineering faculties haven't been doing too bad a job. However, the pessimists might be inclined to say that it is because the lads in whom we are interested chose engineering to start with, and haven't been too badly spoiled in the process of the engineering school course. The optimist would say that in that course they do receive a sound training in the problem-solving approach.

I hope there is a lot of truth in the latter, and I submit that possibly the trouble is in not identifying all the elements in the problems; and, secondly, in possibly not sufficiently appreciating that he must go away from university with a definite technique in solving those problems, at least in a general style.

Engineers not Aware of their Worth

I will therefore identify some four shortcomings in the problem area, and attempt a brief analysis. I shall identify the cause in at least an amateurish way, and suggest something in the way of possible remedy which I think will include the answers to several of these criticisms. The first shortcoming is the failure which I think a number of company recruiting officers detect in the knowledge of the individual about his own capacity, and a recognition

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of his own urges and interests. This failure is probably due to several individual contributing factors. First of all, there is the reluctance of the individual to go to someone. I understand in cases where this has been tried, they haven't made as much use of such counsellors as you might expect. I believe that is partly due to the fact that it suggests something in the nature of a psychoanalytical examination, something of doubt as to whether the counsellor is an expert and can handle the case, and perhaps just laziness and disinterest. In other words if the student is not adequately motivated, he does not realize the importance of this understanding of himself.

I should imagine the remedy involves these various factors. We have to motivate the prospective engineer by showing him in one way or another, that this question is important to him, that facilities or techniques are being made available to an increasing extent, and that the people to whom he can go are more than merely specialists in one particular field. We can all realize that to an increasing extent a man who is a specialist becomes a little biased in his own direction. Counsellors should be generalists rather than specialists, men who have an overall knowledge of the field, and are not biased by an individual specialty.

I would like to read from an important report made since the war at the request of Cornell University, by a group in industry interested in this question. One of their conclusions was: "The data available concerning the college records of the men who have remained in, and in certain groups have succeeded in, the several types of work listed, provides limited evidence of the different patterns of ability and interest, which may be helpful in making intelligent choices between them before undertaking special preparation for one of them after the junior year." Opinions of competent judges concerning the qualities needed in these fields also indicates significant difference in pattern.

"*Actual choices, however, must be made only after wise counselling and thorough individual self-appraisal by each individual. If this is done there is good reason to feel that valid choices can be made.*"

I suggest, therefore, that something more in the way of helping the young man decide in what area he can best make his contribution, would reduce the large number of men who go into other fields than those in which they were specially trained at university.

Excessive Preoccupation with Professional Status

The next shortcoming arises from the lack of appreciation of the actual situation in industry as a whole, coupled in some cases with excessive preoccupation with the professional as contrasted with the commercial status of an engineer. That is related to the preceding point. I think if figures were available, they would show that whereas on graduation something in the order of, let us say, 70 or 80 percent go into engineering jobs, after some ten or fifteen years that proportion is almost reversed. So, from a standpoint of a life career, the field for the majority is probably in the general area of operations. It follows that the orientation of the student to that situation is important, and he should get that orientation in his college days.

This brings us to the vexed question of attitude, of which we heard this morning; these states of mind that are formed quite early. A young man who goes into engineering should first of all be helped to discover himself, against the background of the requirements and opportunities of the total field outside. In other words, he may be leaving the school with an undue concern for maintaining his professional status. The remedy is, in my opinion, a greater degree of uniformity in the courses, for perhaps three years. I certainly agree with specialization in the final year for other than those who have shown a distinct interest and aptitude in the research type of approach, and who require greater specialization. For the main body who are not too sure, I suggest that a type of training similar to that I have proposed should be pursued for three years. During this time the student will be increasingly comprehending where he stands in relation to the opportunities available, and specialization in the final year. This would give him a chance, on the one hand, to make up his mind, and on the other hand give adequate training in specialization insofar as the larger companies are concerned. I agree with the previous speaker that the smaller companies and the professional engineers would have to be heard from separately.

As for the problem of the smaller employer, it might be argued that he might have to get his specially trained men from the larger companies, because the latter do not make a hundred per cent correct selection. Moreover some lads find they would rather get into the smaller companies after experiencing what is, after all, a rather peculiar atmosphere in the larger company. We try to pick those we think will be happy in that atmosphere, but it is to everybody's interest to uncover the young men who will be happier in the smaller industries in the next few years. Presumably they have acquired something in the initial training in the large companies that would help them to prepare for practical work immediately in the smaller companies.

The "Scientific Method"

The third shortcoming is failure to recognize or appreciate the various factors in the problems that he will encounter when he graduates. This is obviously related to the point that he is subject to the influence of specialists in engineering to an undue degree.

In medicine it is an accepted principle that it is foolish for an individual to go to a specialist directly. He should go first to the person who knows him best as a general practitioner. I shouldn't apply the analogy a hundred percent, but I would like to couple this with the fault that Colonel Urwick referred to at lunch; the reluctance of mechanical engineers to appreciate that there is an area outside engineering itself, which is of vital importance to the whole question of production.

I know, on the other hand, the real reluctance to admit the virtue of what is called "scientific methods". A true scientific approach to a problem is nothing more than assembling *all* the facts and identifying *all* the relationships in a particular problem. That means considering not only the physical things but the *methods* which will have to be set up and the *people* who will have to do the job. These things are just as important to the young graduate as the pure engineering features.

We have to approach this from the standpoint of motivation. The young lad comes into the engineering school interested by and large in *things* and one idea is that we are going to give him lectures and turn him out a manager, or a personnel man. Perhaps we should give introductory lectures in these fields and then show by a study of cases that he cannot solve any of the real problems he will be confronted with, without considering not only *things*, but the question of *methods* and the question of *working with and through people*.

If we can introduce the general problem by way of lectures and discussion we can carry him through a logical development that he can follow as he grows in wisdom if not in stature.

More Emphasis on Personal Skills?

Finally, I come to the failure that is so often pointed out — the failure in certain personal skills.

I telephoned one of our high officials to ask for an appointment some weeks ago, to discuss this subject. He jokingly said, "Other than telling them I wish to goodness they would turn out some engineers who can write better letters and reports, I can't tell you very much else." That was a joking way of putting it. Actually, when I got there, he and I talked for some time and had a very profitable discussion. There are these areas of personal skills in communication. You might say I am out of date; they are doing much more of that now. I would suggest, however, that in addition to the question of writing reports, we might consider what kind of reports an engineer is going to be asked to write when he graduates.

There are two kinds of reports. There is the detailed report which many can write, using engineering language. On the other hand there is the report that must present ideas in non-technical language to non-technical people in a one-page story.

Then there is the question of the communication of ideas through discussion. Nowadays few major decisions are made by one man without discussion with different specialists, and the resulting decision is a group decision. Unless a man knows how to listen as well as discuss, he is handicapped. It may be too soon to expect that sort of thing in an Engineering Course, but a start should be made.

There was a question on human relations, which ran somewhat as follows: "Today one of the widest openings for employment of engineers is with the armed services. Should this fact be recognized in the curricula of the universities? For example, some senior officers complain that the young graduate engineer has no knowledge of how to handle men. Can he get that at a university?" I don't think he needs to limit the criticism to the armed services; it is equally true, I think in industry. If the student can be shown how important it is to get his ideas across, he will be encouraged to master the technique and the basic methods which are involved.

Then there is the question of engineers being dismissed for their social unadaptability. That will come in developing this team-play spirit through discussion. There are people who just don't seem to be that way. They are hard people to handle and, by and large, I think large organizations have no place for geniuses. Maybe that isn't right; maybe we will have to see what can be done. The fact remains, such people should be given individual attention by these counsellors fairly early in their careers, at least to help them make such personal adjustments as are possible.

I should like to end by observing that the various questions involve a threefold problem: — First, of motivation in terms such that the young lad can understand and of which he can appreciate the importance; second, of proper information about the actual conditions he is going to meet outside, in which effort people in industry may be helpful; and third, application of the information, techniques, and lectures he has received to the problems he is going to meet; and this application should be in the atmosphere of group discussion, if possible using the case method.

Dean Turner—In many respects I heartily agree with Dean Hardy and Mr. Reid, and I shall speak to you only on those matters in which I disagree, or can add something to what they have already said.

Further Aspects of the Five-Year Course

I do not completely agree with Dean Hardy on the extension of the course to four years or five years in addition to senior matriculation. It is only recently that we have gone to a four year course in addition to senior matriculation in many sections of Canada, and, in the United States, the four year course is standard.

Dean Hardy happens to come from a very prosperous province, and it is possible that in Alberta students have a lot more money than they have, for example, in New Brunswick. Many scholarship candidates receive a very small amount of actual cash during the year, and they look at a five-dollar bill with about the same respect that we might have for a hundred dollars. If you extend the course too much you may possibly cut out a good many deserving individuals.

There is another point, and it is also a financial consideration. By adding a year to the college course you also add a headache for the people who are providing finances for the colleges. I might say the headaches in that respect have been getting more numerous and much more intensive in the last three or four years. We found, for example, at the University of New Brunswick, when we changed from four years in addition to senior matriculation that the expense was certainly not taken care of by the fees which were paid by the students themselves. But by extending the course there is an advantage in that the students have better training, particularly in mathematics, for their professional work later on in their course, and therefore, by adding a little more time they are able to get the necessary mathematics to handle physics, applied mechanics, and the professional courses to follow.

Another point on which I would like to comment is the question of whether students who have shown particular aptitudes in physics and mathematics, but have shown deficiency in general subjects, such as history and English, should be admitted freely to the University. We know that during the past twenty or twenty-five years engineers have had a great struggle to persuade the public that engineering is a real profession like medicine or law. I think possibly one reason is because we have been too intensive in instruction in technical subjects. I certainly feel that any student who is deficient in English and history as he enters the engineering school will probably be deficient in such things when he graduates. He may find a useful niche somewhere in the laboratory, as a technician, but I doubt if he will promote the proper interests of the profession. I do feel that his deficiency in English and history is probably due to laziness as much as anything else, and I think if we are going to start to broaden a student, possibly we should start back before matriculation and deny students entrance to the university if they haven't these general subjects.

Specialization vs. General Engineering Course

I agree with Dean Hardy that the time is not ripe at present to grant a general engineering degree. If for no other reason than competition between the various divisions of engineering, we should, I think, stick to the well recognized fields. Of course it is a grand thing that large companies like the Bell Telephone, General Electric, General Motors, and other companies are quite willing to select students, we will say from civil engineering, and put them in mechanical engineering jobs. I don't think they necessarily feel that there is any handicap, in getting a man who has a degree in Civil Engineering, into a mechanical engineer's job. At least they find out at once whether he is adaptable to new situations. That is something they want to know. If he is a civil engineer, they would like to give him a job in the mechanical engineering line to see if he is really adaptable to change.

Development of Leadership Qualities

As regards leadership, of which Mr. Reid spoke, that is a very difficult subject indeed, because it seems to us at the universities that a man is a born leader or he isn't a born leader. If he isn't a born leader there is not very much you can do about it.

We had occasion to think about the reasons for some of our students being rejected as good officer material during the last war, and we could easily see in every case that the man probably was doomed to failure as an officer. He had qualities, perhaps deficiencies, which would certainly prevent him from becoming an officer. Of course you realize that all the graduates of engineering schools were potential officer material, and were so regarded when taken into training.

I certainly agree that it is not only in the armed services that you need leadership. You also need it in all fields of engineering, but as in medicine and law, there will always be a certain number of people in our profession who will be the office boys, who will be the laboratory technicians. That is their forte and that is all they will ever be suited for. It is a fortunate thing for the profession perhaps to have somebody to do that work.

The only thing the universities are doing to develop qualities of leadership is possibly what we do at the University of New Brunswick. We take a considerable number of promising students and ask them to act as student assistants. In some cases that means they will have to go to the blackboard and analyze and explain certain problems to other students.

Now, we find the result is that the students themselves say they learn more about certain subjects in trying to teach those subjects than they learn in the actual course as they took it. They also learn how to get along with these small classes they are instructing, and I think perhaps that is the only actual way we could attempt to give the students courses in leadership. But we are very glad to do that and we certainly would be very glad to hear from anybody as to suggestions for doing more in that respect.

Are Examinations Satisfactory?

Mr. Tait—One of the questions that comes to my mind is this: Should Industry consider employing only the upper third in academic standing of the graduates, should they pick gold medalists, or should they consider anybody who graduates? That, to my mind, is quite an important question and it can be resolved this way: Do gold medalists make the best engineers? I do not think so.

That brings up the question of examinations. Is it the fault of examinations? Is it the fault of the engineer or the student, or what is it? It seems to me that some form of test is necessary to determine whether a man is going to be useful as an engineer or otherwise.

If you are considering an electric motor, you know very well if a motor is built to a certain size, it will have to pass a certain test to be any good and you can expect it to pass that test. With individuals you have something more than electric wires and steel. You have the question of people's feelings. Some people get very excited in examinations. It is anticipation of an examination that upsets some people completely, and I know a good many have worried greatly over examination papers, although they knew their subjects very well.

The man who has a photographic memory and can study hard the night before the examination, will write a good examination, but at the end of the week he will be unable to pass anything. Is he going to make a good engineer? I don't know whether there is a means of overcoming these deficiencies or whatever you like to call them. There are different ways that might be suggested.

Should students be allowed to bring their books and notes into examinations? I feel there might be some merit in that device, because if a man does not know his subject he probably can't pass anyway, even if he has the whole library with him. Furthermore, if you are a graduate engineer and working in industry, you don't have to remember how to prove through a long formula that it can be resolved that X plus Y equals something else. You can look it up in the tables and many students fall down on trying to work that through in examinations.

I know it has been practical, it has been tried, and it has worked out very successfully. After all, it is the application of your studies to practical engineering that is important and should be, I think, the basic test as to whether a man can do engineering work or not. You can get the information out of libraries. When you are an engineer, you don't sit down and work out the formula for friction in pipes and so forth. You take the tables and believe it.

I thought I was rather alone in this thinking, but I ran into a clipping in a newspaper the other day, that the UNESCO Seminar starting this week at Ste. Anne de Bellevue is somewhat of the same mind. The report states:

> "Oral and written examinations, testing memorization of facts, are not a fair test of a student's worth and are based on wrong principles, Professor Carlos Dalgree Ladal, director of a forthcoming six week UNESCO geography seminar at MacDonald College, said here yesterday.
>
> "At a press conference at the university, the Professor, who is a member of the teaching staff of the University of Brazil and author of sixteen texts on geography, said that existing examination systems are conducted with pomp and circumstance, frightening to students and dealing with the candidate as a digit rather than as a human being. It is not normal for a student to close his book and be required to produce facts in a room where there is nothing but a ceiling above him and white paper before him.
>
> "He advocates an examination system which verifies the learning process in the student and reveals results of his learning. In such an examination the student could take his text and note book, and any other helpful material into the examination room and make full use of them. The examination would set forth a theme for the student to develop through the use, if necessary, of his books.
>
> "In oral examinations the student might be asked to explain his notes taken in lectures during the school term or a passage in a book bearing on the subject he has studied."

That is the general idea. It does seem to me that a lot could be done to help out the student who gets stage-struck with examinations.

There were, I think, two other things I was to say a word about. One was the pre-experience of students before entering university. I do not think that is possible in most cases. Most of these students who go into engineering don't know what they want to do. Most of them want to be engineers, half of them think they would like to be consulting engineers the year they graduate. Until they do find the type of work they want to go into they won't be doing the practical work that will do the most good. However, they should be doing some practical work, but I don't feel that a student should be made to do a lot of practical work before he is allowed to start college.

Dr. Young—There has been a question sent in, Mr. Tait, that I think you might deal with: "Do you not think engineering courses would produce a better product if students had more practical training, through the aid of industry, during their stay at the university?"

Mr. Tait—I think that is very practical. If you can get industry to take students on during their years of college it is not only good for the students but it is good for industry. The students make contacts that are very valuable to them, and often industry finds a lot of good prospects for future employees.

Selection of Student Engineers

Dean K. F. Tupper—In many cases my views are similar to those already expressed, and I think it better perhaps that I try to plough a little new ground. I should like to suggest that the creation of an engineer consists of three processes. The first of these is the selection of those who will become engineers; the second is their education; and the third is their training.

Now, it may seem that education and training are much the same thing, but by education I mean that which is given to them by the universities and by training, that knowledge and experience which they acquire in industry or outside the university, either before or after graduation.

In my opinion, probably the most important of these three processes is that of selection, and the selection at the present time is not done to any large extent by industry or by the universities. It is done by the students themselves. The student applies for admission to an engineering course, and if he has what is regarded as a satisfactory secondary school record he will be admitted to that course. He may have no aptitude for engineering subjects. He may not have any potential leadership qualifications. He will not be perhaps what the Army calls "officer material". But if he has merely a satisfactory secondary school record he will be admitted.

Now, it is much easier to find the weakness in this system than it is to suggest a workable remedy. The universities can do some of the selection during the years that their students are with them. If they feel from the result of the student's work, chiefly as disclosed in his annual examinations, that he does not have the aptitude to become an engineer, they can fail him and after sufficient discouragement along this line the student will drop out of the engineering course or be pushed out.

I feel that this selection, while necessary, is not sufficient, and that it would be desirable if we could find a method of doing it, to select also on personal qualities, on leadership potential, on the ability to get along with his fellow human beings, and on those numerous qualities, unmeasurable and intangible, which make a man a successful engineer, and make him successful in the industrial and business world.

Moral and Spiritual Teaching Essential

I should like to suggest also that we are perhaps making engineering too much of an exact science. We set the student the following problem: "You have a bridge truss, according to Figure 1; at points A, B, and C, there are loads of 15, 20, and 25 kips respectively. Compute the stress in the member C-D." Of course the student is expected to get an answer, the accuracy depending on the length of the slide rule which he carries into the examination.

In actual practice later, the young engineer will discover that very few things in this world are exact, they are dealt with in probability. How heavy a vehicle will roll over that bridge some day and what is the probability that another vehicle will be going across the bridge at the same time in the opposite direction? In dealing with human material there is no equation into which you can put members. You cannot measure the qualifications of the people you are dealing with in terms of 69 per cent, et cetera. I feel perhaps we do not stress this sufficiently.

I sometimes claim, rightly or wrongly, that comparatively few engineers become successful contractors. The engineer is taught to seek an exact answer to a precisely-stated problem. The contractor, on the other hand faces a different problem; he is required to bid on a job. The soil conditions are unknown. Steel at the present time is in short supply, and you almost have to bribe the Board of Directors of a cement company to get cement. Labour is now being paid a dollar an hour, but rumour has it that because of the carpenters' strike, the rate for day labour is going up at least ten cents, probably fifteen cents. How much must you bid on this job in order to keep from losing your shirt?

The engineer is not taught to solve that kind of problem. He can solve the problem in computing the stress on the members of the bridge truss, but he is lost when you give him a problem with inequalities, inexactitudes, and probabilities. I think perhaps we should give a little thought in our engineering schools to these things.

Those of you who attended this morning's panel discussion will remember the quotation of the best definition for education, given originally by Sir Richard Livingstone. I am sorry I cannot requote it for you but it required three things: a training which suited you for a vocation because you had to make a living; a training in moral values, to make you a citizen; and, finally, a training in spiritual things so you could live with your own soul.

Now, in the past I feel that we have in the engineering schools devoted one hundred per cent of our attention to about one-third of the problem, as we have coped with the matter of vocation only. The trend is now away from that position, to some extent. I think that much credit is due to my predecessor, Dean Emeritus Young, for reintroducing the humanities into the engineering curricula.

Today, at the University of Toronto, we devote more time and attention to the humanities than most other Canadian engineering schools, and even here, they are given only about six per cent of the total time. I would suggest that if the technical training for a vocation is only one area of the three, perhaps we are not devoting sufficient time and not attributing sufficient importance to those other two areas.

Questions from the Floor

Dr. Young—I pass on to you, Dean Tupper, two of the written questions that have been asked. One is this: "As long as the time is spent on fundamentals and the development of the 'engineering approach' to problems, does the subject matter really matter?"

Dean Tupper—Well, if I do not misinterpret the question, I would say that subject matter does not really matter. In other words, I don't care exactly what bill of fare is put before the student, as long as he gets a reasonably balanced diet. He must cover his fundamentals, then you can capitalize on his particular interest by giving him a labelled course — Chemical, Mechanical, Civil, or what-have-you. I am not concerned with the exact prescription, so long as he has a reasonably balanced diet.

Dr. Young—Another question: "Cannot the greatest advancement in education be made by directing extra-mural activity into useful channels in the sixteen or eighteen hours per day when the student is not in lectures and laboratories, etc?

Dean Tupper—I do not feel it is the responsibility of the universities and colleges to direct the extra-mural activities. We must create opportunities, but I think this is the area in which the student himself operates. If we were to spoon-feed him and hold his hand in his extra-mural activities to the same extent we do in his class work, I am sure we would ruin him completely. In his extra-mural activity he does get some opportunity to develop himself, and I think it is most important this should remain so.

Values of C.O.T.C. Training

Dr. Young—This question has been handed to me: "Are the universities satisfied with the kind of practical training C.O.T.C. students get in their summer programmes?" As you know, there is practical training given in the technical corps of the Army — the R.C.E.M.E., the R.C.E., and the R.C.C.S. Colonel Boehm, Director of Mechanical Engineering, assures me what the Army wants in technical officers is the same in the matter of qualifications as the good engineering student has. He wonders if the present plan is satisfactory, so far as the experience gained by army students.

Dean Tupper—I have just had the privilege of visiting two of the three schools that the R.C.E.M.E. cadets attend in getting the training which is given to them by the Army. I was greatly impressed by the quality of the training. I would not, however, regard it as an exact equivalent of an industrial training. In an industrial training the student engineer works as an equal with almost all of the men who work alongside of him, and he gets a chance to understand how the working man thinks. He carries a lunch pail.

The cadet, on the other hand, is in an army environment. He is in there as an officer and, although he is on a plane of equality with his brother officers, he is not so situated with the men in the ranks. I regard the training as a very good training, but not an exact equivalent.

Dean Hardy — We have been accepting the training as the equivalent of industrial training in almost all cases, although I must admit that our Faculty people have not been prepared to consider it as being actually equal. Our position has rather been that we wanted to co-operate with the Services to whatever extent we could, and we perhaps have been somewhat more lenient in the West than is the case in the East in accepting various types of summer training. We will consider the man who goes out as a labourer on a pole gang, for example, as getting engineering experience.

I should say that in due course we shall find ourselves in the position of wanting to analyze the type of training that is given in somewhat more detail than has been done in the past, and perhaps we can make some very definite suggestions to the Services if the plan is to be continued indefinitely.

Dean Turner—I would only add that I do think the Service training is valuable in giving something to the student in developing his leadership. As was said before, leadership is a question of native ability, rather than developed ability. On the other hand, I think these men who have had the Service training do come back to us after a summer with possibly a little better developed leadership than they might have had before. Possibly what they do not get in rubbing elbows with the common man, they may get to a certain extent in leadership.

Dr. Young—A question for you, Mr. Tait: "Will not the student who gets stage-struck at the examination most likely be the one lacking in mental ruggedness when under pressure in industry?"

Mr. Tait—I don't think so. I have had several in my own organization and I have found that it is more the anticipation that has bothered a lot of these men than the actual examination. When they are out in industry and can sit around by themselves and think things out they are going to do a pretty good job, and in most cases they have.

Dr. Young thanked those who had introduced the topics, and expressed regret that because the hour for adjournment had arrived it was not possible to deal with all the questions that had been presented.

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Models For Fraser River Delta Study

A paper presented at the joint Annual General Meeting of The Engineering Institute of Canada and the Annual Summer Convention of the American Society of Civil Engineers, in July, 1950, at the Royal York Hotel, Toronto, Ont.

by

E. S. Turner, M.E.I.C.,

Hydraulics Laboratory,
National Research Council, Ottawa.

This paper describes briefly model studies of methods of eliminating shoaling conditions occurring in the Fraser River near the railway bridge at New Westminster which were carried out in the Hydraulics Laboratory of the National Research Council. A model of the complete delta which is being constructed to study proposed channel improvements is described.

The Fraser River and its tributaries constitute the most important river system in British Columbia draining approximately one-quarter of the area of the Province and forming an outlet to the ocean for the Port of New Westminster. The river is navigable to ocean shipping over the lower 25 miles, and to small vessels over the next 50 miles. It is only the main channel used by ocean shipping, and the secondary North Arm Channel used by small vessels serving local industries which are improved with dykes, jetties, and dredging.

The Strait of Georgia, into which the river discharges, is subject to a tidal range of over 14 feet. The influence of the tides extends upstream as far as Sumas, about 56 miles, while the limit of salt water intrusion during periods of low river discharge is about five miles. Pitt Lake, joined to the main river by Pitt River just above New Westminster, has a tidal range of 1½ to 2 feet and modifies the normal discharge characteristics of the delta portion of the river. The tidal section is shown in Figure 1.

The total discharge of the Fraser is large owing to comparatively high precipitation over its large drainage area, and winter storage in the mountains leads to wide variations in rate of discharge. The freshet occurs between May and July and reaches an average maximum of 200,000 c.f.s. while the average minimum flow during the winter season is 17,000 c.f.s. The maximum reached during the 1948 freshet was 536,000 c.f.s. The river is turbid, even during periods of minimum flow, and a large proportion of the sediment remains in suspension during periods of slack tide. Large quantities of silt are transported along the bed in the form of waves. Marked changes in channel configuration usually occur during the freshet period.

The New Westminster Model

Early in 1944, the National Research Council was asked by the Department of Public Works of Canada to investigate methods of improving the navigation channel in the vicinity of the railway bridge at New Westminster. There is a bend in the channel at this point and a sandbar extends from the convex side of the bend into the navigation channel. Annual dredging for a number of years has effected no permanent improvement and relocation of the channel is impossible because of a swing-span in the bridge. It was desired to determine the possibility of removing the sandbar by using dykes to change the direction of the current.

A model was constructed in the laboratory to a horizontal scale of 1:400 and a vertical scale of 1:100. A total length of 5.3 miles of river was included to insure that flow conditions at the bend in the river would be correct, and to enable a wide variety of remedial measures to be tested. The length of the model was about 70 feet and the maximum width 10 feet. Crushed bituminous coal having a mean grain size of approximately 1.5 mm. and a specific gravity of 1.29 was used for the bed.

A system of movable electrically-operated weirs at each end of the model was provided to adjust the levels to represent the tides and stream flow condition. These weirs were controlled by a mechanical tide machine which combined the motions of a number of cams to represent the daily variation in levels. In practice, however, this control mechanism was not used.

Before commencing tests on proposed improvements, a series of verification tests was run. Since the tides merely reduce the velocity of the current in the area represented by the model and do not reverse it except for brief periods when the river discharge is low, a number of trials were made without tides. The results of the first tests were promising, and eventually close agreement with the prototype bar formation was obtained. The resulting time scale under these conditions was extremely short, about 1:730, and enabled a variety of training structures to be tested in a short time.

More than half of the tests were made on models of solid dykes erected near the end of City Bank to deflect the current toward the convex side of the bend. Such dykes were unsatisfactory because of the limitations imposed upon their length and position by the navigation channels and because of the scouring which occurred about their ends. Submerged rock weirs in the deep area on the concave side of the river were reasonably effective but were discarded on the grounds of excessive cost.

Fig. 1. Tidal section of the Fraser River.

Straight permeable dykes located near the end of City Bank were found quite effective in maintaining the desired channel and caused only moderate scouring.

More Extensive Studies Required

As the tests on this model were nearing completion a second and more comprehensive problem was submitted to the laboratory. Plans for increasing the width and depth of the channel in the North Arm and increasing the depth of the main channel were being considered. The problem was to determine the feasibility of these plans and their effect upon the current distribution between the channels. This was important since an increase in the discharge capacity of the North Arm could have serious consequences on the maintenance of the main channel and might ultimately alter the characteristics of the river. A movable-bed model suitable for a detailed study of the entire delta from New Westminster to the Strait was required.

Experience with the laboratory model indicated that the model should be located as close to the prototype as possible to permit the experimenters to compare conditions in the model and prototype and to reduce the time required for the transmission of data. A site on the campus, fulfilling this and other requirements, was made available by the University of British Columbia and the University has co-operated effectively in the preparation of the site and the construction of the model.

Description of the Second Model

Preliminary investigations showed that the model should include a large section of the Strait of Georgia and the River, with its tributary Pitt River and Pitt Lake, to the limit of the tidal influence in order to obtain accurate reproduction of tides and river discharge conditions. A horizontal scale of 1:600 was chosen and artificial bends were placed at two points in the fixed bed section to fit the model into the 300 by 400 ft. area provided for the project. A comparison of the model and prototype configurations is shown in Figure 3. A reinforced concrete reservoir that will hold the entire contents of the model has been provided to store the water when the model is drained for working on the channels. The river channels and tidal reservoir have been formed in the ground and lined with asphalt for water-proofing. River sand placed in these channels will be accurately moulded to represent the movable bed of the channels, islands, and tidal flats, to a vertical scale of 1:70. The channels above New Westminster will be made of sand cemented in place.

The accurate reproduction of tides and river discharge is important in a model where the distribution of discharge between two arms of a river is being studied. A control system was therefore designed which would reproduce prototype conditions over a one-year period without attention.

The tidal basin representing a portion of the Strait of Georgia about 8 miles by 19 miles is supplied with water by a 20 c.f.s. axial flow pump and the water level is controlled by a set of tilting weirs which return the water to the reservoir. The weirs are hydraulically operated and are controlled by an electronic curve follower which follows the tide curve drawn on a transparent chart. A narrow beam of light is reflected from the mirror of a sensitive galvanometer onto the edge of the tide curve. The deflection of the galvanometer is controlled by the output from a photo-multiplier tube which receives a small percentage of the

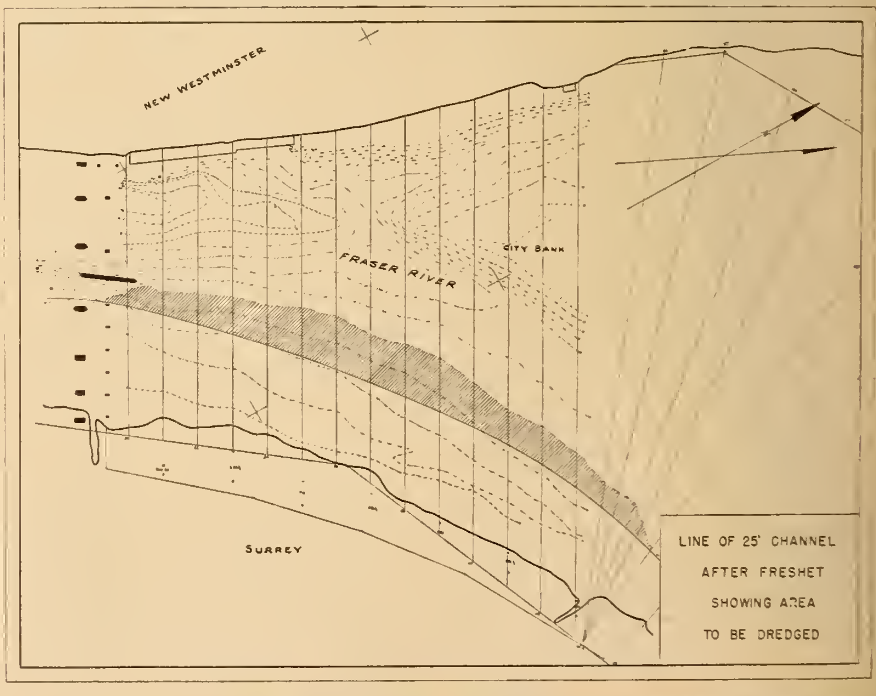

Fig. 2. Sandbar formation in Fraser River at New Westminster.

light passing over the edge of the tide curve. The output signal of the curve follower, which is proportional to the height of the tide, is the voltage drop across a resistance in series with the galvanometer. This voltage is opposed by the output voltage of a float-operated potentiometer in the tidal basin. The unbalance voltage is amplified to operate an oil valve in the hydraulic circuit of the weir operating mechanism.

The river discharge is controlled by similar equipment which controls the head on a calibrated weir. In this case the curve which is followed is the river hydrograph converted to model scale and plotted in terms of head on the weir. The tide and river controls are coupled together and driven by a synchronous motor. The general arrangement of the model is shown in Figure 4.

Observations of silt load and bed movement during the 1950 freshet period were made. Soundings were taken daily over a particular section to obtain information on the movement of sand waves which are an important means of silt transportation.

The two main problems to be studied have been outlined. To these may be added a number of local problems of channel maintenance such as the removal of sandbars, protection of banks against scouring and maintenance of dredged channels to industrial sites. In providing solutions to these practical problems it is expected that the model will also provide useful information on the behaviour of alluvial rivers and in particular those which are subject to the influence of tides. √

Fig. 3. Map showing relation between Fraser River model and natural topography.

Fig. 4. Fraser River model on the campus at the University of British Columbia.

E.I.C. Annual Meetings — 1951 and 1952

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THE ENGINEER and his place IN INDUSTRY

A Re-evaluation Problem for Management

by

Alfred Skrobisch

Technical Advisory Associates

Reprinted from "Personnel", the Journal of the American Management Association Inc., January issue, 1950.

Basking to a small degree in the light reflected by the war-boosted scientist and, to a much greater degree, in the light of his own magnificent achievements of the war years, stands the engineer in the postwar world. Of course, his existence was well recognized before the war end, indeed, his place in industry had reached a sort of stability, uneasy though it seemed to those who pondered his problem. In view of his present importance in the rebuilding of a tattered world, it is time that his position in industry and his relation to it be re-examined in the light of a tremendous amount of research and evidence pertaining to his characteristics which have been accumulated over the last 20 years.

Let us review briefly the engineer's present place in the industrial setup. When engineers are in demand, as they are now, the engineering school graduate can look forward to a job which will in general pay better than any corresponding beginning job for a liberal arts school graduate. As he gathers years of experience, he will be paid increasingly higher salaries by the same employer or by others. Of course, if times are bad he may be summarily laid off. If this does not happen, and he continues to do his work well, he will eventually reach a point where, as an engineer, he is earning all that management seems to believe an engineer should be paid. At this point, if he has become a top design or production engineer, he will be promoted to an executive capacity where higher rates of pay are considered appropriate.

He will be promoted primarily because management wishes to make use of his talents and experience in guiding a design group or a whole department; the additional pay is the incidental reward due him for the heavier responsibilities thrust upon him. If he is indeed a talented design or production engineer, then, by his promotion, management has done the company and the engineer irreparable harm.

For many years now the study of man's innate abilities has occupied staffs of brilliant investigators and students. The determination of these aptitudes has reached the stage where it is increasingly possible to specify with high accuracy the aptitudes required by a certain type of work or to mark out the preferred field of work for any man according to his aptitudes. As a result of tests conducted over 20 years or more on hundreds of thousands of men and women, it is now becoming increasingly clear just what are the proper aptitudes characteristic of, for example, an executive, a salesman, or an engineer. It has also become quite clear that personal happiness and contentment with one's work depend on the use of one's aptitudes and that the attempt to work in other than the indicated fields will

About the Author

Alfred Skrobisch holds bachelor's and master's degrees in electrical engineering from Columbia University. Since 1935 he has taught for two years at that University, worked for various companies in the field of electric motors and generators and radio, edited the McGraw Hill publication "Product Engineering", and been chief research engineer for Eastern Air Devices in Brooklyn, N.Y.

In January 1947 he became a partner in the firm of Technical Advisory Associates, a consulting engineering group which assists companies to design new products and set up for their production.

Mr. Skrobisch's interest in engineering qualifications and aptitudes covers the last decade. He states that it received a considerable impetus when he found himself in the position of an employer and supervisor of engineers. The ideas he presents are perhaps not new or revolutionary, but they have not been too widely considered in Canada.

cause, at the least, a permanent dissatisfaction and a discontented life and, at the worst, severe emotional and mental disorders. Of course, applying one's aptitudes will not guarantee success and large financial rewards in life; there are too many chance factors in human existence. It will, however, prevent the feeling that one's life has been somehow misdirected and futile.

The years of research in this area have shown us that any person's most suitable field of endeavour is determined by a combination of the existence of certain aptitudes and the absence of certain others. Equally important, the researchers have found, is the determination of the type of personality, i.e., its objectivity or subjectivity. The objective type works well with others and can develop into a satisfactory leader or executive. The subjective type works best by himself or in small groups and, in attempting to be an executive, is uncomfortable at the best and, at the worst, downright miserable. No amount of training or study can make a good administrator out of a subjective type; it can only make him somewhat less bad.

It should be pointed out here that few people are what could be called "all subjective" or "all objective." Most are at some point between the two extremes, and only about one person in four is so definitely subjective that it is advisable for him to observe rather closely the rules for his type.

The Engineer Type

If we now examine the aptitude and personality requirements for engineers as determined by years of testing of thousands of men, some of whom are leading engineers, some of whom finally abandoned engineering after working at it for a while, and some of whom stepped from engineering into administrative posts, not always in the industrial field, we can learn just what it is that makes the typical "good engineer."

To begin with, he has the aptitude for "structural visualization" or three-dimensional visualization. This is the ability to form a mental image of the full, rounded form of any object from impressions received from drawn views or disassembled parts. Not only engineers but surgeons and watchmakers, for example, require this aptitude. It is an essential for all engineers, even chemical engineers.

Our typical "good engineer" must have a great deal of the aptitude known as "creative imagination." The possessor of this aptitude is not one who can "get ideas" where others fail; he is just able to get them faster than others. Tests for this aptitude measure the rate of creative thought and not its absolute presence or lack. Everyone can think creatively, but some do it very slowly and others as if by a series of inspirations.

In addition, but of lesser importance to our present problem, the engineer can profit by such aptitudes as those involving "accounting" ability (which concerns more than mathematics and might well be called an "accounting for" aptitude) and also certain reasoning aptitudes.

Every bit as important to our "good engineer" is the fact that he has a highly subjective personality. He is among the one-out-of-four who are very completely so. When we add his aptitudes to his personality, we get a fuller picture of a man who prefers to work by himself (though he may be part of a group working on a large programme with many aspects), who has his own ideas on how a job should be tackled or on what innovations should be tried, who can rapidly "think up" solutions or means to solutions for problems and try them out himself. This man is likely to be somewhat sensitive to criticism, although a hearty exterior may often mask this fact. While he may be a pleasant, sociable chap to his co-workers and superiors, he is always happiest working by himself, doing his own creating and his own testing of his creations.

The Executive Type

Consider now the dominant aptitudes, the innate characteristics, of the executive. The same years of testing of many thousands of men, and women too, have made his aptitude and his personality requirements relatively clear. If he is to be an engineering executive, at least a moderate amount of structural visualization will prove valuable. He will then be better able to comprehend what the men of his department are working on. As an executive, he should not possess "creative imagination" as a marked aptitude. This well-tested fact may amaze those who have always thought that the good executive must have creative ability. He needs vision and imagination, true, but this is the more usually defined imagination—that which will enable him to appreciate the possibilities and future worth of developments devised by his staff. He must not do the "thinking up" himself for, if he does, he invariably tries to do the work of his subordinates himself, instead of administering their work, and thereby disrupts the morale and efficiency of his department.

And, most important, an executive should not possess a very subjective personality. In fact, the more objective his personality the better, for his decisions must be made without that deep sensitiveness to criticism which marks the subjective type. The executive's business is with men, above, below and at his level, and only the objective type enjoys such a relationship. The subjective type becomes uneasy and discontented in such an atmosphere and, besides running his department inefficiently, tends to shirk many of the personnel and policy decisions that must be made.

Basically, then, the facts of most concern here are that the good engineer is highly subjective and must possess creative imagination while the good executive is objective and should have little, if any, creative imagination. Of course, there are men with creative imagination and structural visualization who have objective personalities. These may make good engineers, but they will be very much more successful as sales engineers than they will ever be as designers or production engineers, for the salesman, too, is an objective type who, according to the tests, must have creative imagination. Furthermore, it is possible for an engineering executive to be successful at his work even though he has a rather meager aptitude for structural visualization if he recognizes his limitations and makes good use, as he should, of the advice of his technical men on decisions involving technical problems. These variations and many others, though interesting to explore in their own right, must not divert us from the main theme of this discussion, which is intended to explore the effects of the wide aptitude and personality differences between the good design or production engineer and the departmental or company executive.

The American Tradition

In engineering departments, as in other departments of any company, it is customary to reward excellent service and natural abilities by increased pay and, finally, when sufficient experience has been gained, by promotion to an "executive" position. Such a promotion normally carries with it as well a further pay increase as a reward for "increased responsibilities." American tradition has made the "executive" position the standard goal of a large proportion of the so-called "white-collar" group, which includes the engineer. Everything in his training and environment from boyhood on has tended to make the design engineer look toward his ultimate promotion to the "executive" position for which he is as ill-fitted as is possible for him to be.

Management, which may have originated it back in antiquity, is also a victim of what is now a firm American tradition. How many times have company managements selected a new chief engineer, for example, because he is "our best designer" or "our best production engineer" and then wondered why the engineering department was never again the contented, smooth-working group it once had been. There are managements which have studied and learned to appreciate aptitude testing and its significance but who are still groping for the answer to the problem such testing has now made evident. Management wants to know how it is to make good use of the abilities and experience of its best designers and production engineers in guiding the work of those departments if these men are by nature the most unsuited for the job.

Yet another problem rises from these facts to plague management. It must be remembered that the average engineer is one of the poorest-paid professional workers and often earns much less than a skilled tradesman. Management has customarily felt (the American tradition again) that an engineer was entitled to enter the higher pay brackets only upon his assumption of an "executive" position. If these excellent engineers are not to be rewarded with executive positions (and the concomitant of higher pay), then will it be possible to reward them with increased pay up to or beyond the level reached by their department heads without breaking sharply, even violently, with the American tradition of the pre-eminence of the "executive" job?

Possible Solutions to the Problem

These problems are not insoluble; in fact, more than one solution can be proposed. All these solutions would part, in some degree, from the revered tradition of the absolute superiority of the "executive" position. Some solutions would appear so radical to management that they would be assured of heated opposition from a large segment of management without consideration of such merits as they may really have.

Let us consider first the plan which would, for example, pay a top design engineer as much as or more than his chief engineer receives on the theory that, as a designer, the man was as valuable or more so to his company than the chief engineer. Almost anyone connected with industry for a few years will know of or recall companies that have had such men. These men's compensation was invariably less than that of their chief engineer, regardless of the latter's degree of competence. This situation seems to involve a rigid concept which, if considered at all, is considered as axiomatic: It is that the chief engineer is, in some mysterious way, responsible for all the good work that flows from his department and that, without his presence as a combined spark plug and catalyst, the designers could not design and brilliant engineers would become dull.

Naturally, the above is an extreme view, presented for emphasis. In sober fact, the objective type who becomes a good chief engineer is indeed a jewel to any company but, by that very fact of his excellence as a chief, he should be less able as a designer than the top men on his staff. There is, then, something to be said for the theory that a top design engineer is just as valuable as a chief engineer, for the chief engineer, by attaining his position, has not proved he is more capable than the design engineer. He has merely proved that he is a different type of person, ultimately suited to a different job. Whether he is more or less valuable depends on the specific needs of the company. It is evident that such a view, if acted upon, will bring with it many additional problems for industrial organizations as they are at present constituted. Shall the chief engineer determine the rate of pay of a more highly paid designer? Who shall have the responsibility for hiring and firing? What changes, both obvious and subtle, will it bring about in the relationship between the men? Which of these changes could be tolerated and which could not? This last question is posed from the viewpoint of all those firmly rooted in the tradition of "executive" superiority (and those include engineers as well as management). Were this viewpoint to undergo even a slight change, a number of problems might well lose their importance.

A variation of the type of solution offered above may also be worth considering. In this variation the form of remuneration may be made similar to that often set up for that other type of person with creative imagination. the salesman. Payment could be in the form of a salary plus commission. This is not to be confused with the well-known profit-sharing arrangements used by many firms. The profit-sharing plan aims to give all employees, or some selected group, a share in regular company profits. The engineering commission would be based on savings due to lowered production costs on existing models (because of design improvements) and on new models and designs. In this way commissions, if based on a fair percentage, may reward the design engineer, who cannot now rise financially above a certain level without becoming an executive under the present rules of the game. Obviously, there would be many problems under such an arrangement that would require fresh thinking by both management and engineers.

The author wishes to present now what seems to him to be a solution which, while quite far-reaching in some of its effects, may nevertheless have the best chance of acceptance by both engineers and management. It is firmly based on the proved fact that a design or development engineer and an engineering executive are two distinct types of persons whose natural fields of activity are not identical but complementary and who are equally important to the industries they both serve.

To avoid being accused of putting every personality strictly on a black or white basis, let us acknowledge immediately that there are many shades of gray as well and it will be found that this solution allows for them all. The extremely subjective engineers (usually the best designers) had better continue as individual workers in a company. Those somewhat less subjective can aim toward being project engineers, for example, as their highest step in the executive field; and those of the more objective type would aspire to the chief engineer's post eventually, a truly objective position. However, by means of the solution to be presented it will be possible for even the most subjective engineer to reach the chief engineer's level (but not his job) if his talents merit it.

To operate in its most efficient form, this solution depends on the recognition by engineering schools that a large number of their students are characteristically unsuited for executive posts at any time in life. All students, if they have not already been tested, should be tested at the beginning of their freshman year and advised clearly in which path their future success and personal happiness lie. Thereafter, during their studies, the students should have the option of electing certain courses which will be of aid to their particular type of future. The subjective-creative type may choose to specialize in certain highly technical aspects of his field. Another with a good vocabulary and one or more of the "reasoning" aptitudes may take writing courses with the intention of fulfilling his natural bent toward technical writing. A third, definitely objective, can, if creative in type, study salesmanship or, if not creative, can study plant management in a direct effort to prepare himself for the future executive work he is by nature best suited for. Then there are those with more than one single set of aptitudes pointing out a single field, and these should have the opportunity to take the various electives suitable to them so that in later life they may be free to choose the paths they may then prefer.

We have outlined above the part that engineering schools must play in this solution to the problem. The students may appreciate the school's efforts to clarify some of the mental haze that surrounds the average student's idea of his future but, as practicing engineers later on, the subjective ones, at least, may be rather unhappy at finding themselves asked to accept the fact that they belong at the tail end of industry's professional pay ranks. It is at this point that management must take part in the solution.

Management must realize that the major difference between engineering executives and design engineers is one of kind, not necessarily of degree, and that one may be as valuable as the other. Company employment departments which seek out engineers in schools must be prepared to state their needs in two groups, "executive" engineers and "creative" engineers (or "technical" engineers, or some other suitable term). The young men they hire will all be doing actual engineering work at the outset in learning the company's business, but their assignments will gradually tend to train them for the fields of work to which they will ultimately gravitate. There are companies which try to do something of this nature even now but without the benefit of having pre-tested and specially trained apprentices.

The last, and probably most important, point is that management must consider the "executive" and "creative" engineers as of equal value and of equal price throughout their careers. To take advantage of the talents and experience of a highly subjective designer in the guidance of the work of a department will require that "creative" engineers have a promotion ladder of their own paralleling that of the "executives." To illustrate this at just one level, take the post of chief engineer. It is an executive post, but management usually wants one of their best engineers in the job. The solution might be to have an "executive chief engineer" and a "creative chief engineer" (or call them what you will). The "executive" would be the actual manager and administrator of the department and the "creative" would be responsible for advising upon and guiding the creative efforts of the designers. Or he could be a technical consultant to the executive chief engineer, and it might be advisable to call him that. We might have a separate promotion ladder then—technical consultants to the project engineer, to the chief engineer, to the vice-president. All these consultants would be talented designers, highly subjective, who are by nature unsuited to managing men but whose abilities make their opinions and decisions on technical matters of prime importance to company management.

The last-mentioned plan continues to make the "executive" type paramount in rank though not in pay. There may be some argument for making the talented designer the chief engineer and giving him an "executive" assistant to run the department. A few companies have consciously followed this pattern and done so with success. Management's preference may depend on whether the greatest need is for an administrator or a creator.

The writer's solution to the problem, whatever the details of its final form, is offered as a means whereby management can escape from an old tradition, now scientifically outmoded, and, on the basis of surprisingly accurate tests, can learn to make the most efficient use of the technical talent it employs and to hire the specific talent it wants in the first place. It would remove much of the guesswork from one of industry's major problems and, at the same time, give engineers a new feeling of dignity and a happier appreciation of their position in the industrial world. √

FLOATING LOG FLUME

by

Claude Gliddon, M.E.I.C.

Chief Engineer,
Gatineau Power Company, Ottawa, Ont.

Pine sawlogs and pulpwood floating down the Ottawa River near Bryson, Quebec, are passed through a logslide at the 60-foot drop in the river created by the dam at the Bryson Hydro-electric plant of Gatineau Power Company. In approaching the logslide the logs pass by the entrance of the intake canal to the power house where the current is quite swift (Fig. 1).

Formerly, with two generating units installed at the plant, a boom was strung across the entrance of the intake canal and the logs were pushed to the logslide by men with pike poles. Due to the swift current, many logs escaped under the boom into the intake canal and into the racks at the powerhouse. Blocking of the racks resulted in loss of head and expense for removal of the logs. When the third unit was placed in operation in 1949, the increase in velocity at the entrance of the intake canal aggravated the condition and necessitated an improvement in the log-passing arrangements.

The problem was solved by the installation of a floating flume, which is held in position by wire ropes to the opposite shores and which receives the logs at a point upstream from the canal intake where the current is less swift and discharges them into the logslide (Figs. 1 and 3).

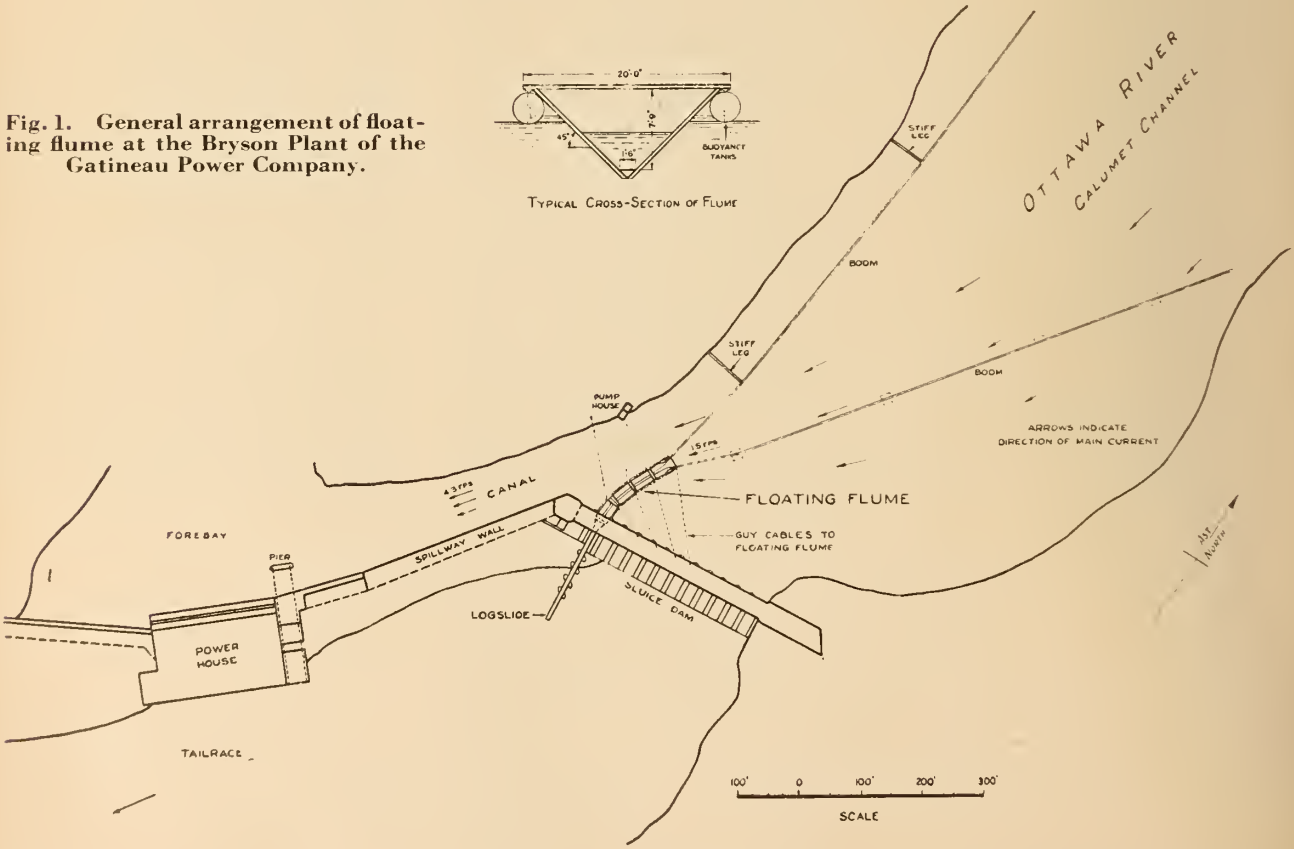


Fig. 1. General arrangement of floating flume at the Bryson Plant of the Gatineau Power Company.

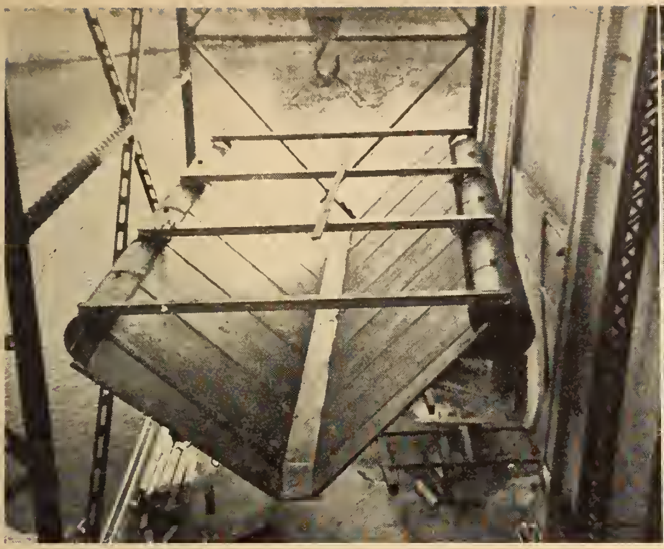


Fig. 2. Assembled 33-ft. flume section ready for launching.

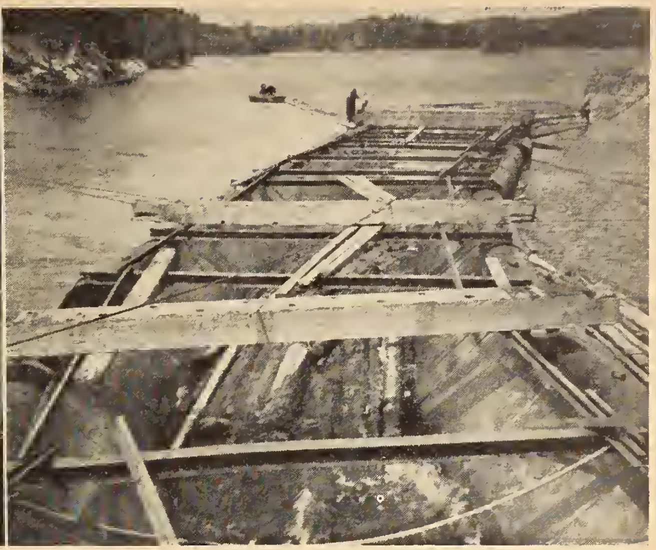


Fig. 3. View of flume from downstream end.

The floating flume is 145 ft. long, of V-shaped cross-section, and has a transition or accelerator section 33 ft. long at the upstream end so proportioned that the water accelerates nearly uniformly from about $1\frac{1}{2}$ ft. per second to about 7 ft. per second in its length. Three additional 33 ft. sections of uniform cross-section, and shorter wedge-shaped sections at angles in the flume, all bolted together form the body of the flume which weighs approximately 38 tons. The flume is constructed of $\frac{1}{4}$-in. steel plate welded and bolted and is equipped with 24 steel air tanks which have sufficient buoyancy, with a small margin, to keep it afloat when not operating. The position of these tanks can be adjusted vertically to give the flume a slight downward grade along its length when operating. Under operating conditions the velocity head causes the water level inside the flume to drop below that in the river which results in considerable buoyancy. As the flume and air tanks rise in the water, the latter provide stability by changing their function from buoyancy to ballast. The whole design is such that a small additional amount of ballast is required to bring the flume to the correct operating level with the water inside the flume about one foot below that in the river. A flexible bolted connection is provided at the downstream end of the accelerator section to take care of the various positions of the flume, as the elevation of the intake end of the accelerator does not vary with the flow in the flume.

The logs pass smoothly through the flume and it is interesting to note that, while the water rides up on the outside of the slight curve in the flume, the logs hug the inside of the curve where the water is lower.

The whole flume, with the exception of the inside below the water line where the logs keep the steel polished, is painted with a red lead priming coat followed by a top coat which is applied hot and consists of 95 parts tar, 5 parts pitch, and 5 parts asbestos fibres by weight. This type of paint treatment applied on Gatineau Power Company's underwater steel structures has been eminently successful, and the first application made eight years ago on headgates is still apparently as good as when applied.

The operation of the floating flume through the 1950 logging season has been very satisfactory. The amount of labour required to pass the logs has been reduced to less than half, the amount of water used has been reduced considerably, and the escape of logs at this point into the intake canal has been practically eliminated.

The capital cost of this flume has been very much less than estimated for other alternative schemes considered, such as constructing a new logslide at the East end of the dam, or equipping the intake racks at the power house with mechanical cleaning devices. √

ENERGY RESOURCES OF CANADA

AND THEIR

DEVELOPMENT

Paper No. 2 — Section A
Presented at the
Fourth World Power Conference, London, England—1950
by
The Canadian National Committee

by:
The Dominion Water and Power Bureau[1].
The Geological Survey of Canada. and
The Dominion Bureau of Statistics

Introduction

Canada has extensive sources of energy in its known reserves of coal, oil, and natural gas, but much the greater amount of the energy used is derived from its great water-power resources, in the development of which the Dominion is one of the outstanding countries of the world. The geographical location of fuel deposits in relation to present centres of population has tended to restrict production, but reserves are extensive. As regards atomic energy, Canada is one of the main sources of raw material. The sources of energy are reviewed and tabulated in the section immediately below, and a brief history of their development since 1924, exclusive of the new province of Newfoundland, is outlined in the following section.

Review of Energy Resources

Water Power

Abundant, well-distributed water power constitutes one of Canada's great natural resources, and has been the principal source of the energy required for the rapid industrialization of the country during the present century. Throughout the greater part of the Dominion, with the exception of the prairies of the middle west, adequate precipitation and favourable topography result in numerous rivers on which falls and rapids, supplemented by lake storage basins, offer frequent opportunities for power development; these rivers are distributed in drainage systems emptying into the Pacific, Arctic, and Atlantic Oceans.

The extent and distribution of the water-power resources of Canada, and of their present development, are set out in Table I.

Table I is computed on the standard bases of stream discharge and power rating as adopted for the Statistical Year-Book of the World Power Conference. The totals of available power may be said to represent only the minimum water-power possibilities of the Dominion, as power explorations are still incomplete. Under Canadian practice of development, the total installation at fully developed sites is usually about 12 per cent less than the power available at Q 50, and on this basis it is estimated that only 20 per cent of total resources has been developed. As regards potential markets, a considerable proportion of the remaining available power lies in the more northerly and at present rather inaccessible regions of the country, although frontiers are gradually being extended with the development of mineral and other resources.

While, in general, water power is well distributed across Canada, it is particularly fortunate that nearly 48 per cent of the total is located in the central provinces of Ontario and Quebec, largely within the Great Lakes — St. Lawrence River drainage basin, as this source of energy compensates in large degree for a lack of indigenous fuels; these provinces contain nearly 80 per cent of the developed power. British Columbia, traversed by three main mountain ranges, and with a high rate of precipitation, has many rivers with potential power sites, and contains about 26 per cent of Canada's total resources; among provinces it ranks third in development, with 9 per cent of the Dominion total. The Prairie Provinces of Alberta, Saskatchewan, and Manitoba embrace about 18 per cent of the resources, the larger part located in the northern sectors; plants on the Winnipeg River in

This paper briefly reviews the energy resources of Canada under headings of water power, coal, oil and natural gas, with tabulations of production and reserves. Water power is shown to be the principal source of energy in Canada. A brief history of the development of these resources since 1924, including graphs, is given in the concluding section.

[1] As a result of changes in the organization of Federal departments early this year, the Dominion Water and Power Bureau is now designated as the Water Resources Division, Development Services Branch, Department of Resources and Development.

Table I

AVAILABLE AND DEVELOPED WATER POWER IN CANADA. KILOWATTS $\times 10^3$. COMPUTED TO END OF 1948

Province	Available gross capacity 100% efficiency		Developed capacity (turbine shaft)
	At Q 95	At Q 50	
British Columbia	6,549	12,098	753.3
Alberta	474	1,384	79.5
Saskatchewan	505	1,190	83.4
Manitoba	3,086	5,870	375.8
Ontario	5,042	7,988	2,159.1
Quebec	7,888	14,370	4,431.0
New Brunswick	64	186	99.4
Nova Scotia	19	141	105.1
Prince Edward Island	3	6	1.9
*Newfoundland	1,057	2,844	190.3
Yukon and Northwest Territories	357	895	21.0
Total	25,044	46,972	8,299.8

* New province of Canada, 1949.

Manitoba comprise the greater part of present development. Widely scattered resources in the Northwest Territories and Yukon are important for mining purposes. In the Maritime Provinces, there are few large rivers, and much of the available power is being used. In Newfoundland, present estimates of available power are tentative; the Hamilton River in Labrador is the largest source of potential power.

Coal

Although Canada has an abundance of coal of all qualities, ranging from low-grade lignites to high-grade bituminous and semi-anthracite, development of its coal fields has proceeded slowly, because of their location in relation to present concentrations of population. The coal-bearing formations occur largely in the western and eastern extremities of the country, so that costs of transportation result in a wide territory, comprising the more thickly populated and industrialized provinces of Ontario and Quebec, being dependent on foreign supplies. A recent estimate indicates that the coal reserves of Canada which are capable of being mined are located principally in the three western provinces: Alberta containing about 49 per cent, Saskatchewan 24 per cent, and British Columbia 19 per cent; the eastern province of Nova Scotia contains about 3 per cent, and the remaining 5 per cent is widely distributed.

The coal deposits of Canada occur in formations of at least five geological ages, the oldest deposits which are thick enough to be worth mining being those of the Carboniferous age, roughly 250 million years old, in Nova Scotia, New Brunswick, and some islands of the Eastern Arctic. The youngest coals, comprising the lignite deposits of southern Saskatchewan, are those of Paleocene or early Tertiary age, estimated at 30 to 50 million years old. The deposits which underlie much of the plains region of Alberta, and those on Vancouver Island, are of the Upper Cretaceous Age, perhaps 100 million years old, whereas those of the inner foothills belt of the Rocky Mountains are of Lower Cretaceous Age estimated at 150 million years old. The coal deposits of the different geological ages reveal a wide range with respect to continuity, uniformity of thickness of seams, and quality, with the Carboniferous and Lower Cretaceous coals generally showing the more favourable aspects from the mining viewpoint. The geological age of the deposit is not a true indication of the quality of Canadian coal, as other factors, such as heat and pressure produced by mountain building forces or by igneous intrusions, are the effective factors in the metamorphism or evolutionary process of coalification from lignite to anthracite.

Until recent years, no uniform classification of coals existed in Canada but, as a result of investigations of the Canadian Associate Committee on Coal Classification and Analysis, of the National Research Council, in association with the American Society for Testing Materials, coals are now arranged into the four main classes: anthracite, bituminous, sub-bituminous, and lignitic; further classification requires a total of thirteen standard sub-class groupings.

As a result of geological explorations, drilling programmes, and mining operations over the past thirty years, estimates of Canada's coal reserves have been considerably scaled down from an estimate made in 1913 for the International Geological Congress. Any estimate of coal reserves will depend upon the basis employed; present estimates relate only to coal which, for reasons of quality and extraction costs, is considered to be capable of being mined economically. In Canada, it is not usually considered economically feasible to mine coal seams less than 3 ft. (0.91 m.) thick, or at greater depths than those stipulated below; also, in certain areas, other thicker seams cannot be safely extracted, and have been excluded. The limiting economic depth of operations varies with the rank and geographic location of the coal; thus it is considered to be 500 ft. (about 150 m.) in the lignite deposits of Saskatchewan, 1,000 ft. (300 m.) in the sub-bituminous deposits of the Alberta plains, and 2,500 ft. (750 m.) in the bituminous coals of the foothills of the Rocky Mountains; in Nova Scotia, where current operations are being carried out in the Springhill area on a seam 9 ft. (2.7 m.) in thickness at a depth of 4,000 ft. (1,200 m.), this depth is considered to be economic.

The estimated reserves of coal capable of being mined in Canada, divided into five classes, are shown by provinces in Table II.

Oil

About one-quarter of the area of Canada is underlain by relatively undisturbed sedimentary rocks. This region includes the Interior Plains which stretch westward from the Canadian Shield to the Rocky Mountains and the Hudson Bay and St. Lawrence lowlands. Although "shows" of both oil and natural gas have been obtained at widely separated localities throughout much of this sedimentary area, commercial fields are at present located only in the provinces of New Brunswick, Ontario, Saskatchewan, and Alberta, and in the Northwest Territories.

Drilling for oil began in southwestern Ontario about 1860, and, for the ensuing fifty years, Ontario was the centre of the oil industry. Production has been continuous since the first discovery. Highest yield was in 1894 when 829,100 barrels (29×10^6 Imp. gal.) (131,800 kl.) were recovered; production in 1948 was about 176,000 barrels (6.16×10^6 Imp. gal.) (28,000 kl.).

Table II

Reserves of coal capable of being mined, listed according to provinces and grades (metric tons × 10^3)

Provinces	Grade of coal											
	Low-volatile bituminous including anthracite		Medium-volatile bituminous		High-volatile bituminous		Sub-bituminous		Lignite		Total	
	Probable	Possible	Probable	Possible	Probable	Possible	Probable	Possible	Probable	Possible	Probable	Possible
Nova Scotia	2,140	6,100	23,137	14,500	1,759,180	1,020,276	—	—	—	—	1,784,457	1,040,876
New Brunswick	—	—	—	—	81,478	10,493	—	—	—	—	81,478	10,493
Ontario	—	—	—	—	—	—	—	—	91,000	45,400	91,000	45,000
Manitoba	—	—	—	—	—	—	—	—	30,500	61,000	30,500	61,000
Saskatchewan	—	—	—	—	—	—	—	—	11,908,510	9,983,000	11,908,510	9,983,000
Alberta	7,981,000	3,932,100	10,753,840	3,007,500	6,841,030	3,150,860	5,665,480	2,099,950	—	3,050	31,241,350	12,193,360
British Columbia	876,000	967,800	9,378,248	4,129,220	253,043	572,394	—	—	193,050	712,250	10,700,341	6,381,664
Yukon	—	—	79,250	165,620	22,350	25,910	—	—	292,620	1,123,750	394,220	1,315,280
Northwest Territories	—	—	—	—	27,430	1,539,300	—	—	99,570	719,450	127,000	2,258,750
Total	8,859,140	4,906,000	20.234,475	7,316,840	8,984,511	6,319,133	5,665,480	2,099,950	12,615,250	12,647,900	56,358,856	33,289,823
Grand total	13,765,140		27,551,315		15,303,644		7,765,430		25,263,150		89,648,679	

Chief yield is from limestone of Devonian age at depths around 500 ft. (150 m.), although important quantities are recovered from Silurian and Ordovician rocks at depths of about 2,000 ft. (600 m.) and 3,000 ft. (900 m.) respectively.

In New Brunswick, production is from sandstone of Mississippian age at depths of 2,000 to 3,000 ft. (600 to 900 m.). The yield is small and relatively unimportant, being about 21,400 barrels (750,000 Imp. gal.) (3,400 kl.) in 1948.

In Saskatchewan, drilling in the Lloydminster field, at present the only field of importance, began in 1933, but extensive development did not take place until 1944. Production in 1948 was about 850,000 barrels (30 × 10^6 Imp. gal.) (135,000 kl.) of heavy black crude from sands of Lower Cretaceous age at a depth of about 1,900 ft. (580 m.).

About 90 per cent of the total Canadian oil production comes from the Province of Alberta, and it is here that the great bulk of the known oil and gas reserves is situated. The Turner Valley field, discovered in 1924 about 40 miles south-west of Calgary, was the first major discovery, and remained the chief producer until the discovery of the Leduc field in 1947. Turner Valley has produced about 100 × 10^6 barrels (3,500 × 10^6 Imp. gal.) (16 × 10^6 kl.), with a peak recovery of 9.7 × 10^6 barrels (34 × 10^6 Imp. gal.) (1.54 × 10^6 kl.) in 1942; chief yield is from limestone reservoirs of Mississippian age at depths up to about 9,000 ft. (2,700 m.).

Increased prospecting activities during and following the Second World War have resulted in several other major finds of which perhaps the Leduc-Woodbend and Redwater fields in the general vicinity of Edmonton are the more important. Present recoverable reserves at Leduc-Woodbend are estimated at about 250 × 10^6 barrels (8,750 × 10^6 Imp. gal.) (40 × 10^6 kl.). The oil occurs in two zones of Devonian limestone at depths of about 5,100 ft. (1,550 m.) and 5,400 ft. (1,650 m.), the lower of which is considered to be a coral reef deposit. In the Redwater field, recoverable reserves are presently estimated at about 350 × 10^6 barrels (12,250 × 10^6 Imp. gal.) (56 × 10^6 kl.). Production is from a limestone reef formation in the Devonian at a depth of about 3,000 ft. (900 m.). Other recent discoveries in Alberta are expected to develop into major fields, but have not as yet been fully proven. Alberta also has enormous potential oil reserves in the bituminous sands of the Fort McMurray area which are estimated to contain up to 250 × 10^6 barrels (8,750 × 10^9 Imp. gal.) (40 × 10^6 kl.). However, only a part of this would be recoverable under the most favourable conditions, and present methods of extraction are not economically feasible.

In the Northwest Territories, oil was discovered in 1919 on the Mackenzie River about 90 miles (150 km.) south of the Arctic Circle, and a small refinery was built to supply the small local demand. During the Second World War, under the Canol Project, production was increased by drilling new wells, and for some months a daily average of 4,300 barrels (150,000 Imp. gal.) (680 kl.) was produced. Following the war, production was again confined to supplying local demand, which in 1948 required about 350,000 barrels (12,250,000 Imp. gal.) (55,600 kl.). The reservoir occurs as a coral reef in the Upper Devonian, and is reached at depths of 1,050 to 2,000 ft. (300 to 600 m.). The recoverable reserves of the Norman Wells field are estimated at about 36 × 10^6 barrels (1,260 × 10^6 Imp. gal.) (5.7 × 10^6 kl.).

A great programme of oil exploration and development is currently under way in Western Canada, with millions of acres under permit or lease, and many drilling rigs in operation. The Prairie Provinces are

Table III

petroleum production and reserves by provinces, in kilolitres

	Production			Estimated reserves	
	1947	1948	Cumulative to Dec. 31, 1948	Proven	Probable
New Brunswick	3,677	3,398	100,718		
Ontario	20,690	28,017	4,849,097		800,000
Saskatchewan	86,472	134,676	238,480		16,000,000
Alberta (excluding McMurray bituminous sands)	1,082,586	1,744,655	17,187,780	111,300,000	
McMurray bituminous sands	Nil	Nil	Nil		800,000,000
Northwest Territories	36,860	55,608	451,116	5,763,000	
Total	1,230,285	1,966,354	22,827,191		

now self-sufficient in oil production, and it is a reasonable hope that within the next decade Canada's entire oil needs will be met from domestic production. Table III lists production figures and estimated oil reserves for the producing provinces and the Northwest Territories.

Natural Gas

Natural gas fields in Canada have essentially the same geographic distribution as the oil fields. Earliest drilling for natural gas was in the Niagara district of Ontario about 1885, and at present Ontario has a number of commercially productive small fields distributed along the north shore of Lake Erie. Production in 1948 was about 9,000 $\times$ 10^6 cu. ft. (255 $\times$ 10^6 cu. m.) chiefly from limestone reservoirs of Silurian age at depths ranging from 800 to 2,000 ft. (240 to 600 m.).

Most of Canada's natural gas is situated in the Province of Alberta, where proven reserves, as of November 30, 1948, are estimated at about 1,460,000 $\times$ 10^6 cu. ft. (41,340 $\times$ 10^6 cu. m.). Earliest drilling took place in Southern Alberta about 1901, but production did not reach significant proportions until 1911 when the city of Calgary was supplied by the Bow Island field. Subsequent expansion was rapid, and a number of additional fields were discovered, so that many towns as well as the city of Edmonton are now supplied with natural gas. The recently intensified search for oil has resulted in the establishment of large new gas reserves. Most of the gas is in Cretaceous sands and associated with oil in Devonian limestone reservoirs. Production in 1948 was more than 49,000 $\times$ 10^6 cu. ft. (1,390 $\times$ 10^6 cu. m.) from seventeen fields.

In New Brunswick, all the natural gas produced comes from the Stoney Creek field which yielded about 420 $\times$ 10^6 cu. ft. (12 $\times$ 10^6 cu. m.) in 1948.

Saskatchewan has three areas producing natural gas at the present time, but all are relatively unimportant and produce only for local use. Total yield in 1948 was about 271 $\times$ 10^6 cu. ft. (7.7 $\times$ 10 cu. m.) from sands of Cretaceous age.

Prospecting for natural gas is currently being carried on in the Peace River district of British Columbia. Four productive wells have been completed, but these are capped awaiting development of sufficient reserves to warrant construction of pipe line facilities.

Production and reserves by provinces are listed in Table IV.

TABLE IV

NATURAL GAS PRODUCTION AND RESERVES BY PROVINCES, IN CUBIC METRES$\times 10^3$

	Production			Reserves	
	1947	1948	Cumulative to Dec. 31, 1948	Recoverable	Probable
New Brunswick......	13,856	11,887			
Ontario..............	241,159	256,560	12,800,000	11,330,000	
Saskatchewan........	5,127	7,861	51,164		*1,840,000
Alberta.............	1,309,020	1,394,290	49,824,000	*41,340,000	*79,300,00

* As estimated by G. S. Hume and A. Ignatiaff in the supplement to the "Natural Gas Reserves of the Prairie Provinces", Geological Survey of Canada, Department of Mines and Resources, November 30, 1948.

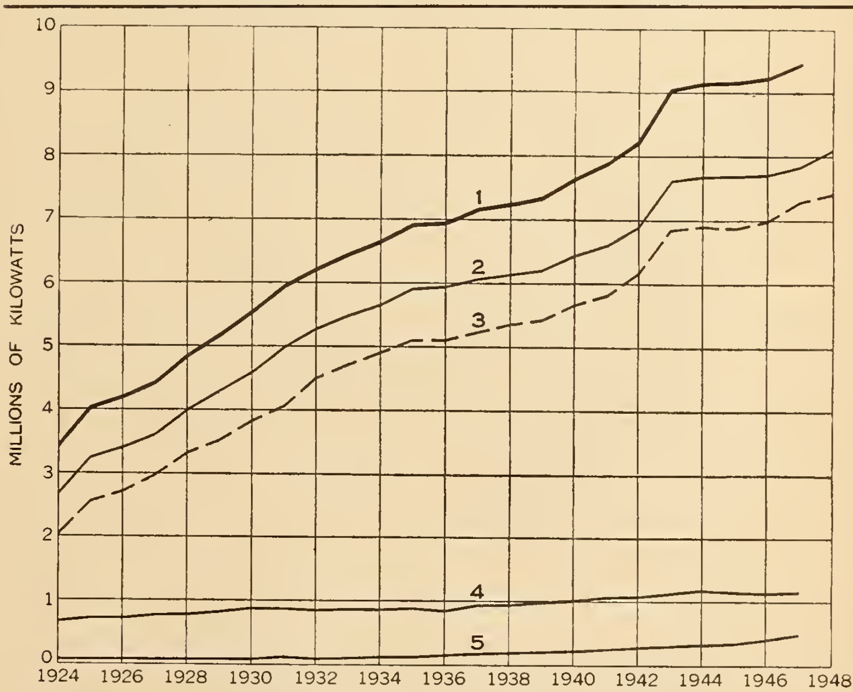
Historical Record of Development of Energy Resources

Water Power

The water power resources of Canada were extensively reviewed for the First and Second World Power Conferences. Since 1924 great strides have been made in their development, total installations having tripled during the period. The year-by-year growth is indicated in Fig. 1, which shows total installations of all stationary prime movers; quite evidently water power is the main Canadian source of energy, comprising nearly 83 per cent of the total stationary prime movers in 1947.

The growth in capacity, although continuous, has not proceeded uniformly, there being periods of low activity in hydraulic construction. As large-scale hydro-electric projects take considerable time to complete, there is a lag between increased capacity and power demand, which is governed by general economic conditions. The 11-year period 1924-35 was one of consistent growth in capacity, the annual increase being about 293,000 kw.; projects under way were carried out even when power demand fell off in the early 1930s. However, the result of the economic depression is reflected in the low rate of annual increase in capacity during the years 1935-9, when it fell to an average of 70,600 kw. per year. The huge demand for power for war purposes accounts for a sharp rise in capacity during the period 1939-43, when the average

Fig. 1. Stationary prime movers. 1—Total prime movers. 2—Water wheels and turbines. 3—Water wheels and turbines in central electric stations. 4—Steam engines and turbines. 5—Internal combustion engines.



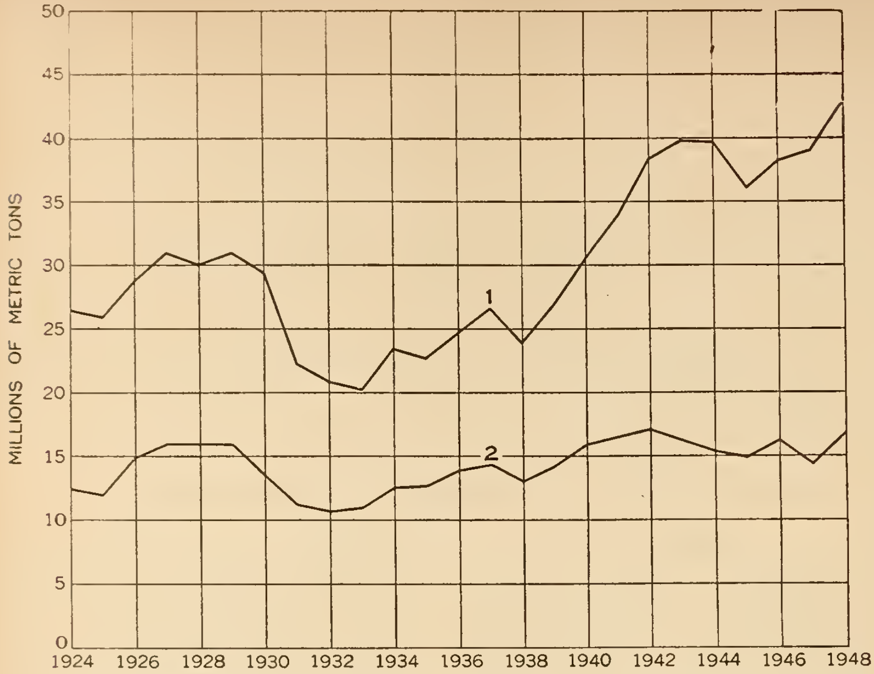


Fig. 2. Coal. 1—Total consumption. 2—Production in Canada.

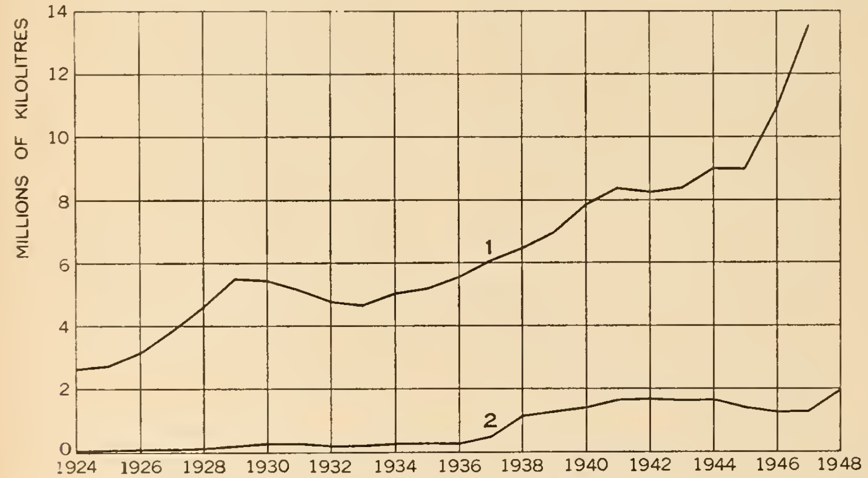


Fig. 3. Petroleum. 1—Apparent consumption of petroleum products (fuel Diesel, gasoline, kerosine.) 2—Production in Canada.

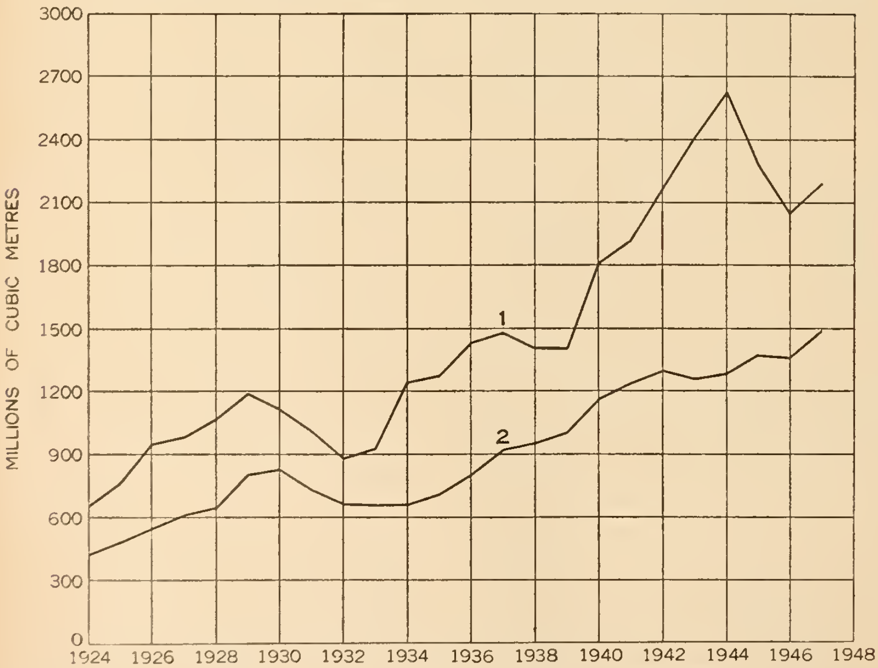


Fig. 4. Gas. 1—Manufactured gas production. 2—Natural gas production.

annual increase was 359,000 kw. Few new developments were undertaken in the later war years or in the immediate post-war period, and little capacity was brought into operation between 1944 and 1947. However, a great building programme was begun in 1946, and many large plants are at present under construction. New capacity coming into operation in 1948 totalled 330,000 kw., and it is expected that more than 1,500,000 kw. will be added within five years. Further opportunities for future progress are offered by the reserves of undeveloped power; in the more populous areas, however, such reserves as are within economic transmission distance are becoming limited, and a trend is indicated toward the development of power stations using supplementary fuel.

The energy from all the larger water-power developments in Canada is produced as electricity, and the majority of plants act as central electric stations, in that surplus power is sold even from those plants primarily built to serve a particular industry. In 1948, 90 per cent of total water-power installation was classified as central station, as compared with 75 per cent in 1924. Less than 150,000 kw. of a total installation of 8,100,000 kw. is used to produce mechanical power.

Coal production, steam engines

Although Canada has extensive coal resources, difficulties in transportation to the main consuming areas in the central provinces has tended to restrict native production while total consumption has been growing. As shown in Fig. 2, production increased from 13,500,000 tons* (12,400,000 metric tons) in 1924 to 18,456,000 tons (16,800,000 metric tons) in 1948, while consumption increased from 29,000,000 tons (26,500,000 metric tons) to 47,382,000 tons (43,000,000 metric tons). There was a falling off in both production and consumption during the 1930s, and a similar rise during the war years, but it was much sharper in the case of total consumption.

As a source of energy in stationary prime movers, steam engines and turbines, using coal as fuel, rank second to water power in importance, and the total installation has increased from 680,000 kw. in 1924 to 1,150,000 kw. in 1947, as shown in Fig. 1. The future growth will probably be more rapid as new plants are built to carry the peak load of hydraulic central stations in certain areas.

Petroleum and natural gas: use in engines and motor vehicles

As shown in Fig. 3, consumption of petroleum products in Canada, having grown fivefold in the period 1924-47 to reach 85,300,000 barrels ($2,990 \times 10^6$ Imp. gal.) (13,600,000 kl.), has been far outstripping native production, although the latter has been expanding, and new discoveries in Alberta and Saskatchewan give promise of much enlarged production within a few years. Natural-gas production also has been increasing, steadily rising from 15×10^9 to 52×10^9 cu. ft. (420×10^6 to $1,490 \times 10^9$ cu. m.) in the period 1924 to 1947, as shown in Fig. 4, which also shows the yearly output of manufactured gas. The construction of pipe lines from the main natural gas fields in Alberta to consuming centres in other provinces is under consideration. As regards prime movers using oil and gas fuels, the increase in the installation of stationary internal combustion engines is shown in Fig. 1, and the rapid growth in numbers of mobile prime movers is indicated by the plotting of the annual registrations of motor vehicles in Fig. 5.

Electricity

The production of electrical energy in Canada, shown in Fig. 6, has been predominantly from water power, although the amount generated from fuel sources shows a rise of 1.6 per cent of total generated in 1924 to 2.8 per cent in 1948; this trend will probably continue, as a large number of the more convenient water-power sites have already been developed, and the demand for electricity is expanding both industrially and domestically; at present, new steam plants are under construction to carry peak loads in Ontario. A feature of electrical production in Canada has been the sale of off-peak secondary power at much lower rates for special industrial uses, such as steam raising in electric boilers which in pre-war years absorbed about 25 per cent of the total output. With growing demand for primary power, and with the lag in growth of installed capacity, the proportion of secondary power decreased to 6 per cent in 1948, indicating current lack of adequate reserves of generating capacity. √

*In this paper "tons" refers to short tons of 2,000 lb. (907 kg.).

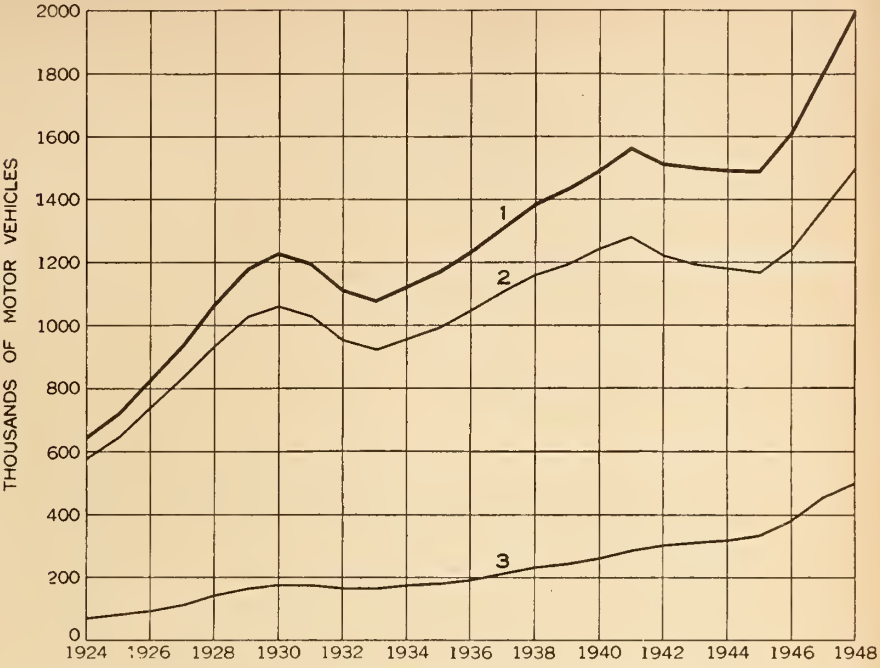
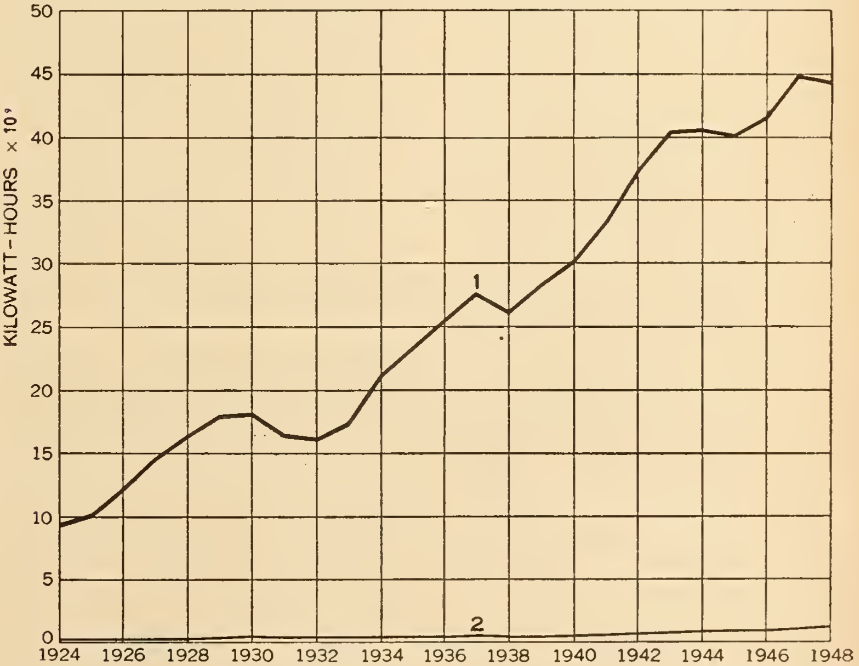


Fig. 5. Motor vehicle registration (excluding motorcycles). 1—Total passenger and commercial vehicles. 2—Passenger cars. 3—Commercial vehicles.

Fig. 6. Electricity (central station production). 1—Total production — hydro-electric and fuel. 2—Production from fuel only.



Discussion

by

J. G. G. Kerry, M.E.I.C.
Port Hope, Ont.

of the paper

A Plan for the Development of the St. Lawrence (Lachine Section)*

by F. S. Small, M.E.I.C.

J. G. G. Kerry, M.E.I.C.

I have read with much interest Mr. Small's paper which appeared in the August number of the *Journal* and which deals with waterway improvement planned to be made near the City of Montreal in the interests both of navigation and of water power development. All previous papers dealing with these questions have been more or less official and it is refreshing to read an entirely independent discussion of a Canadian engineering problem of the first importance.

Particularly this writer likes the following recommendations made by Mr. Small, namely (1) The raising of the level of Lake St. Louis as high as the aggregate of land damages will permit (2) The placing of the proposed power development near the Jacques Cartier Bridge and the confining of practically all the flow of the main river to the channel south of St. Helen's Island. (3) The provisions for the protection from flooding of the Chateauguay shore of Lake St. Louis. (4) The suggestion of a canal at Lake Champlain level running from the dam at Fryer's Island on the Richelieu River to the St. Lawrence River near Laprairie. A lift of about 25 feet would be necessary at Laprairie and Lake Champlain which usually remains open for ten months in the year would be added to the deep waterway system.

It may interest members of the Institute to learn that the idea of diverting the flow of the St. Lawrence River into the channel south of St. Helen's Island is not at all new. It was a principal feature of the Shearer-Bateman scheme which was a matter of acrimonious debate in Montreal in the early 1880's. James Shearer and his engineer Bateman proposed to build a dam from Windmill Point to St. Helen's Island. This was before the days of hydro-electric construction and it was intended to build a series of hydraulic power developments along the line of the dam. The project was finally vetoed by the Dominion Dept. of Public Works which anticipated difficulties arising out of the heavy flow of frazil ice.

The writer regrets that two features of the main problem with which Mr. Small is quite familiar have not been dealt with. The first of these is the possibility of reorganizing the movement of through freight traffic on the railroads in such a way that this traffic will not cross the line of the waterway between Beauharnois and Sorel. This would be following the present practice of highway engineers who build detours around principal cities to avoid congestion of traffic within the cities. Montreal promises to become a very crowded port and any diversion of traffic from the bridges within the port itself would be a material advantage to vessel movements on the waterway.

Mr. Small also has not discussed at length the possibilities for a year-round open waterway from Montreal to the ocean, a development that would not only be of inestimable advantage to the growth of traffic on the waterway itself but incidentally would aid in the better development of Greater Montreal by making possible the use of a much narrower main channel for the river. This would simplify the problem of building cross river highway tunnels between Isle aux Herons and St. Helen's Island and aid materially in the development of the South Shore areas.

It might be well then to review the known facts in favour of the open waterway. Few engineers today would care to question a statement to the effect that the Great Lakes and especially Lake Ontario are natural heat accumulators operating on an annual cycle. In a preliminary way it is known through the studies of Prof. Church and Mr. Millar that the waters of Lake Ontario are, during the winter months, practically isothermal and that their temperature is, in the mass, always above freezing point. At any date in the winter the temperature of the lake waters can probably be predicted with but a minor error.

The rate of heat loss from the surface of a great body of open water during the winter months is also known with preliminary accuracy from the papers published by Prof. Church. The time that it will take a channel of known depth to yield up its stored heat can therefore be predicted with some accuracy and if the speed of the current is also known it is not too difficult to calculate how far the waters in the channel will flow before ice begins to appear on its surface. Throughout the winter, the waters in the main lake are steadily but slowly growing colder until about March 15th when they again begin to gather in heat energy. To express the facts in rough figures, the waters in a St. Lawrence channel 50 feet deep would flow for some 15 or 16 days about Jan. 1st., before ice began to appear on them. This time interval about Feb. 1st would be 9 or 10 days and about March 1st. 7 or 8 days. These figures rest at the present time on insufficient data but they may reasonably be compared with the facts that a regimented channel for the St. Lawrence River would be about 420 miles long from the deeps of Lake Ontario to the deep and broad waters of the St. Lawrence estuary. A river flowing steadily at a rate of 3 m.p.h. would make this trip in about 6 days and there is ample fall along the course of the river to allow engineers to create the desired velocity. The writer is using the above velocity partly because it was the speed at which the earlier masters of hydraulic engineering felt that their headraces were safe from the formation of ice cover, and partly because it is a current speed not too infrequently to be found on the charts of the St. Lawrence Ship Channel. It is therefore a speed suitable for deep water navigation

* Mr. Small's paper appeared in the August, 1950, issue of *The Engineering Journal*.

and for hydro-electric power development.

It is perhaps truism to say that ice will not form in a channel whose temperatures are above freezing point but the conclusion reached by Dr. Barnes and Dr. King that frazil ice also will not form in waters where temperatures are sensibly above freezing point — say as much as one half of one degree Fahr. is not so well known. There is therefore good reason to call for an intensive study of the data secured by Professor Church and Mr. Millar, and press dispatches report that the National Research Council of Canada is now undertaking an inquiry along allied lines. This is very desirable but the fact that so pertinent an inquiry has not been undertaken until this late date must, in the judgment of this writer, be laid at the doors of the great professional societies of the United States and Canada. In neither country, so far as this writer knows, has the attention of government been drawn by the great engineering societies to the need of the information that could be secured by such an inquiry.

This writer would like to see this study attacked by direct engineering methods. The Dominion Hydrographic office has at its disposal the men and the equipment with which to duplicate in Lake Ontario the work of Prof. Church in Lake Michigan and observations taken over two or three winters would secure for the profession data on the changing temperatures of Lake Ontario. These, if read with reference to the long time records in the Dominion Meteorological Office, would provide fairly dependable design data. Canada also owns, in the Welland Canal and in the Beauharnois headrace, excellent flumes for the study of heat losses. The flow in these channels is under the control of government officials, and every year for a brief period in the fall the waters entering them are isothermal. It would not be difficult to measure the rate of heat loss along the lines of the canal. Furthermore, in early spring, the waters entering the canal are marked by sharp temperature stratifications and it should not be difficult to determine for how long these stratifications can be detected in the flowing waters. The waters in a flowing stream are naturally isothermal but data on the rapidity of the mixing process are much to be desired.

When such data are made available it will no longer be necessary to delay a definite pronouncement as to the feasibility of maintaining an open channel from Lake Ontario to the salt waters of the estuary. Obviously such a channel will need to be protected against the entrance of drift ice from the lakes and wide bays that it crosses, the best protection probably being levees of the Mississippi type such as are recommended by Mr. Small for the protection of the Chateauguay shore of Lake St. Louis.

In 1921 the engineers of the Hydro-Electric Power Commission of Ontario prepared a memorandum that was submitted to the International Joint Commission in which the maintenance of an open waterway from Lake Ontario to Barnhart's Island was recommended. This recommendation was qualified, however, by a statement that this open waterway would be of little value to navigation, because navigation in the Gulf of St. Lawrence would be impossible owing to the ice floes always present in the Gulf in winter. In the light of present day knowledge, this qualification must be received with the old Scotch form of verdict "not proven". It is known now that conditions east of Quebec can be much improved. It is true that these ice conditions will be more difficult to overcome than those west of Quebec, but this does not justify a conclusion that they are unsuperable.

There is reason to conclude that the waters of Lake Ontario if contained in a skilfully designed channel would flow ice-free to a point beyond Montreal. Not more than three days of time would be necessary to carry these waters beyond Montreal and it needs but the limited scientific study already discussed to place this conclusion beyond challenge.

Fifty years ago Mr. T. C. Keefer told Canada, in an address to the Royal Society, that the channel between Montreal and Quebec could be kept open all winter long whenever it was desired to do so. The fact that this channel is now kept open between Three Rivers and Quebec gives strong support to Mr. Keefer's opinion. Mr. Small has discussed in his paper the possibility of the river itself maintaining an open channel between Montreal and Sorel, and it needs but some bold dredging and dyking to extend the favourable conditions of the upper reach of the river down to Three Rivers. The fact should not be overlooked that all tonnage discussions and estimates for the waterway indicate that much of the larger portion of the tonnage to be handled will be seeking ports located on the Great Lakes and, to this portion of the tonnage, the open river above Montreal is just as important as the open river below Montreal. This point Mr. Small has not noted.

Below Quebec there is a yearly gathering of drift ice which is formidable. This occurs in the section of the estuary that lies between the Island of Orleans and Ile aux Coudres and prevents winter navigation from reaching the port of Quebec. The section of the estuary and of the Gulf between the Port of Murray Bay and the West End of Anticosti Island has been regularly navigated during the winter months for many years past and it would not be difficult to design a system of dykes and channels which would prevent the formation of the ice pack above Murray Bay. This would open the Port of Quebec, to winter navigation from the upper section of the Gulf of St. Lawrence.

Between Port aux Basques at the south west corner of Newfoundland and the west end of Anticosti Island, a distance of some 250 miles, the real St. Lawrence ice pack gathers and effectively prevents commercial navigation between the upper reaches of the Gulf and Port aux Basques from about the beginning of February to some date between April 1st and April 15th. Beyond Port aux Basques there is always a channel open to the ocean which can be readily navigated in winter by any vessels sailing under the directions of Ice Information Officer at Halifax.

There is reason to think that most of the drift ice which prevents navigation west of Port aux Basques is of foreign origin and is carried into the gulf from the upper reaches of the river by the Gaspe current, but, under favourable conditions, currents through the Straits of Belle Isle can also carry substantial quantities of ice from the Labrador current into the Gulf. Both of these sources of supply can be cut off by suitable engineering works and it is the opinion of some seamen who have had much experience in these waters that if the cut-off works were to be built, winter navigation through the remnants of ice pack that would be encountered west of Port aux Basques would not normally be too difficult to well-built and well-powered vessels.

In other words, there is reason to hope that the ice obstructions which seal the ports on the St. Lawrence River and on Lake Ontario during the winter months can be removed by engineering works that have been thoughtfully planned after a careful study of all material conditions. Such a study might reveal much of importance to all eastern Canada and it has been long overdue.

F. S. Small, M.E.I.C.

It is very gratifying to find that Mr. Kerry has been able to approve so considerable a part of Plan X. Also, he evidently shares my optimism regarding the future of the Port of Montreal. His endorsation should help materially in arousing public interest in the plan.

The matter of diverting through railway traffic around Montreal is important; a similar remark is true of through highway traffic, as Mr. Kerry has implied. It is not too early to begin to plan the outlines of the industrial and transport systems of the future city. Such a plan must, of necessity, be very flexible, so as to permit of the inevitable changes and adjustments which future developments in science, in the arts and in economic relationships will make necessary. This consideration presents a serious obstacle to the making of any plan, yet a great deal can be done along this line. Anything is better than to proceed blindly without any plan.

The main body of Mr. Kerry's letter is devoted to the subject of year round navigation in the Gulf, River and Lakes. This is a very big and vitally important matter. The crying need at the moment, as Mr. Kerry has said, is the collection of data on the heat cycles in all these waters. We need to know how and to what extent they are warmed in summer, in what manner this stored heat is lost and how much ice is formed in winter and also which conditions favour and which retard the formation of this ice. The effect of the depth of the water on the rate and amount of heat storage and emission needs to be studied.

I am glad to learn from Mr. Kerry's letter that the National Research Council is apparently taking an interest in this matter. It is not stated, however, just what studies the Council is undertaking or how far it intends to go.

This whole matter is of very great national importance and since it may well be that the design adopted for the lower river will affect the water levels in Montreal harbour it is desirable that the necessary field studies should be put in hand promptly. It is almost inevitable that the design for the Lachine section will be affected by these studies. A similar remark will doubtless be true of the other sections. The longer the records of the temperature cycles and of the storage and emission of heat the more valuable these records will be.

The aim should, I think, be to work out a well co-ordinated design that will provide for the ultimate development of all the resources of the St. Lawrence System — Gulf, River and Lakes. This should be done before any construction is started, so that when the work is eventually finished we shall have a well thought out, complete and unified job. An important feature of the work should be the preservation and enhancement, where possible, of the natural beauty of the system.

The St. Lawrence has made great contributions to Canada in the past and is capable of making still greater contributions in the future.

Discussion

by

B. G. Ballard, M.B.I.

of the paper

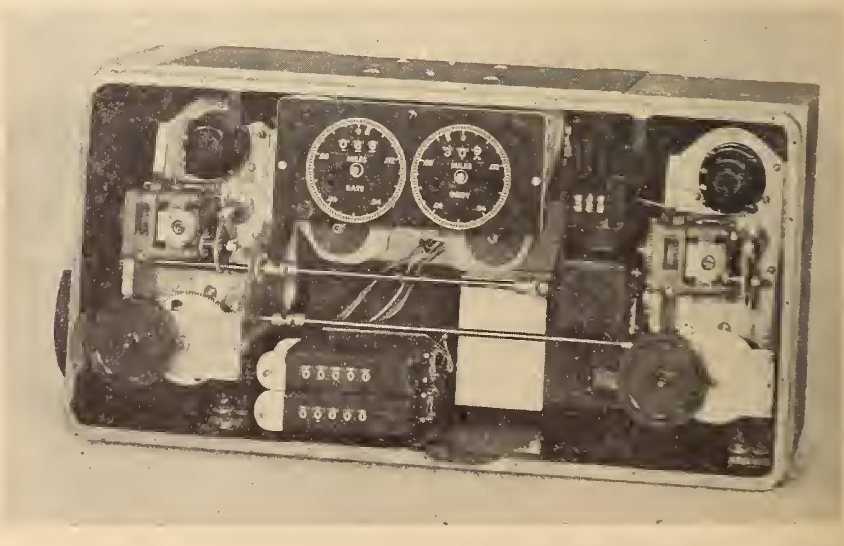
Shoran — An Electronic Tool for Surveying and Mapping*

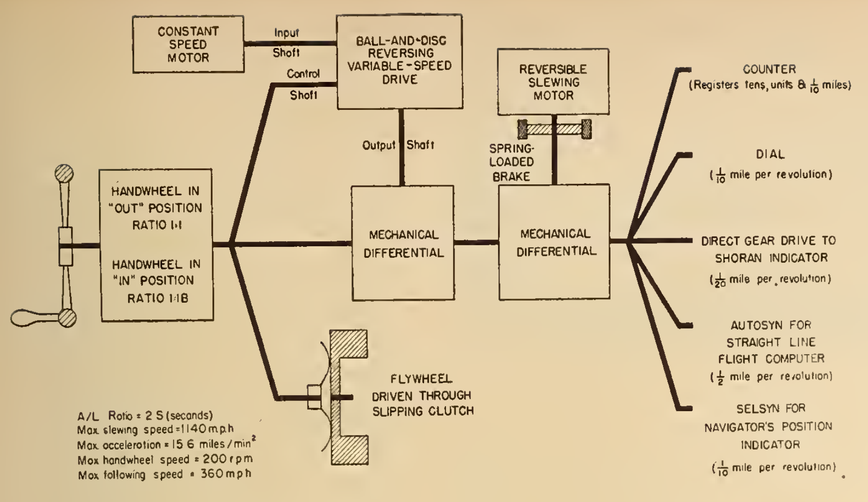
by J. L. Rannie, M.E.I.C.

Mr. Rannie's paper presented a very lucid explanation of the application of Shoran radar to surveying and mapping. Canada is very fortunate, indeed, in having men like Mr. Rannie and his associates to guide her surveying programme. It is unnecessary to mention here their well-known contributions to surveying practice and instrumentation. They were quick to recognize the possibilities of aircraft and the camera for surveying purposes, and it is not surprising that they should be equally quick to

* Mr. Rannie's paper appeared in the August, 1950, issue of the Engineering Journal.

Fig. 1. Recorder-controller unit for Shoran radar.





ponents can, however, be presented more clearly by referring to a block diagram, shown in Figure (2). It is desirable that the operator maintain the radar display pips in accurate alignment. This operation is semi-automatic since it employs a system of aided-laying, familiar to all who have had any contact with various radar tracking devices, and to which Mr. Rannie has referred. The device aligning the radar pips is motor-driven but, if and when they become displaced, the operator can inject manually a correction to re-align them. This operation automatically changes the rate at which the motor drives the align-

appreciate the contributions that radar could offer.

The essential difference between Shoran radar and more conventional radar should be appreciated. In Shoran radar, the scale range on the cathode-ray display is limited to one mile under ordinary operating conditions, and in measuring greater distances the value is determined by counting the number of times the Shoran display goes off scale and adding to that the fraction of the final mile which it registers at the time the measurement is taken. The operation is facilitated by means of a device which enables the operator to keep pips on the display in alignment and the distance is then registered automatically on a mechanical counter. The extremely high accuracy results from the fact that the velocity of electro-magnetic propagation is very constant and electronic oscillators are very precise.

As Mr. Rannie pointed out, Shoran was developed to provide a navigational system for aerial bombing, and, while it was admirably suited for that purpose, it left something to be desired in its application to surveying. Certain modifications and additions were undertaken and it is to these that the following paragraphs will be devoted.

In the military application, the bomber flew along the arc of the circle, the radius of which was established by the distance-measuring equipment of the Shoran. When it reached a predetermined distance from a second ground station, the bombs were released—again in response to a Shoran distance measurement. Actually, the Shoran error was considerably less than the uncertainty of the bombs' trajectory following release. It may be of interest to note that the bomber's radius arm was known as the "drift" measurement, and the intercepting distance from the second ground station was known as the "rate" measurement. These two terms have persisted into the present survey radar although the words no longer have the same significance.

In surveying operations, no attempt is made to maintain a constant radius arm about one ground station. On the contrary, the distance to each ground station is changing continually. In the military application the objective was to locate a point at known distances from two ground stations. In surveying, the distances are unknown and it is the sum of the distances that is important rather than individual values.

One of the most important components to be added to the Shoran is the recorder-controller, the interior of which is shown in Figure (1). The description of its com-

Fig. 2 (above). Block diagram for Shoran recorder-controller.

Fig. 3 (right). Position indicator for Shoran navigation.

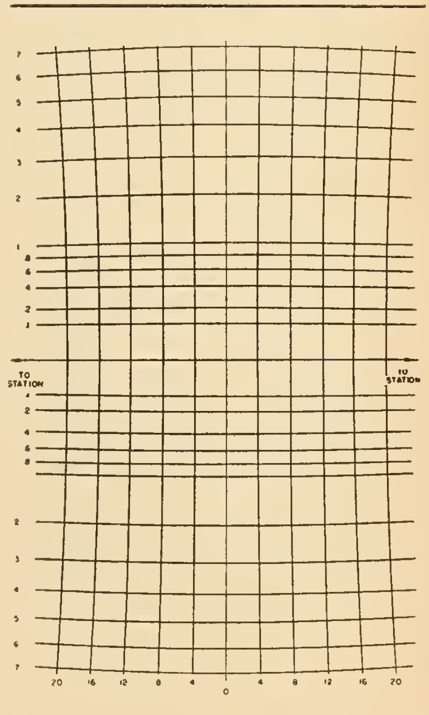


Fig. 4 (below, right). Hyperbolic-elliptic chart for Shoran navigation.

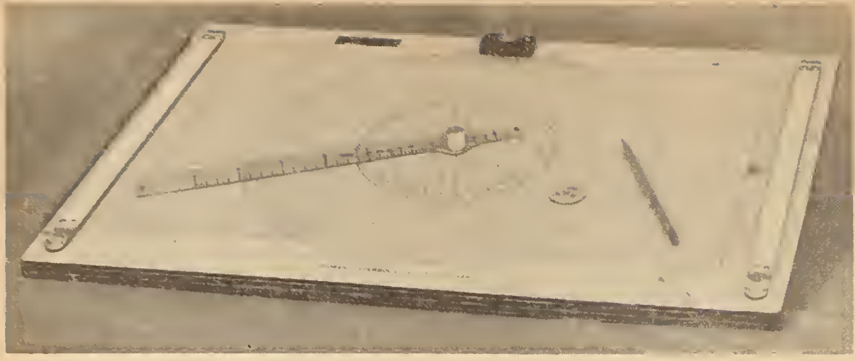


Fig. 5. Hyperbolic-elliptic chart with compass superimposed for Shoran navigation.

ing device so as to reduce future misalignment and, in time, the pips remain true with relatively little further attention. This naturally holds only as long as aircraft course and ground speed remain constant. If, however, the alignment is not absolutely correct, a camera photographs the displacement, and a suitable correction can be incorporated in the subsequent computation. The manual control has two ratios, one to deal with high-speed changes and the other with lower-speed changes. Also, in the left-hand corner there is a flywheel with a slipping clutch. The purpose of this is to filter out violent corrections by mechanical means and enable the aided-laying device to introduce smooth and reliable correction to the rate-of-follow.

Very often when a series of line crossings is undertaken, the recorder setting will be well removed from that corresponding to the actual position of the plane and in such cases, a much more rapid adjustment is necessary than the ordinary re-aligning controls will permit. For this purpose a separate high-speed slewing device is introduced and this is shown at the right-hand end of the block diagram.

The modified Shoran radar was intended as an aid in mapping in some of our northern regions which are not now well charted and, in line-crossing work, navigation presents a problem. The navigator's position indicator, shown in Figure (3), was developed to overcome the difficulty. Most electronic systems of navigation are known as hyperbolic or elliptic and a combination of the two, or two sets of readings on one, will, in general, establish a position with certain obvious, but not usually troublesome ambiguities. The Shoran navigator knows at all times the distance to each of the two ground stations, and by using differences, a hyperbolic plot is obtained. The sums give an elliptic plot. One dial in the instrument shown, gives the difference and the other, the sum. The instrument is equipped also with a device for presetting zero so that the final reading gives the sum in excess of the distance between the two ground stations. Obviously, if the difference were zero, then the plane must be on a straight line, all points of which are equi-distant from the two ground stations and any departure from zero means that the plane is flying on a hyperbola on one side or the other of the equi-distant line. If we subtract from the sum of the distances the distance between the two ground stations (as the pre-set zero does automatically), then we are able to locate the plane along the other co-ordinate. If, for example, the sum of the two distances equals the distance between the two stations, (a situation corresponding to zero reading on the meter), then the plane must be on a line joining the two stations. If the sum exceeds that value, then the plane must be on an elliptic line to one side or the other of the line joining the two stations. From this data it is possible to plot the aircraft's position on the hyperbolic-elliptic chart, shown in Figure (4). While this could be superimposed on a chart of the district, no useful purpose would be served because the navigator is interested only in his position with respect to the two ground stations. It follows that the hyperbolic-elliptic chart must be prepared for the appropriate distance between the two ground stations and since this distance varies widely, it is necessary to have available a number of charts from which a proper selection can be made for station separation. It is not necessary to have a precise fit for this purpose, and charts are selected so that the error in plotting positions does not exceed 2 per cent. A chart is mounted on a plotting table, shown in Figure (5), and a compass rose is superimposed as shown. From this, the required course of the plane can be determined and the information is relayed to the aircraft pilot for line crossing purposes. It is of interest to note also that the scale used is graduated in minutes of time. This means that a separate scale must be used for each ground speed rate and the scale graduations then indicate the precise times at which various necessary operations for taking Shoran reading should be initiated.

True aircraft altitude is a prime requisite for the computations and this may be determined either by a pressure altimeter or a radar altimeter. Up to the present time, a pressure altimeter has been used but it is hoped that a radar altimeter may be installed in the future. In using a pressure altimeter it is necessary to have relatively complete meteorological data for the vicinity and for that purpose two approaches have been made. One employs radio sonde equipment, which will reveal to the aircraft-crew meteorological conditions at various levels. This approach has not yet been completely successful. The second method is to spiral the aircraft up to its final operating height, taking meteorological data on the way up and repeating this on the return to ground. The complete spiraling operation requires about 1½ hours and it is hoped that a more rapid, but otherwise equally satisfactory solution may be found in the future. The data so-collected are used both in correcting for the variation in velocity of electromagnetic propagation and to correct the altimeter reading for prevailing conditions. √

British Air-to-Ground Television Trials

From a release by
The Bristol Aeroplane Co. Ltd., Bristol, England

On two successive days recently, extraordinary things happened on British television screens. Against an intermittent background of fantastic electronic patterns appeared bird's-eye views of many of London's most familiar landmarks — the dome of St. Paul's, Big Ben, Hyde Park, the Albert Hall, Buckingham Palace, the Oval, and many others.

Later a four-engined Hermes airliner flew across the screens, followed by a trainer aircraft executing slow rolls. Then a squadron of jet fighters swooped into view in "attack" formation. Finally, as dusk fell over London, viewers saw the myriad lights of the capital twinkling below them.

British people were seeing London from the eye of a television camera carrying out the first air-to-ground transmission ever achieved. For this experiment, the rear door of a Bristol Freighter aircraft was removed to give a clear view to an image orthicon television camera, with a four-lens turret, installed in the doorway. As even the slightest vibration affects the television image when telephoto lenses are used, the camera tripod was mounted on several layers of soft rubber and both camera and tripod were lashed into position with elastic rope.

The Freighter also carried 12 members of the B.B.C. staff and a 30-watt television transmission station in miniature.

Power for the camera and all vision and sound transmitting equipment was supplied by a special gasoline generator.

Preliminary tests over the City of Bristol had been promising but the results of the first day (Saturday) over London were not very satisfactory. The next day, a transmission began with the Freighter at 1,250 ft. over Victoria station and at this time reception was so clear that viewers were able to pick out a Brighton train leaving its platform. From this point results varied, and the tests were hindered by bumpy conditions and a strong wind. London's notorious smoke — though not so thick as it would have been on a week-day — also played its part in making things difficult. There were times, however, when the capital's best-known landmarks showed quite clearly and, in Hyde Park, traffic could be seen crawling like ants, with the white dots of people's faces clearly visible as they looked up at the aircraft. At other times there was — to quote one observer — "nothing more on the screen than a dizzily moving pattern of black and white lines, and pictures were interrupted by quivering lines of light and interlaced patterns."

Among the thousands of viewers there were one or two sufficiently perceptive to glimpse, through the "flashing, eye-straining confusion" which periodically interrupted reception, the shape of many things to come. Among them were chiefs of Britain's three services, who agreed that the experiment showed that air-to-ground and air-to-air television may prove a powerful strategic factor in any future military or naval operations. TV planes, if necessary escorted by fighter screens, can transmit to ground HQ behind the lines, shots of enemy troops, strong points and supply routes. They can act as spotters for artillery units, radioing to battery commanders from vantage points above targets, instructions for adjustment of range and trajectory.

In sea operations, the airborne TV eye, roving at altitude, can reveal the strength and disposition of enemy units and may even help commanders in actual immediate direction of engagements.

Scope in peace-time applications would seem to be enormous. Coverage of outdoor sport fixtures and other events can be made much more vivid, and with the additional help of the helicopter, the viewer can be given a much better view of things than he gets at present with an earth-bound camera.

Fig. 1. TV camera at aircraft door.

Fig. 2. Airborne television transmission equipment.

FROM MONTH TO MONTH

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

Progress in Co-operation

Negotiations which have been under way for some time in Manitoba, have resulted in the acceptance by the Council of the Institute, of a form of co-operative agreement with the Association of Professional Engineers of Manitoba. The proposed agreement is published in full in this issue of the *Journal* (pages 991-992).

There still remains the necessity of submitting the proposal to the corporate members in the province, but in view of the fact that they have already approved the principle by a preliminary ballot, it appears that the submission of a final ballot will be successful. It is planned to have the terms effective from January 1st, 1951. A letter ballot must go also to the councillors of the Institute.

Manitoba thus will become the sixth province to conclude such an agreement. As a matter of fact it was one of the first provinces to consider such action and many years ago received a favourable ballot from members of both organizations. Action was delayed because of some legal entanglements. It must be a matter of satisfaction to all concerned to have at last, a clear road to co-operation.

An Opportunity to Help

The Institute is appealing for funds. A committee which was appointed at Toronto in October, 1948, has been studying the matter carefully and has presented a report with findings and proposals, to the regional meeting of Council held at Saskatoon in October.

The report states that the revenue from fees is inadequate to meet the increasing activities and responsibilities of the Institute, and to provide any "hedge" against the future. It stresses the desirability of holding the annual fee at the present level, because of the great number of young men now in the membership, upon whom an increase might work a hardship. It suggests that many members would welcome an opportunity to assist financially under the present conditions, and recommends that certain arrangements be made to meet the wishes of those members.

There are five proposals to meet a variety of conditions, but they all possess one important characteristic —they propose voluntary action only. No one is asked or urged to do anything unless he wishes to do it. Council accepted the report unanimously but not all proposals will be put into action immediately. It is planned to follow the recommendations step by step as the committee and the staff are able to handle the work.

In considering these proposals, it should be kept in mind that the Institute's affairs are in good shape. Income of necessity is at least equal to expenses, and under existing economic conditions the present activities could be maintained indefinitely. However the Institute and the profession are growing up in the affairs of Canada and must accept the additional obligations that go with such increasing importance in national affairs.

With so many thousands of Students and Juniors in the organization the income is disproportionate to the total of members. Council believes the senior members will be glad to make contributions that will bring the income up to the amount required to render the best services to these young men.

No one needs to be told that the cost of doing business is extremely high and steadily going higher. The increase in annual fees authorized by the membership in 1946 with which it was planned to do much, has turned out to be little more than was necessary to meet the higher costs of operating. However it should

COVER PICTURE

This month's cover shows two of the four steam generators at the new Hamilton steam plant of the Hydro Electric Power Commission of Ontario.

Each generator provides 35,000 lbs. of steam per hour at 450 p.s.i.g. and 750° F.T.T.

—*Photo courtesy John Inglis Co. Ltd.*

be noted that the Field Secretary and his office which were promised at that time have become a part—and an important part—of the Institute organization and programme.

All these things and others have indicated the need of additional revenue. The Institute is one of the great organizations in Canada. Today it has greater opportunities than ever for service to the profession and the people. Council believes the members, of their own volition will provide the additional funds that will be required to meet the present and future challenge.

The first step to be taken is to afford every member, other than Students, an opportunity to make a voluntary contribution at the first of the year at the time of remitting the annual fee. The account cards will have an additional space on them for this purpose. The amount may be anything the member pleases. It is Council's wish that every member will take part in this endeavour. Small amounts multiplied by the great number of members, will produce a substantial sum that will be of great assistance.

This is a day and age for financial drives. Council recognizes that the engineer's dollar has many hands reaching for it. So many causes are urgent and just, that it is difficult to turn a deaf ear or a blind eye to them. Nevertheless in the midst of these conditions the Institute appeals to its own members for support for their own organization believing that their own interests as represented by their own society merit serious and sympathetic support.

"You don't need a cook, Ma'am . . . you need an engineer!"

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What Is Your Idea of a Profession?

Modern usage of words has given some shocks to those who were taught that the dictionary was a reliable book of reference, and that there were rules of grammar and composition that were reasonably well fixed. Adverbs and adjectives have become interchangeable; nouns have become verbs; groups of letters normally intended as abbreviations have become words; old words are given new meanings and then substituted for some other old word, such as "know how" for knowledge and "blue-print" for plan, and so on.

Today the word *profession* is getting a lot of kicking around, and who knows what it may mean in 25 years' time. A lot of people have gone to universities to obtain a professional degree and they may be excused if they think that a university course, in conjunction with a ministry to the people has something to do with it.

There is a tendency now for everyone who doesn't enjoy membership in a trade union to call himself and his group professional. On all sides you hear of the profession of advertising, of insurance, of salesmanship, of real estate, and so on — all highly respectable and respected callings, but not what has been regarded by many as professional.

Recently there appeared in the Montreal papers a news item to the effect that the painters and decorators were applying to the Quebec government for a charter establishing The Professional Association of Contracting Painters and Decorators. How do you like that?

To show that here in Canada we haven't reached the bottom yet, here is a quotation from a publication of the National Industrial Conference Board of the United States, as reported in the New Yorker.

"The Professional Pallbearers Association, passing up amalgamation with the A.F. of L.'s gravediggers or the A.F. of L.'s casket makers, voted 100 per cent to join the A.F. of L. as a separate unit. Object of the Professional Pallbearers Association will be to make all funerals union funerals, with relatives and friends permitted to act only as honorary pallbearers. Members must be six feet tall, weigh 180 pounds and fit into a size 40 suit. Union pallbearing rates vary with the dress. For sugar-scooped coat and diplomat-striped trousers, it's \$4; grey flannel is \$3.50; and in ordinary blues \$3."

Isn't it likely that the desire to build up in the minds of the people some respect for the true professions, will not be achieved if the word *profession* itself becomes meaningless? Once the public accepts the plumber, the painter, the undertaker, the pallbearer, the technician, or the butcher as a professional person, the word becomes so debased as to be meaningless. It is only a step from recognition by the provincial government, to recognition by the people.

Can anything be done to stop this lunacy?

(Left) At the head table for Friday night's banquet were: J. P. H. Perry, New York City; Raymond Walters, Cincinnati; L. F. Grant, Toronto; Dr. H. S. Rogers, Brooklyn; E. E. Howard, Kansas City, Missouri.

E.C.P.D. 1950

It was pretty well agreed by everyone there, that this year's annual meeting of the Engineers' Council for Professional Development was the best ever held. No matter from which angle it is examined, the result is the same — it was the best meeting. There were more people in attendance, more meetings, more papers, and more enthusiasm.

The meeting was held in Cleveland, Ohio, at the Tudor Arms Hotel on Friday and Saturday, October 20th and 21st. Two train wrecks on the American lines blocked several delegates both from Canada and the United States. The chairman from New York and the vice-chairman from Kingston, along with several committee members were held up until early afternoon of Friday. This made necessary certain revisions in the arrangements, but it all worked out very nicely except that the councillors were not able to conclude their executive meeting until one A.M.

The Institute was fortunate in having all of its eight representatives there, perhaps for the first time. The group was headed by L. F. Grant, a member and vice-chairman of the Council. The other councillors are de Gaspe Beaubien and W. J. W. Reid. Representatives on committees are G. B. Moxon, Student Selection and Guidance; W. S. Wilson, Engineering Schools; R. C. Flitton, Professional Training; E. V. Buchanan, Professional Recognition, and L. Austin Wright, Information.

Speakers

There were interesting speakers for the luncheons on both days and for the annual dinner on Friday evening but their addresses are not being reviewed here as it is expected manuscripts will be available shortly from which all or portions may be published in the *Journal*. For the luncheon Friday the speaker was A. R. Hellwarth, assistant to the employment manager, Detroit Edison Company, who spoke on "Relationship of Guidance to an Industry-Recruiting Programme". For the banquet, the guest speaker was Raymond Walters, president, University of Cincinnati, whose subject was "Relationship of Engineering Education to the Profession and Industry in the Community". Saturday's luncheon speaker was Tell Berna, general manager, National Machine Tool Builders Association. His subject was "The Place of the Engineer in Industry". The chairman of E.C.P.D., Dr. Harry S. Rogers, president, Polytechnic Institute of Brooklyn, delivered his annual message on Friday evening. It is expected that this will be published in the *Journal*.

Reports

The report of the Committee on Engineering Schools was presented at a closed meeting and therefore cannot be commented on here, but it is interesting to note that during the year approximately 240 curricula were examined or re-examined. That is a tremendous volume of work for a voluntary group. Reports were made by all committee chairmen but the outstanding feature was the report of the Committee on Professional Training. This committee has prepared an extensive, far-reaching proposal that caught the imagination of the audience. It is called "The First Five Years of Professional Development". It is a most comprehensive series of proposals, suggestions, ideas, and background material that will enable groups all over the United States and Canada to get their teeth into the problem of helping the graduate attain professional status in the early years after graduation.

The method of presentation was excellent. The chairman, A. C.

Five of the eight E.I.C. representatives were: G. B. Moxon, R. C. Flitton, and deGaspé Beaubien, all of Montreal; E. V. Buchanan, London, Ont.; L. F. Grant, Toronto.

At the luncheon on Saturday (l. to r.): the speaker, Tell Berna, general manager, National Machine Tool Builders Association; L. F. Grant, Toronto; Elmer Hutchisson, Cleveland, Ohio; W. J. W. Reid, Hamilton, Ont.

Monteith, vice-president, Westinghouse Electric Corporation (born in Canada and a graduate of Queen's), after introducing the report in a general way, called on each of the six members of his committee, who were chairmen of the six sub-committees, to explain the different parts of the report. The divisions with their chairmen are:—Orientation and Training of the Young Engineer in Industry, H. K. Breckenridge, West Penn Power Company; Continued Education of the Graduate Engineer, J. C. McKeon, manager, University Relations, Westinghouse Electric Corporation; Integrating the Young Engineer into His Community, Karl B. McEachron, Jr., manager, Technical Education Division, General Electric Company; Registration and the Young Engineer, H. L. Solberg, head, School of Mechanical Engineering, Purdue University; Self Appraisal Methods for Valuable Characteristics in Engineering, A. R. Cullimore, president-emeritus, Newark College of Engineering; Reading Lists, Don P. Reynolds, assistant to the secretary, American Society of Civil Engineers.

In presenting the report Dr. Monteith stated that the most challenging problem now facing management is the development of leaders for the future. Well-trained men are urgently needed in both the technical and management fields. Our future leaders will be drawn, in increasing numbers, from the ranks of professionally-trained men.

The type of leadership we can expect will depend upon the quality of education and training our young men are receiving today. Although the young engineer cannot continue his formal education on a full-time basis forever, he must grow professionally during his entire life.

Undoubtedly the most critical period of the young engineer's whole career is the first five years after leaving college. During this period he is finding his place in industry, attempting to understand himself, and shaping his professional goals. Frequently, he is establishing his family, and generally his salary is modest. He steps into an organization at a relatively high level and has had no opportunity to understand its problems.

Closing the gap between the attitudes of the college campus and the realities of earning a living in a complex situation is not an easy task. The young engineer needs a helping hand in getting started in the right direction. His experience during his first years in practice are significantly related to his future welfare, as well as to his usefulness to his employer.

As one of the eight members of E.C.P.D., the Institute has a vital interest in these proposals. The situation in Canada is very much the same as in the United States. The need to provide leadership, support and inspiration for these young men is just as urgent here as any place. Already the Council of the Institute has given official approval to the report, and it is proposed to study it carefully in order to adapt efficiently and economically as much as possible of its substance to Canadian conditions. It is an undertaking in which many organizations should co-operate to secure the best results — the employers, communities, universities, chambers of commerce, boards of trade, and professional societies. In a later issue of the *Journal* details of the proposals will be presented to the membership.

What Is E.C.P.D.?

The Engineers' Council for Professional Development is a conference organized to enhance the professional status of the engineer through the co-operative efforts of the following national organizations: American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, American Institute of Electrical Engineers, The Engineering Institute of Canada, American Society for Engineering Education, American Institute of Chemical Engineers, National Council of State Boards of Engineering Examiners.

Its objectives are to co-ordinate and promote efforts to attain higher professional standards of education and practice, greater solidarity of the engineering profession, and greater effectiveness in dealing with technical, economic, and social problems.

Ninth International Management Congress

The International Committee of Scientific Management (CIOS) has announced that the Ninth International Management Congress will be held at Brussels from July 5th to 11th, 1951, under the auspices of the Belgian National Committee.

The Ninth Congress has been planned to take advantage of the experience of previous Congresses, but will be organized on new and progressive lines. In particular it will feature twelve subjects of topical interest and practical value, each one entrusted to a particular country. These subjects and the countries charged with their presentation are:—

Title of Subjects	*Countries*
Structure of Large Enterprise	Great Britain
Working Methods & Personal Effectiveness of Top Managers	Sweden
Work Measurement (Methods of Establishing Production Standards)	United States
Recent Developments in Quality Control	Great Britain
The Establishment of a Sense of Common Purpose Between Management and Employees	France
Job Evaluation	Switzerland
Tested Procedures for Reducing Unit Costs of Distribution	Belgium
The Flexible and the Variable Budget	Netherlands
Home Design for Simplified Household Routines	Norway
Fundamentals in Effective Farm Management	Brazil
Advanced Procedures in Public Administration	United States
Education for Management	United States
Work Simplification	United States

Canada is to collaborate in the presentation of several of these subjects, and the Canadian correspondents with their respective subjects are:—

Correspondents	*Subject*
S. M. Gossage, Asst. Mgr. of Personnel, Room 347, Windsor Stn., Montreal, Que.	Top Manager's Methods
T. J. Metayer, Dominion Bridge Co., Lachine, Que.	Job Evaluation
J. E. Dion, M.E.I.C., 4643 Sherbrooke St. W., Montreal, Que.	Distribution
J. Nelson Allan, Rm. 200, MacKay Bldg., 66 King Street E., Hamilton, Ont.	Budgeting
Prof. Hadley Van Vliet, Department of Farm Management, University of Sask.	Agriculture
A. M. Patience, R.C.A. Victor Co., 1001 Lenoir Street, Montreal, Que.	Education

The rules for the Congress require registration with the national organization of the participating countries. For further information therefore, Canadians should contact the Canadian Management Council, 549 Burnside Place, Montreal 25, Quebec.

Correspondence

Dear Mr. Editor:

I have recently been appointed, on an honorary basis, historian to the Corps of Royal Canadian Engineers.

While much information is available from war diaries, official files, reports and records and various books on R.C.E. units and other aspects of the service, yet the major store of knowledge to make such a history interesting and readable is locked up in the individual's memory of incidents or personal diaries or letters home. It is comparatively easy to write a dry as dust factual account of our doings but what we want is to bring the dry bones to life. In order to reach as many members past and present as I can, I wonder if you would publish this appeal in the *Journal?* I shall be more than grateful for any information sent me.

While the first part of the history to be tackled is the 1939-45 period, being the clearest in our memories, it is intended to carry the story right back to our beginnings, of which I have some records back to 1863 already! There must be many men still alive who can carry the story back for over fifty years from their own knowledge and their memories would be of particular value to the Corps, as well as any old documents reaching as far or further back.

Col. A. J. Kerry, M.E.I.C.,
West End Farm,
Wootton, Oxfordshire,
England.

News of Other Societies

Chemical engineers will meet in Toronto on February 19 and 20, 1951, for the Toronto regional conference of the **Chemical Institute of Canada.** Among events and sessions staged at the Wallberg Building, University of Toronto, will be a discussion of chemical engineering education.

This will be the first subject division meeting sponsored by the chemical engineers of the Chemical Institute. More details can be obtained from the secretary-treasurer, Mr. A. Monsaroff, Box 6103, Montreal.

The 1950 annual meeting of the **American Society of Mechanical Engineers** (29 West 39th Street, New York 18) will be in session at Hotel Statler, New York, from November 26 to December 1. The semi-annual meeting of A.S.M.E. will be held in Canada, June 11-15, 1951, at the Royal York Hotel, Toronto.

Meetings on the calendar of the **Institute of the Aeronautical Sciences** (2 East 64th Street, New York, 21, N.Y.) include: the fourteenth Wright Brothers Lecture at the U.S. Chamber of Commerce Auditorium, Washington, December 16, 1950; and the nineteenth annual meeting at Hotel Astor, New York City, January 29-31 and February 1, 1951.

The annual meeting of the **American Institute of Chemical Engineers** (120 East 41st Street, New York, 17, N.Y.) is scheduled for December 3 to 6, 1950, at the Neal House Hotel, Columbus, Ohio. Also scheduled is a regional meeting at White Sulphur Springs, Va., March 11-14, 1951.

The winter general meeting of the **American Institute of Electrical Engineers,** will be held January 22 to 26, at New York City.

Three world meetings of interest to engineers are scheduled for January, 1951, in New Delhi, Dominion of India. These are the **Hydraulic Structures Research Conference,** January 3 to 10; a sectional meeting of the **World Power Conference** from January 10 to 15; and the fourth **Congress on Large Dams,** January 10 to 15.

A general assembly of the **International Union of Theoretical and Applied Mechanics** will be held in the spring of 1951 in Rome, Italy.

A comprehensive **Building Research Congress** has been planned to take place in September, 1951, in London and will be the first of its kind ever to be held. The purpose of the Congress will be to review the progress made in research in relation to architecture, building and the associated branches of civil engineering, and it has been arranged because of the widespread interest shown in the subjects in many countries since the end of the war. There have been rapid developments in all branches of building science and papers presented at the Congress will review these developments and will consider their significance and their effects on future trends. Many of the papers will be contributed by authors from overseas, and it is expected that the Congress will attract many members from all over the world from amongst the ranks of architects, engineers, builders and contractors, and from many branches of science.

The Congress is to be held from the 11th-20th September, 1951, and will be centred at the Institution of Civil Engineers by the kind permisison of the Council of the Institution. It will take place during the period of the Festival of Britain, 1951, and visitors attending the Congress will, therefore, have an opportunity of seeing the various exhibitions in connection with the Festival.

It is announced by the organizing committee of the **Third World Petroleum Congress** (The Hague, May 28th to June 6th, 1951) that since the beginning of preparatory activities for the Congress keen interest and active co-operation have been forthcoming from many countries throughout the world.

In many countries this has led to the formation of National Committees for the Third World Petroleum Congress, whose task it is to guide and co-ordinate the interest and co-operation of scientists and technicians in their own country. These National Committees are also in a position to supply any information required about the aims and organization of the Congress.

Enquiries regarding the Canadian Committee and Canadian participation in the Congress should be addressed to Dr. R. K. Stratford, Imperial Oil Ltd., Sarnia, Ont.

PROPOSED CO-OPERATIVE AGREEMENT

between

THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF THE PROVINCE OF MANITOBA

and

THE ENGINEERING INSTITUTE OF CANADA

MEMORANDUM OF AGREEMENT made in duplicate at the City of Winnipeg in the Province of Manitoba, this ....day of.................19......

By and Between:

THE ENGINEERING INSTITUTE OF CANADA having its head office at the City of Montreal, in the Province of Quebec, hereinacting by its President and General Secretary, duly authorized for the purpose hereof by a resolution of its Council passed at a meeting duly called and held on the..............day of ....19......hereinafter called the "Institute";

PARTY OF THE FIRST PART

and

THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF THE PROVINCE OF MANITOBA, having its head office at the City of Winnipeg, in the Province of Manitoba, hereinacting by its President and Registrar duly authorized for the purpose hereof by a resolution of its council passed at a meeting duly called and held on the ....day of.......... 19....... hereinafter called "The Association".

PARTY OF THE SECOND PART

WHEREAS it is desirable in the interests of the Engineering Profession that there be close co-operation between the Institute and the Association, and

WHEREAS such close co-operation will be promoted if, so far as is practicable, there is effected:

(a) A common membership in the Province of Manitoba of the Institute and the Association.

(b) A simplification of existing arrangements for the collection of fees.

(c) A coordinated management.

NOW, THEREFORE, the parties hereto agree with each other as follows:

Sec. 1: Any person resident in the Province of Manitoba who, on the date of this agreement, is registered as a Professional Engineer in the Association and is not a Corporate Member of the Institute, shall have the right, under the provisions of this Agreement, to become a Corporate Member of the Institute. If such registered Professional Engineer desires to become a Corporate Member of the Institute under the conditions of this agreement, he shall so notify the Registrar of the Association, in writing, within 12 months of the date of this Agreement.

Sec. 2: Any person resident in the Province of Manitoba registering as a Professional Engineer in the Association subsequent to the date of this Agreement who is not a member of the Institute shall, upon such registration, have the right to be accorded the class of membership in the Institute warranted by the age, experience and professional qualifications of such person, according to the by-laws of the Institute and the decision of the Council of the Institute. If such Registered Professional Engineer desires to secure membership in the Institute under the conditions of this Agreement, he shall so notify the Registrar of the Association, in writing, within 12 months of the date of such registration.

Sec. 3: Registered Members of the Association shall not be required to pay the transfer fees of the Institute. Registered members of the Association shall not be required to pay the entrance fees of the Institute, provided they make application in accordance with Sections 1 or 2.

Sec. 4: Any Corporate Member of the Institute who is, at the date of this Agreement, or who thereafter becomes, a resident of the Province of Manitoba shall be eligible for membership in the Association if qualified for such membership, and all entrance fees otherwise payable to the Association shall be remitted provided that application for membership in the Association is made within twelve months of—

(a) The date of this Agreement in the case of any Corporate Member of the Institute who is at such date a resident of the Province of Manitoba; or

(b) The date on which he becomes a bona fide resident of the Province of Manitoba in the case of any Corporate Member who is not at the date of this Agreement such a resident;

Sec. 5: Any person who subsequent to the date of this Agreement becomes a member of the Institute, or advances his grade of membership therein and who is or becomes a resident of the Province of Manitoba, shall be eligible for membership in the Association if qualified for such membership, and entrance fees otherwise payable to the Association shall be remitted up to the amount of the entrance fee currently required for the grade of Institute membership held, provided that the application for membership in the Association is made within twelve months of the date on which he becomes a member of the Institute or advances his grade of membership therein.

Sec. 6: Also under the same terms provided in Section 1, 2 or 3, hereof for Members of the Association, Student Engineers and Engineers in Training of the Association shall have the right to be accorded the class of membership in the Institute warranted by the age, experience and qualifications of such person, according to the by-laws of the Institute and the decision of the Council of the Institute. Similarly, Student and Junior Members of the Institute will have the right to be accorded the classification in the Association for which they are qualified under the same terms provided in Section 4 and 5 for Members of the Institute.

Sec. 7: Notwithstanding the provisions for the total or partial remission of entrance fees in sections 3, 4 and 5 hereof, if subsequent to the date of this Agreement either or both parties hereto change the amount of the entrance fee required, then provision shall be made for the total or partial remission of entrance fees to continue the intention of this Agreement, namely that when a resident of the Province of Manitoba, who is a non-member of both the Institute and the Association, but who becomes a joint member within a 12 months period, shall be required to pay in entrance fees a total amount not greater than the larger of the two individual entrance fees.

Sec. 8: (1) In lieu of the ordinary membership fees of the Institute the following annual fees are hereby established for members of the Association who at the same time are, or who may become members of the Institute.

(a) Corporate Membership per annum, $11.00

(b) Junior Membership, per annum, $6.00

(c) Student Membership, per annum, $2.50

(2) The annual fee payable to the Institute by Members of the Association who are, or who may become members of the Institute shall be due and payable on the First day of January in each year, and shall be paid to the Association on behalf of the Institute.

(3) Each member of the Association who pays such annual fee to the Institute through the Association shall be entitled to all the privileges of Membership in the Institute, and to the annual subscription of the Institute Journal.

(4) The Association undertakes to receive the appropriate annual fee for membership in the Institute from each of its members who pay the same, and to remit the amount collected to the Institute at its Head Office at least once a month.

(5) The provisions of this section of this Agreement shall become effective on the First day of............... 19......

Sec. 9: On the First day of January of each year the General Secretary of the Institute shall furnish to the Registrar of the Association a list of members of the Institute resident in the Province of Manitoba, indicating as far as possible those who are not members of the Association. On the same date the Registrar of the Association shall furnish the General Secretary of the Institute with a list of members of the Association in good standing as on the thirty-first day of December preceding, indicating as far as possible those who are members of the Institute under the terms of this Agreement.

Sec. 10: It is agreed that the Winnipeg Branch of the Institute shall continue to function as such during the term of this Agreement. The Winnipeg Branch of the Institute shall consist of all members of the Institute resident in the Province of Manitoba. All functions of the presently existing executive committee of the Winnipeg Branch shall be assumed by what shall be termed the Management Committee of the Winnipeg Branch.

The Management Committee of the Winnipeg Branch shall consist of:

(a) All members of Council of the Association who are elected in accordance with the by-laws of the Association and who are Corporate Members of the Institute.

(b) Two Corporate Members of the Institute in good standing, preferably Registered Professional Engineers in the Association, who shall be appointed by the Council of the Institute. For the initial appointment one of these shall be for a two-year term, the second one for a one-year term. Thereafter, and throughout the term of this Agreement, one appointment shall be made for a two-year term, effective on the First day of January each year.

(c) Any member of the Institute resident in the Province of Manitoba who is elected President, Vice-President or Councillor of the Institute, while holding such office shall be a member of the Management Committee.

(d) The Chairman of any standing or special committee or of any authorized section, appointed by the Management Committee, or elected in accordance with By-laws, or Regulations governing the Winnipeg Branch; these persons shall have the right to vote on all Branch business except that dealing with the expenditure of moneys.

Sec. 11: Insofar as officers of the Association are members of the Management Committee as specified in Section 10 hereof, they shall ipso facto be and become the corresponding officers of the Management Committee where the office is applicable. Any office in the Management Committee remaining unfilled due to the requirements of section 10 hereof or for any other reason, shall be filled by the Management Committee from among its members, except the office of Secretary-Treasurer which may be filled by appointment by the Management Committee of a suitable member, in good standing, of both the Institute and the Association, who upon appointment shall thereupon become a member of the Management Committee.

Sec. 12: The representative upon the Council of the Institute of the members of the Institute in Manitoba will be nominated and elected in accordance with by-laws of the Institute.

Sec. 13: The Management Committee as constituted by Sections 10 and 11 hereof shall be responsible for the management and financing of the Winnipeg Branch. Each year, the Institute shall pay to the Winnipeg Branch the regular Branch rebate of fees in accordance with the by-laws of the Institute for each member of the Institute resident in the Province of Manitoba who is not a member of the Association. The Management Committee shall recommend to Council of the Association the sum or sums to be paid by the Council of the Association to the Winnipeg Branch. The total of such sum to be paid by Council of the Association in each financial year shall not be less per joint member than the rebates now required by the Institute by-laws, provided, however, that such payments shall be made from annual revenue and in no case from capital reserve.

Sec. 14: Each meeting of the Winnipeg Branch of the Institute and the Association will be announced as a joint meeting thereof with the exception of any legally required special or annual meetings of either the Winnipeg Branch of the Institute or of the Association.

Sec. 15: Upon the occasion of any of the following, the other party to this Agreement shall be so informed within a period of one month, in writing:

(a) the acceptance of the resignation of a joint member by one party to this Agreement, or;

(b) the removal from the membership roll or from the register, of the name of a joint member by one party to this Agreement, or;

(c) the receipt by one party to this Agreement of notification from a joint member that he has taken up permanent residence outside the Province of Manitoba.

Sec. 16: The term of this Agreement shall be for a period of three years commencing on the .... day of .... 19...... and ending on the .... day of .... 19...... on which date this Agreement shall terminate provided either party has given to the other notice of termination at least six months prior to the ....day of .... 19...... and if no such notice is given this Agreement shall continue after .... day of .... from year to year but may be terminated at the end of any calendar year by either party giving notice in writing to the other of such termination at least six months prior to the end of the calendar year. Notice of termination of this Agreement shall be given by the delivery by one party to the other of a certified copy of a resolution of the Council of the one party to that effect.

Sec. 17: The terms and conditions of this Agreement may be amended by mutual agreement, in writing, between the Councils of the parties hereto duly executed by their accredited officers.

Sec. 18: This Agreement and the terms and provisions thereof shall not be applicable to the Institute members who are not, and do not become, registered with the Association. Likewise, this Agreement and the terms and provisions thereof shall not be applicable to Registered Professional Engineers of the Association who are not, and do not become, members of the Institute.

Sec. 19: Nothing in this Agreement shall prevent either party thereto from exercising its rights and privileges with respect to the disciplining, the suspension, or the expelling of any of its members. Any person suspended, or expelled from the Association or from the Institute during the term of this Agreement shall forfeit all rights under this Agreement until reinstated. When final action is taken by either party the other party shall be so notified.

Sec. 20: This Agreement is intended to apply with respect to residents of the Province of Manitoba only, and no person who is not a resident of the Province of Manitoba may become or continue to be a Corporate Member of the Institute under the provisions of this Agreement, but may continue to be a Corporate Member of the Institute and/or a member of the Association on the same conditions as if he had been admitted as a Corporate Member of the Institute and/or a member of the Association without reference to this Agreement.

IN WITNESS WHEREOF these presents have been duly executed on behalf of the parties hereto on the date and at the place first above written.

THE ENGINEERING INSTITUTE OF CANADA

....
President

In the presence of:—

....
General Secretary

....

ASSOCIATION OF PROFESSIONAL ENGINEERS OF THE PROVINCE OF MANITOBA

....

....
President

....
Registrar

Personals

Notes of the Personal Activities of Members of the Institute

James F. MacLaren, M.E.I.C., announces the formation of the firm James F. MacLaren Associates in Toronto, to carry on a consulting practice in the field of municipal engineering, specializing in water supply and purification, sewerage and sewage disposal, drainage, flood control and planning. Mr. MacLaren has withdrawn from the firm of Gore and Storrie with whom he has been a partner for the past sixteen years.

Mr. MacLaren has been active in the Institute, having served in 1948 as chairman of the Toronto Branch. He is presently a councillor of the Institute, representing the Toronto Branch.

Dr. J. B. Challies, HON. M.E.I.C., was awarded the honorary degree of LL.D. at the recent fall convocation of McMaster University, Hamilton.

Dr. Challies, director, vice-president and executive engineer of The Shawinigan Water and Power Company, was cited as a scientist, a trusted public servant and company executive.

Dr. Challies is a past-president of the Institute, and was the recipient of the Julian C. Smith Medal of the Institute for the year 1946.

Ira P. Macnab, M.E.I.C., general manager of the Public Service Commission of Halifax, has been elected president of the Dominion Council of Professional

Ashley & Crippen

Ira P. Macnab, M.E.I.C.

Engineers. The election took place at Winnipeg where delegates from the provincial engineering associations recently attended the annual convention.

Mr. Macnab has been active in the Association of Professional Engineers of Nova Scotia and in the Halifax Branch of the Engineering Institute. In 1949 he was president of the Association, and has been vice-president of The Engineering Institute since 1948.

Alan K. Hay, M.E.I.C., of Ottawa, Ont., chief engineer of the Federal District Commission was elected recently to the Ottawa Suburban Roads Commission, succeeding the late Norman B. MacRostie, M.E.I.C.

Mr. Hay is chairman of the advisory committee on highway research, Research Council of Ontario. He is also prominent in Ottawa as advisor to the various planning boards. He was chief engineer with the Ottawa Suburban Roads Commission from 1920 to 1945.

A. A. Colter, M.E.I.C., of Fredericton, N.B., has been elected a director of Canadian International Paper Company. He is president of Diamond Construction Co. Ltd., Ashley Colter Ltd., A. & R. Loggie Co. Ltd., and a number of other companies operating in the Maritime Provinces and Newfoundland.

Mr. Colter was born at Keswick, York Co., N.B., and graduated in science from McGill University in 1910.

Sidney Hogg, M.E.I.C., has been appointed president of Western Bridge and

Steffens-Colmer Studios

Sidney Hogg, M.E.I.C.

Steel Fabricators Limited of Vancouver. He succeeds Mr. Frank M. Ross who becomes chairman of the board.

Mr. Hogg is the chairman of the Vancouver Branch of the Institute.

J. P. Carriere, M.E.I.C.

Brigadier J. P. Carriere, M.E.I.C., chief engineer of Dufresne Engineering Company Limited, has been promoted from the rank of colonel and has assumed command of the 10th Infantry Brigade of the Canadian Army Active Reserve. This unit comprises the Regiment de Joliette and the Regiment de St. Hyacinthe.

E. R. Jacobsen, M.E.I.C., has recently been elected president and managing-director of Brazaço, S.A., which represents the United States Steel Export Co., throughout Brazil, with headquarters in Rio de Janeiro.

Earlier this year Mr. Jacobsen was a member of the American delegation at the conference held at Santos, Brazil, of the Inter-American Council of Commerce and Production.

J. F. Braun, M.E.I.C., superintendent of Ore Plants, Aluminum Co. of Canada Ltd., Arvida, Que., has been elected chairman of the Saguenay Branch of the Institute.

Mr. Braun is from Switzerland, and was educated at Ecole Polytechnique, Zurich. Upon his graduation in 1922 he joined the Bureau d'Etudes Technique, Brussels, Belgium, and in 1924 he worked for Wayss & Freytag, Cologne, Germany. Then in 1925 in went to Australia and was employed by the Standard Portland Cement Co., at Sydney. On coming to Canada in 1929 he worked for Ross & MacDonald, architects, Montreal, Que. He joined the Aluminum Company of Canada, Ltd., at Arvida, in 1935.

M. S. Mitchell, M.E.I.C., partner in the firm of Meech, Mitchell & Meech, architects and engineers, has been elected chairman of the Lethbridge Branch of the Institute.

Mr. Mitchell graduated from the University of Alberta, receiving a B.Sc. degree in civil engineering in 1942.

During the summer of 1941 he worked with the Department of Mines and Resources at Jasper, Alberta. From 1942 to 1943 he was with Aluminum Co. of Canada, Montreal, Quebec. During the academic sessions of 1943, 1944 and 1945, he was employed by the University of Alberta as a sessional instructor in civil engineering. He joined Meech & Meech, architects, Lethbridge, Alta., during the summer of 1945, and was in charge of all engineering. He became a partner in the firm in 1946.

R. B. Jones, M.E.I.C., assistant chief engineer of the Canadian Pacific Railway Company, Montreal, retired from the Company in October.

Mr. Jones' railway career began in Scotland 48 years ago with the North British Railway Company. Coming to Canada in 1910, Mr. Jones was employed by the Grand Trunk Pacific Railway Company at Fort William and in Saskatchewan. He commenced his work for

R. A. Emerson, M.E.I.C.

C.P.R. in 1913 on track revision and surveys location work.

In 1915, he enlisted as a gunner in the Canadian Field Artillery and rose to officer rank in the field during four years of overseas service. From 1919 to 1939 he was assistant engineer in the office of the chief engineer of C.P.R. at Montreal. In 1939 he was appointed engineer of track of the system while his appointment as assistant chief engineer, also with system jurisdiction, came January 1, 1946.

Mr. Jones is also a member of the American Railway Engineering Association, and of the Corporation of Professional Engineers of Quebec.

R. A. Emerson, M.E.I.C., succeeds R. B. Jones, M.E.I.C., as assistant engineer of the Canadian Pacific Railway Company, Montreal, after 22 years' association with the C.P.R.'s engineering department. Since early in 1948 he has filled the position of engineer of track for the system.

He entered the engineering department in 1928, on a summer basis, to finance the winning of a degree from the University of Manitoba. He attended post graduate studies at Yale University, New Haven, through 1933 and 1934, with a Strathcona scholarship for studies in transportation.

His permanent career with the Canadian Pacific engineering department started in 1935, as transitman at Revel-

R. B. Jones, M.E.I.C.

stoke, B.C. Later he was roadmaster on the Portage division, Winnipeg, and was promoted to division engineer, holding that post first at Brandon and later at Moose Jaw. This led to his selection as assistant district engineer and subsequently district engineer of the British Columbia district, at Vancouver, which post he left in March, 1948, to become engineer of track with system jurisdiction which he also holds as assistant chief engineer.

Mr. Emerson is a member of the American Railway Engineering Association, and of the Corporation of Professional Engineers of Quebec.

J. G. Little, M.E.I.C.

H. Miller, M.E.I.C., works manager of the wire and cable division of Northern Electric Company Limited, has accepted the Dominion Government's invitation to attend a new course at National Defence College in Kingston. Lasting one year, the course will train senior officers of government and industry who will be called upon in an emergency to prepare for Canadian defence requirements. He will be succeeded as works manager by **J. G. Little,** M.E.I.C., formerly works manager of Belleville plant.

Mr. Miller, who helped to plan and design the company's new Lachine modern non-ferrous wire and cable manufacturing plant at Lachine, graduated from the University of Toronto in 1925 with the degree of bachelor of applied science in electrical engineering. Two years later, he joined Northern Electric as an engineer on machine design and factory planning and remained in that position until he was made technical superintendent of telephone manufacture in 1940. During the second World War, he supervised production of highly technical war equipment. In 1941, when the company undertook to turn out anti-aircraft fire control equipment, Mr. Miller was sent to England to investigate manufacturing methods. In addition, he served as a major in the wartime reserve army.

Mr. Miller was appointed assistant works manager of the wire and cable division in 1944, and became works manager the following year.

Mr. Little, whose appointment will date from September 16, 1950, joined Northern Electric as a manufacturing

Harry Miller, M.E.I.C.

methods engineer, following his graduation in 1928 from the University of Toronto with the degree of bachelor of applied science. In 1933 he was transferred to the telephone division and was serving there as technical superintendent at the time of his promotion to works manager of the company's former electronics division in 1945. Mr Little is a member also of the Association of Professional Engineers of the Province of Ontario.

Mr. Little is a vice-chairman of the agricultural committee of the Belleville Chamber of Commerce and a director of the board of the Belleville Fair.

K. W. Fraser, M.E.I.C., manager of sales of Canadian Westinghouse Company Limited, Hamilton, Ontario, was elected vice-president of Canadian Electrical Manufacturers Association at the recent annual meeting of the Association. **O. W. Titus,** M.E.I.C., general manager of Canada Wire & Cable Company Limited, Leaside, Ont., has also been elected vice-president. They are also continuing as directors of the Board.

W. J. W. Reid, M.E.I.C., president of Otis Elevator Company Limited, Hamilton, Ont., has been elected to the executive committee and is a director on the board. **J. W. Stafford,** M.E.I.C., manager of the electrical conductor division of the Aluminum Company of Canada Limited, Montreal, Que., and **J. M. Thomson,** M.E.I.C., vice-president and general manager of Ferranti Electric Limited, Mount Dennis, Toronto, Ont., are directors on the board.

Fred C. Ansley, M.E.I.C., will head the plant engineering subdivision of the Ford Motor Company of Canada, Limited, and **Arthur D. Harris,** M.E.I.C., the maintenance subdivision. Post war expansion at Ford of Canada and construction projects have led to the formation of these two subdivisions of the Company's plant engineering activities.

F. C. Ansley, M.E.I.C.

In his capacity as chief plant engineer Mr. Ansley will supervise such projects as the company's Power House expansion, a new parts depot at Winnipeg, and other construction undertakings.

Mr. Ansley, a graduate of Queen's University, has been with Ford of Canada since 1937, and has been closely associated with major construction and extension of Company plants in Windsor. He was head of the construction design group in plant engineering when, in 1946 he went to South Africa in a supervisory capacity in connection with the designing of the new Ford plant at Port Elizabeth. Since his return to Windsor Mr. Ansley has served successively as assistant plant engineer and as assistant chief plant engineer.

A. D. Harris, M.E.I.C.

As chief maintenance engineer, Mr. Harris and his staff will handle all maintenance and repair work, plant rearrangement and current construction work in plants and offices.

Mr. Harris joined Ford of Canada in 1922 and since that time has fulfilled a number of key engineering positions. In 1935, he was moved to New Zealand where he spent two years supervising the construction of a new plant for Ford Motor Company of New Zealand. He became acting head of the engineering department at Ford of Canada in 1941 and the following year became chief plant engineer.

K. A. Truman, M.E.I.C.

H. R. M. Acheson, M.E.I.C.

K. A. Truman, M.E.I.C., of Canadian Pacific Railway Company, has been transferred to Winnipeg, Man., as special engineer for C.P.R., after six months as assistant district engineer in Vancouver. Mr. Truman has served the Company at Medicine Hat, Lethbridge, Regina and Kenora.

H. R. M. Acheson, M.E.I.C., has been appointed as pulp and paper specialist for Canadian General Electric Company in Montreal district. Widely-known throughout the paper industry, he becomes responsible for the sales engineering of the Company's equipment for pulp and paper companies which have operations in the province of Quebec.

Mr. Acheson graduated in 1929 from the University of Alberta with the degree of B.Sc. For the past 15 years he has been associated with some of the largest pulp and paper companies on the continent, specializing in maintenance, design engineering, purchasing and mill management.

H. Lloyd Johnston, M.E.I.C.

He is also a member of the Association of Professional Engineers of Ontario and of the Technical Section of the Canadian Pulp and Paper Association.

H. Lloyd Johnston, M.E.I.C., who has been, for the past twelve years, works manager of Canadian Industries Limited in Windsor, Ont., has been transferred to the Montreal engineering department, to be in charge of important expansion work being undertaken in the Montreal Area.

Mr. Johnston joined the C.I.L. at Montreal in 1936 and in 1938 he was transferred to the Windsor, Ont., plant of the Company. After graduating in civil engineering from McGill University, he was an engineer in the paper industry before coming to C.I.L. He is a veteran of World War I, where he won the Military Cross and was mentioned in dispatches as a member of the Royal Canadian Engineers and the Royal Garrison Artillery. He also held the rank of major in the former 30th Recce. Regiment Reserve during World War II. He is a member of the Windsor Garrison Officers Mess.

Mr. Johnston is past chairman of the Border Cities Branch of the Engineering Institute of Canada.

F. G. Smith, M.E.I.C., of Ottawa, Ont., after serving for over 36 years in the chief engineer's branch, retired in September from the Federal Department of Public Works.

Mr. Smith joined the Department in 1914, as assistant to the bridge and structural engineer. Previous to that time, Mr. Smith was associated with the Canadian Pacific Railway, the Dominion Bridge Co., Limited, and the Canada Foundry Co., Limited.

In 1920 Mr. Smith was promoted to the position of bridge and structural engineer. In 1939 he became supervising office engineer, and in 1947, engineer Grade 6.

Mr. Smith has been president of the Civil Service Association of Ottawa, and has been editor of the Quarterly Bulletin of the Department of Public Works.

James Pullar, M.E.I.C., has been appointed building engineer, Atlantic Region, Canadian National Railways with headquarters at Moncton, succeeding **H. J. Crudge,** M.E.I.C., who has retired from the Company.

Mr. Pullar, who was born in Dundee, Scotland, entered the railway as a draughtsman in the engineering department at Moncton in 1915. He was on military service for 14 months in 1918-19, and resumed duty in 1920 as assistant engineer. He was appointed architect at Moncton in 1949.

Mr. Crudge has been in private practice working on industrial buildings, design, surveys and appraisals since leaving C.N.R. He went as building engineer to Moncton for C.N.R. in 1915, from the Montreal engineering department of Canadian Pacific Railway. He has served as councillor of the Institute and is a past president of the New Brunswick Association of Professional Engineers. In 1938 he was appointed to the advisory Committee of the National Research Council of Canada in the preparation of the national building code.

J. K. Ronson, M.E.I.C.

James K. Ronson, M.E.I.C., whose association with Ford Motor Company of Canada Limited began in 1934 when he was a summer student in engineering work, has been appointed assistant to the vice-president — manufacturing. In his new duties at Ford of Canada he will supervise staff and assist on special assignments.

Mr. Ronson graduated from the University of Toronto in 1938, receiving a B.A.Sc. in mechanical engineering. He began his full-time employment with the Company that year in the plant engineering department, and during the war was in charge of various engineering activities in connection with the manufacture of universal gun carriers. In 1946 he was transferred to the inspection department as assistant chief inspector, and in June, 1948 began special assignment work in the office of the vice-president, manufacturing.

He is secretary-treasurer of the Border Cities Branch of the Institute, and a member of the Professional Engineers of Ontario.

J. D. Solomon, M.E.I.C., who played a role in the development of Canada's first jet propelled air transport, has returned to Dartmouth, N.S., to open an engineering office.

Mr. Solomon graduated from the Dartmouth High School and went on to Dalhousie University. In 1942 he earned a degree of civil engineering at the University of Toronto. Subsequently he was with the Hamilton Bridge Company as designer and with the Victor Aircraft Ltd., as structural designer.

He was assistant to the production engineer of A. V. Roe Canada Ltd. at Malton, Ont., from 1946-1948 where he was engaged as production engineer for the Jet Transport C102.

After spending some time with the C.N.R. Central Region on structural design of railway bridges, Mr. Solomon was engaged for several years in the construction business in Toronto.

H. J. Williamson, M.E.I.C., has been appointed district controller of air services, for the Department of Transport at Moncton, N.B.

Coming from Regina, he joined the Government service 19 years ago. He was transferred from Ottawa to Edmonto by the Department in 1941 and placed in charge of developing radio communications for the northwest staging route and the Alaska Highway. He left Edmonton last year to start a National Defence College course at Kingston, Ont.

Mr. Williamson received his bachelor of science degree in electrical engineering from the University of New Brunswick in 1930.

He served first with the Defence Department after joining the Government service in 1931, and moved to the Transport Department in 1937, serving in Western Canada in the early development of a trans-continental airway.

H. E. Smith, M.E.I.C., is the president of Strathearn Heights Ltd., Edmonton, Alta., which company has been formed in Alberta to construct and operate a $3,500,000 rental housing development in Edmonton. He is a graduate of McGill University where he received a B.Sc. degree in civil engineering in 1925.

Mr. Smith was in New York City during 1949, assistant to the vice-president. production, in the American Gas & Foundry Company. Previously from 1945 he was production manager for the Silex Company, at Hartford, Conn.

C. R. Hoar, M.E.I.C., of Edmonton, is a maintenance engineer with the Calgary Power Ltd. The work involves maintenance of the transmission lines and distribution systems of the Company in Alberta.

Mr. Hoar joined Calgary Power in 1940 after graduating from University of Alberta in electrical engineering. After service in the British Commonwealth Air Training Scheme and with the R.C.A.F. in the recent war, he returned to Calgary Power in 1946.

F. F. Walsh, M.E.I.C., who has been assistant technical controller for the Polymer Corporation Limited at Sarnia,

F. F. Walsh, M.E.I.C.

Ont., has joined Canadian Industries Limited, and is located in Montreal.

Mr. Walsh is a past chairman of the Sarnia Branch of the Institute. He was also secretary-treasurer of the Branch. He went to Sarnia in 1943 from Hamilton, and after training at Imperial Oil Limited he was appointed technical supervisor of the Polymer Corporation's steam and power plant. Two years later he received his appointment as assistant technical controller of the Corporation.

Welding Bureau Council

The Canadian Welding Bureau, a division of the Canadian Standards Association, announces that a number of prominent engineers, industrialists and educators have recently accepted invitations to serve on an Advisory Council to assist in the rapidly expanding operations of the Bureau.

E.I.C. members on the advisory council are: **H. G. Conn,** M.E.I.C., professor of mechanical engineering, Queens University; **R. A. Dunn,** M.E.I.C., sales manager, Canadian Liquid Air Co. Ltd.; **K. W. Frasier,** M.E.I.C., sales manager, Canadian Westinghouse, Co. Ltd.; **Dean R. M. Hardy,** M.E.I.C., University of Alberta; **W. D. Hurst,** M.E.I.C., city engineer, Winnipeg; **J. K. Jamieson,** M.E.I.C., chief engineer, Imperial Oil Co. Ltd.; **I. F. McRae,** M.E.I.C., works' manager, Canadian General Electric Co. Ltd.; **W. A. Newman,** M.E.I.C., chief of motive power, Canadian Pacific Railway Co.; **J. C. Oliver,** M.E.I.C., city engineer, Vancouver; **W. A. Osborne,** M.E.I.C., general manager, Babcock-Wilcox & Goldie-McCulloch Ltd.; **Dr. J. M. Thomson,** M.E.I.C., general manager, Ferranti Electric Ltd.

Nearly all sections of the Dominion are included and as the Council is expanded it is anticipated that no part of the country will be without representation.

In this way it is anticipated that the Bureau's purposes and activities may be known and interpreted to all. Further, it is hoped that sectional representatives may serve to instruct and inform the Bureau of the needs of their communities and interests.

The Bureau whose offices and principal engineers are located at Toronto, Ontario, operates under the advice and instructions of a 10-member administrative board.

E.I.C. members on the board are: **A. H. Cowie,** M.E.I.C., (chairman) general manager, eastern division, Dominion Bridge Company Limited; **D. S. Lloyd,** M.E.I.C., vice-president and general manager, Dominion Oxygen Company Limited; **G. P. Wilbur,** M.E.I.C., general manager, Dominion Bridge Co., Ltd., Toronto.

Gerald G. Fisch, JR.E.I.C., has been appointed as Montreal representative of J. B. Fraser and Associates, executive placement consultants. Mr. Fisch is a graduate of McGill University and has had several years' experience in Canadian industry. He is an honour graduate of the Massachusetts Institute of Technology in business and engineering administration.

Malcolm Grant, S.E.I.C., is working in the control department of the Bathurst Power and Paper Company Limited, Bathurst, N.B. He graduated from Nova Scotia Technical College in chemical engineering this year.

J. R. Mainprize, S.E.I.C., is working with Proctor, Redfern and Laughlin, Toronto, consulting engineers. He graduated from the University of Toronto in mechanical engineering this year.

D. MacCready, S.E.I.C., who was a chemical engineer for Howard Smith Paper Mills Ltd., Cornwall, Ont., is now employed by Dominion Alkali and Chemical Company in Beauharnois, Que. He graduated from Nova Scotia Technical College in chemical engineering in 1949.

Colin McCallum, S.E.I.C., has been transferred to Toronto to join the Massey Harris Company's Latin American sales division. At present he is undergoing a part of Massey Harris sales training at Millikens, Ont.

Mr. McCallum graduated this year from McGill University, receiving a B.Eng. degree in mechanical engineering.

Jacob Herbert Schuster, S.E.I.C., who graduated from McGill University in civil engineering in 1950 is engaged in foundation work in Pittsburgh, Pa., for Moran, Proctor, Freeman and Mueser.

T. H. Shillingford, S.E.I.C., is with the Department of National Defence, H.M.C. Dockyard at Halifax, Nova Scotia. He graduated from Nova Scotia Technical College in civil engineering this year.

H. E. Smyth, S.E.I.C., is working with Merck and Company in Valleyfield, Quebec. He graduated from the University of British Columbia in chemical engineering this year.

F. G. Ursel, S.E.I.C., joined the staff of the City of Regina, engineering department, after graduating from the University of Saskatchewan in electrical engineering this year.

R. E. Chamberlain, S.E.I.C., of Montreal, a fourth year civil engineering student at McGill University has been awarded the Roy M. Wolvin scholarship, value $350, and was also made a "University Scholar", in recognition of top ranking position in his class.

In addition to Mr. Chamberlain, the following were named "University Scholars" in engineering, entitling them to awards of $100 to $300 as well as the distinguishing title. **D. H. Kennedy,** S.E.I.C.; **J. C. Osler,** S.E.I.C.; **R. C. Johnston,** S.E.I.C.; **Russell I. Sharratt,** S.E.I.C.; **Rubin Bonney,** S.E.I.C.; **Thomas G. Troy,** S.E.I.C.; **John J. Jonas,** S.E.I.C.; **I. Braverman,** S.E.I.C.; **John Adjeleian,** S.E.I.C.; **R. Girolami,** S.E.I.C.; **T. Roumbanis,** S.E.I.C.; **George E. S. Ayer,** S.E.I.C.; **John H. Dinsmore,** S.E.I.C.

R. E. Grant, JR.E.I.C., of Consul, Sask., and formerly located at Lethbridge for Canadian Pacific Railways, has been transferred to Moose Jaw as division engineer of C.P.R., after two years as roadmaster in Consul.

Mr. Grant received a B.Sc. degree in 1944 in civil engineering from the University of Saskatchewan.

Visitors to Headquarters

J. L. Balleny, M.E.I.C., Trail, B.C., Sept. 28, 1950.

I. P. Macnab, M.E.I.C., Halifax, N.S., Oct. 3.

J. D. Fraser, M.E.I.C., Halifax, N.S., Oct. 3.

Sir Frank Whittle, M.E.I.C., London, England, Oct. 3.

D. C. Gall, M.I.E.E., London, England, Oct. 3.

G. J. Konreid, M.I.E.E., London, England, Oct. 3.

Group Captain A. O. Adams, M.E.I.C., R.C.A.F., Ottawa, Oct. 3.

Commander T. Fife, M.E.I.C., R.C.N., Ottawa, Ont., Oct. 3.

Lt. Col. W. A. Capelle, M.E.I.C., Ottawa, Ont., Oct. 5.

Lt. Col. W. B. Akerly, M.E.I.C., Montreal, Que., Oct. 5.

Prof. W. G. Sutton, Johannesburg, S.A., Oct. 5.

Dr. E. A. Cleveland, M.E.I.C., Vancouver, B.C., Oct. 5.

Fred. R. Phillips, M.E.I.C., Vancouver, B.C., Oct. 13.

Sir Arthur Fleming, London, England, October 19, 1950.

Wm. J. Ahearn, JR.E.I.C., Toronto, Ont., Oct. 19.

Paul E. Buss, M.E.I.C., Thorold, Ont., Oct. 21.

Obituaries

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

J. Athol P. Marshall, M.E.I.C., chief engineer of municipal roads for the Department of Highways of Ontario, died on October 2, 1950, at his home in Toronto, Ont.

Mr. Marshall was born in London, Ont., in 1886. He attended London Collegiate. He graduated in science from the University of Toronto in 1914, joining the Ontario roads department as assistant engineer in the same year. He served in the First World War overseas with the Royal Canadian Engineers. Following his discharge in 1919 he took a postgraduate course and graduated in civil engineering from the University of Toronto. He then returned to the Department, and during subsequent service became prominent among Ontario road-building engineers.

He joined the Institute as a Junior in 1912, transferring to Associate Member in 1916 and to Member in 1940.

Bruno Grandmont, M.E.I.C., who was district engineer at Quebec, Que., for the Department of Public Works, Canada, before retiring in 1948, died September 8, 1950.

Mr. Grandmont was born in the parish of Champlain, Que., in 1889. He studied at Ecole Polytechnique, in Montreal, and graduated in 1914 with the degrees of civil engineer and bachelor of applied science. That year he joined the department as an assistant engineer at Three Rivers, Que. From 1916 to 1917 he was assistant engineer on the construction of the Champlain dry dock. In 1919 Mr. Grandmont was acting district engineer at Three Rivers. He became district engineer in 1921.

In 1937 he was promoted to the position of district engineer at Rimouski, Que., which position he held until 1944, when he was transferred to Quebec as district engineer.

Mr. Grandmont joined the Institute in 1913 as a Student, transferring to Associate Member in 1917 and to Member in 1940. He was also a member of the Corporation of Professional Engineers of Quebec.

John Joseph Sears, M.E.I.C., transit superintendent of the Nova Scotia Light & Power Co. Ltd., Halifax, N.S., died suddenly on September 11, 1950.

Mr. Sears was born in Antigonish, N.S., in 1891. He graduated with a bachelor of arts degree from St. Francis Xavier University in 1911, and from Nova Scotia Technical College in 1916 received a degree in civil engineering. He joined the Nova Scotia Steel & Coal Company shipbuilding department that year, working in the draughting office and shops, where he remained till 1918. Then he went to the Halifax Shipyards as office assistant in the engineering department. In 1921 and 1922 he was with C. A. Fowler & Co., after which he joined the Nova Scotia Tramways and Power Co. as a field engineer on estimating, inspecting, engineering, field work.

He played a leading role in the installation and success of the new trolley coach system. He served for many years as assistant superintendent and he succeeded the late J. B. Bulley as transit superintendent shortly after the recent war. The Halifax system was completely revolutionized under his direction.

He joined the Institute as an Associate Member in 1924 transferring to Member in 1940.

N. B. MacRostie, M.E.I.C., prominent consulting civil engineer and surveyor of Ottawa, Ont., died on Ocober 4, 1950.

N. B. MacRostie, M.E.I.C.

Mr. MacRostie was born at Metcalfe, Ont., in 1885. After a period of teaching at Metcalfe Public School he attended Queen's University, graduating with the degree of B.Sc. in civil engineering in 1911 and that of B.A. in 1912. That year he was in charge of field work on surveys in Manitoba and Saskatchewan and in 1913 he was employed with J. B. McRae, consulting engineer, Ottawa, as inspector on construction of a dam at High Falls, Que. From 1912 to 1916 he was with the engineering department of the City of Ottawa as city surveyor and engineer of special works.

From 1916 to 1918 he was gauge examiner with the Imperial Munitions Board. In the spring of 1918 he joined the Royal Canadian Engineers and went overseas. Upon his return to Canada in 1919 he entered private practice in Ottawa as a consulting engineer and surveyor, first with the firm of Lewis and MacRostie, and later in his own firm of N. B. MacRostie. He has been retained by the Municipalities of Gloucester, Nepean and Osgoode as engineer. Mr. MacRostie was also associated with the Ottawa Suburban Roads Commission. His firm has had much to do with suburban development in the Capital area. He was employed often in connection with the Ottawa Area Planning Board and the National Capital Planning development.

Mr. MacRostie was a member of the Hydro-Electric Power Commission of Ontario, serving as the Ontario government's representative.

Active in many fields, he was a member of the Ottawa Town Planning Commission, a member of council of the Ottawa Board of Trade and a past president of the Ottawa Branch of the Queen's University Alumni Association. He was a member of the Ottawa Public School Board and was chairman of its property committee in 1943 and 1944. He was the Progressive Conservative candidate for Ottawa West in the Federal elections in 1945.

Mr. MacRostie joined the Institute in 1921 as an Associate Member, transferring to Member in 1940. He served the Ottawa Branch as its chairman in 1942, and represented that Branch on the Council of the Institute in 1942.

W. C. M. Cropper, M.E.I.C., former apparatus engineer of Northern Electric Company Ld., died at his home in Kingstown, St. Vincent, B.W.I., on September 29, 1950.

Born in Kingstown in 1884, Mr. Cropper came to Canada in 1901 in order to take up studies at McGill University. He graduated in 1905 with a bachelor of science degree in electrical engineering, and joined Northern Electric that year as a telephone apparatus and equipment draughtsman.

In 1919, he was appointed engineer in charge of the apparatus engineering department, and the following year played a leading role in the production of the first experimental models of radio receiving sets manufactured by the company. Two years later, he assisted in the design and development of Northern Electric station 9BM.

During the First World War, Mr. Cropper was involved in the design and inspection of field communication equipment for the Canadian Army. He was concerned with the same work during the Second World War.

Mr. Cropper joined the Institute in 1927 as a Member. He also held membership in the Corporation of Professional Engineers of Quebec and in the American Geographical Society.

Dr. H. T. Barnes, M.E.I.C., F.R.S., of Burlingon, Vermont, who won international recognition as an ice engineer and who served on the staff of McGill University, Montreal, for more than three decades as a physicist, died on October 4, 1950. Dr. Barnes was, in 1933, named emeritus professor of physics by McGill.

Dr. Barnes was born in Woburn, Mass., in 1873. He graduated from McGill University where he distinguished himself for studies in physics and gained B.A.Sc., M.A.Sc., and D.Sc. degrees, in 1893, 1895 and 1900 respectively.

He was appointed first as a lecturer in physics in 1900 and was made assistant professor four years later, associate professor in 1907. He succeeded the late Lord Rutherford as Macdonald professor of physics in 1908. He was made director of the department of physics in 1909.

He became famous in the world outside the campus for his continuous battle with ice. He developed the use of thermite in combating ice-jams, relying upon the great heat of this material when burned to disintegrate ice rather than the explosive force of dynamite or T.N.T. He fostered the use of certain chemicals in combatting snow. His methods were given a practical application in one of the New York City boroughs.

He performed experiments, long before the introduction of radar, in the detection of icebergs through sensitive heat measurement tests, and their destruction when they wandered far south into shipping channels by the use of thermite.

One of his greatest dreams was the extension of the shipping season on the St. Lawrence by the use of ice-destroying chemicals. He even envisioned the day when, through the advancement of ice engineering, Montreal could be made an all-the-year-round port.

Dr. Barnes published work on ice engineering, and many papers dealing with electrical measurements, specific heats, ice formation, and radioactivity, which appeared in various scientific publications in Canada, England, and the United States

He was called to Holland to investigate ice formation on the vitally important Dutch canals and during the course of his lifetime won many honours including a much coveted membership in the Royal Society, London, of which he was made a Fellow, in 1911. He was elected a Fellow of the Royal Society of Canada in 1898.

Dr. H. T. Barnes, M.E.I.C.

Among the professional activities of Dr. Barnes there should be noted service as secretary of the physics section, International Electricity Congress in 1904; president of the section 3 of the Royal Society of Canada, 1909; president of the Canadian Committee of the International Electrotechnical Commission in 1925-26; Tyndall Lecturer for the Royal Institution in 1912.

He held memberships and fellowships in other American and British scientific associations. He became a Member of the Institute in 1927.

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News of the Branches

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

Cape Breton

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

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

On September 21st the Cape Breton Branch enjoyed a visit from President J. A. Vance and Mrs. Vance. The presidential party consisting of W. H. Chisholm, chairman of the Halifax Branch and A. G. McDermott of Montreal, were returning from a visit to the Newfoundland Branches.

The Newfoundland boat was met at North Sydney and the party escorted to Sydney. At noon the president and party were guests of the Branch executive.

Branch Chairman C. N. Murray was in the chair at a dinner in the evening when the President gave the members an outline of Institute activities. He stressed the openings available for young engineers, and stated that he did not think that smaller industries had taken advantage of them the way they might. He thought that there was a field for younger engineers to start their own businesses.

In conclusion he was persuaded to give a description of his visit with Dr. L. A. Wright to the Second Commonwealth Engineering Conference in Johannesburg in March. It was most interesting to get a first hand report of conditions in our sister Commonwealth.

The president was introduced by Mr. W. H. Chisholm and he was thanked for his address by Mr. C. M. Anson. It was with regret that the members saw the president off on the evening train.

Cornwall

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

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

Autumn activities for Cornwall branch commenced on September 29, twelve members having accepted an invitation to meet with the Kingston branch at Brockville.

Mr. M. G. Saunders of the Aluminum Company of Canada gave an illustrated address on **The Aluminum Industry in Canada.** Speaking with a wealth of experience and great interest in his subject, Mr. Saunders entertained a large audience at the Manitonna Hotel. Refreshments were served at the close of the meeting. A salute to Kingston branch and their Brockville members, for an excellent programme.

On October 4, a dance was held at the Legion Hall. An attendance of 57, made up of members and friends, indicated that this type of activity was welcome. P. H. Nasmyth, assisted by G. G. M. Eastwood and H. W. Nickerson, arranged the event. A snack of sandwiches and coffee, during the evening, took care of the inner man.

Hamilton

G. L. Schneider, Jr.E.I.C.,
Secretary-Treasurer

John H. Mitchell, M.E.I.C.,
Branch News Editor

In keeping with the policy of fostering better fellowship and relations within the engineering profession, engineers in the Hamilton District accepted the invitation of the Hamilton Branch E.I.C. and assembled at McMaster University to hear **The Story of the New Pipe Mill** presented by Mr. C. W. Morehead, assistant general works manager, Page-Hersey Tubes Limited, Welland, Ontario.

Mr. L. C. Sentance opened the meeting and called on Mr. E. T. W. Bailey to introduce the speaker of the evening.

Mr. Morehead was born in Evanston, Illinois, and graduated from Princeton University with a degree in electrical engineering. He joined Republic Steel Corporation and occupied various positions in their open hearth, combustion engineering, electric weld pipe mill and the rolling mill. In 1943 he came to Canada to join Page-Hersey and shortly after was made assistant general works manager.

Mr. Morehead said he would start by listing the operations sequence and follow-up by describing interesting points in the sequence.

Of the three types of pipe making, seamless, submerged arc, and resistance, his company had chosen resistance, as it fitted into their diversified products.

The operations are as follows: unpiling, roller levelling, shearing and trimming, shot blasting, forming, resistance welding, bead trimming, sizing and straightening, inside washing, cutting off, crop end flattening, expanding, coating, and packing.

In the expanding machine, 2300 lb. per square inch hydraulic pressure expands the pipe ¼ inch in diameter, rounds it out and increases its strength. The mill runs at a speed of 15-60 ft. per minute from 4-inch to 16-inch O.D. and welds sections from 17 to 50 feet long.

Many interesting questions were asked and answered during a half hour question period, after which Mr. H. Thomasson thanked the speaker for the assembled engineers.

The chairman announced that the next meeting on October 26th at the science theatre, McMaster University, would feature a talk by Mr. W. H. Paterson, M.E.I.C., chief engineer of the Toronto Transportation Commission.

Mr. Sentance invited members and guests to donuts and coffee, and declared meeting adjourned.

Kingston

J. T. Provan, Jr.E.I.C.,
Secretary-Treasurer

S. H. Rochester, M.E.I.C.,
Assistant-Secretary

On Friday, September 29, the Kingston Branch of the E.I.C. held a meeting at the Manitonna Hotel, Brockville, in response to the kind invitation of the Brockville members. A considerable gathering, including some members from the Cornwall Branch, was present.

Mr. J. S. Waddington of Brockville welcomed the members present and expressed the hope that similar meetings might be arranged in the future. The meeting was then handed over to Mr. G. T. Andrews who called upon the field secretary, Lieut.-Colonel L. F. Grant, to speak about Institute affairs. Lieut.-Colonel Grant spoke briefly of the excellent work being done by the Institute in the employment field, and in the professional field. He expressed the hope of seeing all engineers become members of the Institute and also of the Provincial Associations. He encouraged the arrangement of meetings of this sort since only in this way could engineers really get to know each other and exchange information.

Mr. G. T. Andrews then called upon Dr. R. D. Bennett to introduce the speaker for the evening, Mr. M. G. Saunders, of the Aluminum Company of Canada whose subject was the **Aluminum Industry in Canada.**

Mr. Saunders, who has seen some 23 years' service in the Aluminum industry, illustrated his talk with slides and traced the production of aluminum from its raw materials to the finished product.

Commencing with the mining of the primary bauxite in British Guiana, cryolite from Greenland and petroleum coke from the United States, he followed their transportation to the great aluminum smelter at Arvida, and explained the tremendous advantages of this location both from the point of view of the shipping facilities at Port Alfred and the harnessing of the mighty Saguenay River at Shipshaw to provide the huge quantities of hydro-electric power used in the reduction of the ore to metallic aluminum.

Mr. Saunders touched upon the development of the aluminum industry in Canada since the early days. In comparing present day production costs with those of 20 years ago, he showed some 20 per cent decrease resulting from improved processes and manufacturing facilities developed over the intervening period.

The speaker illustrated the fabricating processes carried out at Kingston Works of the Aluminum Company of Canada where such products as sheet, plate, foil, extrusions and forgings are produced in large quantities. He commented briefly upon the operations at Etobicoke and Toronto, finally giving some interesting production figures for aluminum over the past years and developing a trend for the future uses of aluminum. This was illustrated by the magnificent aluminum bridge across the Saguenay at Arvida and the all-aluminum crane in use at Kingston Works.

A lively question period followed Mr. Saunders' talk, after which Mr. John Kerfoot of Brockville, expressed the thanks of those present.

Moncton

V. C. Blackett, m.e.i.c.,
Secretary-Treasurer

On September 25, a dinner meeting was held in the club house of the Fundy National Park golf course, on the occasion of the official visit to Moncton Branch, of the president of the Institute, Mr. James A. Vance.

The President and Mrs. Vance were welcomed on arrival in Moncton by members of the branch executive and their wives. They were then taken on an extensive tour of our recently opened national park, and later, they were guests of honour at an afternoon tea.

The dinner meeting was held at 8 o'clock in the evening and was attended by a large number of branch members and their ladies. N. B. Eagles, chairman of the branch, presided.

In his opening remarks, the president expressed surprise and pleasure at what he had seen of the development of Fundy Park, and predicted that it would play an important part in the ever growing tourist industry of the Maritime Provinces.

Dealing with the future of engineering in Canada, Mr. Vance could see increased opportunities resulting from increasing prosperity of the Country. He pointed out the possibilities in many small industries, not now employing engineers. The technical background and love of efficiency which the young engineer would bring to these industries would in many cases mean the difference between success and failure of an enterprise.

The president reviewed the highlights of the conference of Commonwealth Engineering Societies, which was held at Johannesburg, and at which he and Dr. Wright were delegates. He also spoke of his recent visit to Newfoundland and expressed disappointment that so many engineering students were taking their training elsewhere and failing to return to their native province.

A vote of thanks to Mr. Vance was extended by R. L. Parsons. Other speakers during the evening included, G. L. Dickson, V. A. Ainsworth, Charlottetown, H. J. Crudge and B. E. Bayne.

During the evening, a programme of piano-accordion music was presented by Kenneth Smith.

Ottawa

W. R. Meredith, m.e.i.c.,
Secretary-Treasurer

A. J. Bernard, m.e.i.c.,
Branch News Editor

The Place and Contribution of Research in Aviation was the subject of an address to the Ottawa Branch at the first fall meeting on September 21, 1950. The speaker was Mr. W. G. A. Perring, C.B., F.R.Ae.S., director of the Royal Aircraft Establishment, Farnborough, England, and vice-president of the Royal Aeronautical Society.

Mr. Perring gave an interesting resume of the history of aircraft research from before World War I to the present day. He emphasized the great cost of development facilities such as wind tunnels, etc. Tribute was made to the contributions of the Wright brothers, Lilienthal, and Turnbull to aviation.

The great advances in air-frame construction, engines, controls, and overall design were outlined by the speaker; and mention was made of the great improvements in airfields.

Descriptions in Canadian newspapers of the Royal Aircraft Establishment at Farnborough had amused Mr. Perring very much. He read as follows: "The Royal Aircraft Establishment Farnborough is not a particularly prospering place. Laid out on bumpy heath country, it is dusty, shabby and ancient. So ancient that its landmarks include balloon sheds, antidating the start of heavier than air flying in the first decade of the Century, and a gnarled stump known as "Cody's Nose" to which the pioneer of British service aviation is reported to have tethered his aircraft in days well before the First World War".

In conclusion Mr. Perring stressed that good men are far more important than tools in the future progress of aviation. Progress will depend mainly on the quality of the men we attract to research, on the engineers who develop and transform the results of research into the practical and useable aircraft, and on the skill and courage of the pilots who fly them.

Dr. J. J. Green introduced Mr. Perring, and Mr. John Parkin expressed the gratitude of the audience.

Guests at the meeting were members of the Council known as the Commonwealth Advisory Aeronautical Research Committee, who were holding their second meeting in Ottawa. Members from all over the Commonwealth were present. Head table guests were as follows: Air Marshal G. C. Johnson; Dr. D. MacPhail, assistant director, Division of Mechanical Engineering, N.R.C.; Dr. J. J. Green, deputy director general, Defence Research Board; Mr. Perring, the guest speaker; Mr. Allan C. Ross, chairman of the Branch; Air Vice Marshal A. James; Mr. John Parkin, director, Division of Mechanical Engineering, N.R.C.; Dr. O. M. Solandt, chairman, Defence Research Board; Air Vice Marshal E. W. Stedman, professor of engineering, Carleton College.

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The luncheon meeting of the Ottawa Branch on October 5th was honoured by the attendance of Mr. Lee A. Kelly, prominent Ottawa barrister who spoke on **The Functions of the Courts of Canada.**

Mr. Kelly gave an interesting history of old English courts. The many courts and procedures described were found amusing. At one time criminal cases were decided by an "Ordeal Test". One such test consisted of dunking the accused in an ice bath. If he sank he was immediately convicted. The time required for recovery of "floaters" was a measure of their guilt. The oath from early times has always been in important procedure of courts. Some early courts immediately convicted a man if he even mispronounced any part of an oath.

Present day courts in Canada were briefly outlined by Mr. Kelly. Emphasis was placed on the fact that a person

At Moncton on September 25, President Vance was photographed with members of the Branch Executive. Left to right: E. M. Nason, W. D. G. Stratton, N. B. Eagles, President Vance, R. L. Parsons, V. C. Blackett, R. T. Sansom.

accused of any crime is given absolutely every chance in Canadian Courts to obtain fair trial. An interesting fact quoted by the speaker was that ninety per cent of persons appearing in magistrates court elect to be tried by the magistrate. The question of the value of suspended sentences is answered by the fact that only six to eight per cent of people so sentenced reappear in court.

While, without a doubt, all engineers present felt that they were beyond being called to the courts, Mr. Kelly's talk was found interesting by all. Branch secretary Bill Meredith thanked the speaker.

Head table guests were as follows: Allan Ross, branch chairman; W. R. Jackett, K.C., assistant deputy minister of justice; Peter MacDonald, K.C., president, Carleton County Law Association; Brigadier Melville, M.E.I.C.; Major General Rodger, M.E.I.C.; W. R. Meredith, the secretary treasurer.

Saguenay

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

Junior Section

G. K. Clement, M.E.I.C.,
Acting Secretary

The Junior Section of the Saguenay Branch opened its winter session with a smoker held at the Saguenay Inn, Tuesday evening, September 26. A satisfactorily large group enjoyed the refreshments provided, and also the discussion period which followed the highly interesting talk on **Armament Design** by Mr. H. J. Butterill of the Aluminum Company of Canada.

Mr. Butterill, who enlisted immediately after graduation in metallurgical engineering from the University of Toronto, spent several years overseas with the R.E.M.E. On his return to Canada he was employed by International Nickel as a consultant on alloy application. Later he worked for the Department of National Defence on armament design.

Mr. Butterill presented in a capable and highly interesting fashion an outline of the engineering qualifications required in design, production and testing of armament. He stressed particularly the difference in approach and thinking between design of military and industrial equipment, illustrating the point with some of his more humorous experiences. A lively question and answer period followed the talk. The speaker, introduced by Chairman F. H. Duffy, was thanked by Mr. E. Gavlas.

Sarnia

J. W. Graeb, M.E.I.C.,
Secretary-Treasurer

F. Belshaw, Jr.E.I.C.,
Branch News Editor

On Wednesday, September 18, 1950, an address by Dr. Dwayne Orton, director of education, International Business Machines Corporation, was sponsored by the Sarnia Branch.

As Dr. Orton's address **Trends in Industrial Human Relations** was of considerable general interest, the Branch extended invitations to executives and personnel departments of various Sarnia industries, and a large group gathered in Johnson Memorial School auditorium to hear the speaker.

Introduced by Mr. G. R. Henderson, M.E.I.C., Dr. Orton pointed up the necessity of considering the man in modern industry. He likened the essential factors in industrial process to the three sides of an equilateral triangle, one side representing profits, the other side, products, and the base representing persons. Modern business management is concerned with keeping these in balance.

Concerning himself with the problems of human relations in business, the speaker used as his hypothesis "To build a business, you must first build men". The relationship of man to products and profits was observed with respect to two major problems—the field of communications, i.e. contacts between the worker and top management, and job satisfaction.

Of the former, it was pointed out that the area of top management should be increased so that foremen and job supervisors, who are in direct contact with employees, can be established as responsible executives—a part of management—with the full confidence of top management and the respect of the workers. In other words, the distance between so-called top management and the worker should be decreased, in order to restore the "face-to-face" contacts of the small shop.

The second problem, involving the need to develop job satisfaction, can be solved by getting away from the current trends in "job simplification". By enlarging the responsibility of the worker, his satisfaction with his job increases. Although the theory that the more limited and simple the worker's activity the more efficient he would be may be sound engineering, it is questionable human relations.

The speaker concluded his address with a quotation from Edwin Markham—"In the human plan, nothing is worth the making if it does not make the man".

Mr. F. F. Walsh, M.E.I.C., thanked Dr. Orton on behalf of those present.

Prior to the meeting, the executive of the Branch were hosts to Dr. and Mrs. Orton at dinner in the Dow Chemical Company staff house.

Saskatchewan

D. W. Houston, M.E.I.C.,
Secretary-Treasurer

R. Bing-Wo, M.E.I.C.,
Branch News Editor

The first regular monthly meeting of the Saskatchewan Branch for the year 1950-51 was held on Friday, September 29, 1950, in the recreation room of the Saskatchewan Power Corporation.

Mr. J. W. Tomlinson, general manager, Saskatchewan Power Corporation, presented a talk on **Farm Electrification.**

In the programme of electrification being carried on at the present time in Saskatchewan, 25,000 Saskatchewan jackpine poles have already been used this year. Last year's construction required 1.5 million pounds of steel and it is expected that 2 million pounds of steel are needed in the forthcoming year. Thousands of pieces of pole line hardware, insulators, and transformer meters will be used in the electrification plan. With the progress of farm electrification, a whole new field in electrical appliances will be opened. Many new jobs will be created as a consequence of electrification.

Farm electrification will have the effect of raising the whole standard of rural living. Farm production will be increased and the drudgery connected with farming will be decreased with the use of electricity.

In the past, the general opinion was that Saskatchewan farms were too far apart to make electrification feasible. The present policy is to locate areas where farms are close enough together to bring electricity in and develop these particular areas.

New equipment has done much for electrification of areas where hitherto it has been considered impossible. High voltage transmission at 13,800 volts has replaced all 2,300 volt lines. New type transformers, practically lightning proof; self-reading meters; new type thermal switches; ground return lines; automatic circuit breakers; new type steel conductors; all have contributed to the progress of farm electrification.

Mr. Tomlinson then compared the Saskatchewan scheme with those of Alberta and Manitoba as to the types of power, areas covered, basis of service, and ownership.

An interesting discussion period followed the talk and the evening's programme concluded with a film showing the advantages of bringing electricity to our farms.

Sudbury

Dennis McKinty, Jr.E.I.C.,
Secretary-Treasurer

The first general meeting of the Sudbury Branch was held September 30, 1950, in Sturgeon Falls where the members were the guests of the Abitibi Power and Paper Company on a tour of their plant and at dinner. There were thirty-two members in attendance.

The Sturgeon Falls plant is unique in that it utilizes waste from sawmills and woods which other mills cannot use. At present there are twenty-one species of wood in the plant's stock piles, all useful in turning out the product, a coarse paper used in the manufacture of corrugated cardboard. The Company has portable chippers set up at some sawmills with which they chip the mill scrap for shipment to Sturgeon Falls. At present the Company is building an extension to the plant and will soon be producing hardboard.

The tour was conducted by Mr. A. L. Farnsworth, M.E.I.C., general manager, and three engineers on his staff who are also members of the branch. After the tour dinner was served at the Sturgeon Hotel, with the branch councillor, E. R. Eaton, giving a report on the annual meeting of the Institute at the short business meeting which followed.

Mr. J. S. Cooper of North Bay complimented Mr. Farnsworth on the hospitality of his Company and thanked him on behalf of the branch for a most enjoyable meeting.

St. Maurice Valley

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

The 1950-51 season's activities of the St. Maurice Valley branch opened on September 16th with a trip to the Shawinigan Water & Power Company's new power development at La Trenche, on the upper St. Maurice River. This visit, undertaken as a joint meeting of the E.I.C. and the A.I.E.E. was made possible through the courtesy of the Shawinigan Engineering Company, who were host to the party for luncheon and tea.

Some 150 members of the two societies motored to Fitzpatrick from centres down the river. From there the party travelled by rail to Rapid Blanc siding where the Shawinigan Company took over. After driving by bus to Rapid Blanc to view briefly the development and townsite, the party proceeded to La Trenche for lunch.

Following lunch Mr. J. A. Burke, M.E.I.C., general superintendent of construction gave a brief outline of the 390,000-hp. development. This was followed by two movies showing model tests of the spillways and general views of the construction. The party then split into small groups, each accompanied by a guide, to go over the project. The visit took place just before the closing of the by-pass which provided the members with a unique opportunity to see the upstream details of the dam and head-gates in an unwatered condition. The power house, too, was in a most interesting stage with one 65,000-hp. unit nearly assembled and the others in various stages of construction. After tea the group returned to Rapid Blanc siding, thence to Fitzpatrick and home.

All those who made the trip agreed that a most enjoyable outing resulted from the arrangements made by the Shawinigan Engineering Company and its employees, who made the tour both interesting and instructive.

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On October 21st the branch held the annual golf meeting at the Ki-8-eb Golf Club near Three Rivers. Although attendance was slightly lower than on previous occasions due to poor weather and conflicting activities, nevertheless the event proved to be a most enjoyable outing for those who were able to attend. Some twenty-five golfers braved the elements, a few of whom struggled through to the bitter end with eighteen holes. All were present and accounted for at the nineteenth! Another twenty members, non golfers, visited the plants of the St. Regis Paper Company, Dominion Foils, and Electro Refractories and Alloys; all three industries being located in Cap de la Madeleine. Following the golf tournament and plant tours an informal supper was held at the Ki-8-eb club house. After supper Mr. John Wickenden, regional vice-president for the Quebec District, gave those present an interesting description of the branch's early days. Charlie de Tonnancour, chairman of the programme committee, closed the meeting with an outline of his proposed programme for the season.

Junior Section

The Shawinigan Falls Junior Section of the Branch held its first meeting of the season at the Cascade Inn on Thursday, September 28th. The section had as speaker Mr. D. N. Ferguson, works manager of the Aluminum Company of Canada, Shawinigan Falls. The subject of his address was **Operating an International Business.** With the able assistance of the members of his audience, he illustrated his talk by organizing and conducting a hypothetical international business.

Toronto

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

I. S. Widdifield, M.E.I.C.,
Branch News Editor

On Thursday, October 5, the Toronto Branch held its first regular meeting of the current season, at the Mining Building of the University of Toronto. Branch Chairman E. Ross Graydon presided, and introduced Mr. Gilbert Dunkin, of A. V. Roe Canada Limited, to the 180 members and guests present.

Mr. Dunkin addressed the meeting on **The Jetliner — the Air Travel of the Future.**

Detailed analysis recently conducted in conjunction with major U.S. Airlines indicate that the Avro Canada Jetliner can economically hold its own against the best revenue-producing air transports now in service, Mr. Dunkin said.

Slides were presented showing that the Jetliner's direct operating cost per aircraft mile is considerably less than that of a comparable modern 4-engined, propeller-driven aircraft for a given range, and if this was not the case, it would be impossible to compete on a seat mileage basis with the larger aircraft. Another slide showed little difference between the direct operating cost per seat mile for this conventional aircraft and the Jetliner.

There should be little or no difference in fare for the passenger travelling by either aircraft, Mr. Dunkin said, yet the one choosing to go by Jetliner will arrive at the airport of his destination in 25 to 40 per cent less scheduled service.

Mr. Dunkin stated that the fact that Jetliners can provide faster and more comfortable service at no extra charge is well appreciated by airlines who are engaged in a competitive livelihood. The soundness of the basic design had been firmly established from the flight testing programme, and the final specification for the production aircraft is now being drafted.

Several other slides were shown giving the runway requirements for the Jetliner as compared with those for several modern U.S. transports. These indicated that the Jetliner had excellent take-off characteristics and did not require unusual runway lengths.

The servicing advantages of the Jetliner might be instanced by the fact that only about three-quarters of an hour per aircraft flying hour is required to overhaul and maintain the four jet engines installed. Engine overhaul periods are comparable to those specified for present-day piston engines. The engine manufacturers had given assurance that their turbo jets for the Jetliner will have an initial service life between overhauls of about 500 hours. With further development and experience, this figure should increase substantially. While the aircraft is to a degree unorthodox as compared with present-day aircraft, its equipment, instrumentation and accessories, are conventional and consist of units which have been proved over thousands of hours in operation in other aircraft.

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Mr. Gordon R. Munnock, a prominent member of the legal profession in Toronto, addessed the regular meeting of the Toronto Branch on Tuesday, October 17. Mr. Munnock's subject was **Law and the Engineer** and his address covered the many situations when the two professions—legal and engineering —come together or cross.

Mr. Munnock said that anyone who offers professional services to the public or services which are known to require particular knowledge, skill and experience, represents by implication that he has such knowledge, skill and experience as will enable him to perform the services required. When a person undertakes a task that obviously requires special skill, and in particular, professional skill, there is an implied warranty on his part that he has the skill required for the task he undertakes. If your professional duties are such that you must employ assistants, you must use every care to select proper and qualified employees because it is you that is retained and if you entrust the work or part of the work to an employee you are taken to represent that the qualifications of that employee are sufficient.

Mr. Munnock said that an engineer finds his way into the courtroom either as an expert witness or because of his participation in some task that has gone wrong, whether or not he is in any way responsible for the failure. Mr. Munnock gave some sound advice and suggestions on giving professional evidence and conduct in the courtroom.

The speaker's concluding remarks concerned Engineer's Certificates and arbitrations.

Vancouver

Alan Fletcher, Jr.E.I.C.,
Secretary-Treasurer

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

On Wednesday, October 4th the annual ladies' night of the Vancouver Branch was held at the Stanley Park Pavilion. A group of approximately 225 members and ladies were entertained with generous refreshments and a programme of films on home decoration, ballet, hunting and fishing and nylon stocking production. The large turnout of members, juniors and students demonstrated the popularity of the annual informal event. Chairman Sydney Hogg and the executive responsible were congratulated from the floor; the hard-working secretary, Mr. Alan Fletcher, acted as chief projectionist.

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The annual president's dinner was held at the Alhambra Dining Room on October 20th. President Vance had been occupied prior to the dinner with an address and inspection tour at the Military Engineer's Convention held at Chilliwack. Chairman Sydney Hogg introduced President Vance and the head table guests. The president told of his trip to the South African Conference and commented briefly on his trip across Canada. He urged young engineers to take up the pioneering challenge of their vast undeveloped country; too many young men are looking for easy jobs and salaries.

Mr. "Dutch" McPherson, vice-president of the western zone thanked the president for his remarks and Dean McLeod of the University of British Columbia's faculty of applied science added his congratulations.

Employment Service

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

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

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

Situations Vacant

CHEMICAL

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

CHEMICAL ENGINEER recent graduate for paper mill located in Province of Quebec. Permanent position. Apply to File No. 1606-V.

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

CIVIL

YOUNG CIVIL ENGINEER required by construction company in Montreal. Duties include contact work and buying. Apply to File No. 1597-V.

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

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

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

CIVIL ENGINEER with some experience for inspection duties with a Toronto firm. Apply to File No. 1630-V.

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

ELECTRICAL

ELECTRICAL ENGINEER required in Montreal with experience in power house or substation operation, relay protection, electronics. Apply to File No. 1592-V.

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

ELECTRICAL ENGINEER required by large firm in Montreal. Applicant should have experience in the writing of specifications for, the selection and installation of motors, controls and other items of electrical equipment required for cranes and hoisting machinery. Salary open. Apply to File No. 1600-V.

ELECTRICAL ENGINEERING GRADUATES to be trained as field engineers in applied illumination by a firm located in Ontario. Excellent opportunity offered for mature-minded graduates who are seeking a lifetime career. Several openings for young men as trainees or more mature former graduates who would be accorded an opportunity commensurate with their experience. Apply to File No. 1601-V.

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

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

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

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

ELECTRICAL ENGINEER, recent graduate required by large organization in Montreal for their general engineering department. Apply to File No. 1629-V.

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

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

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

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

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

MECHANICAL

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

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

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

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

MECHANICAL ENGINEER required by large firm in Montreal for Mackenzie, British Guiana. Applicant should have 4 or 5 years Kiln operation and general mill experience along mechanical lines with a knowledge of the principles of combustion. Duties include mechanical maintenance, operation of crushers, conveying systems, vibrating screens and mechanical and electrical drivers etc. Apply to File No. 1611-V.

MECHANICAL ENGINEER required for long term design project requiring highest skill, preferably with experience in design of typewriters, accounting machines, cash registers or similar apparatus. Location Montreal. Excellent salary for right man. Apply to File No. 1614-V.

MECHANICAL ENGINEER required in Ontario. 1948 to 1950 graduate, to join small development group engaged in design of new products in radioactivity field, would prefer a man who has had some industrial experience in production shopwork. Salary open. Apply to File No. 1616-V.

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

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

TWO MECHANICAL ENGINEERS required in Ontario. Applicants should have some farm background and be familiar with the operation of farm machinery. Apply to File No. 1624-V.

YOUNG MECHANICAL ENGINEER required in Montreal with some field experience. Duties include the installation of pipe lines in connection with various construction projects. Will also consider recent graduate for training period. Apply to File No. 1628-V.

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

MECHANICAL ENGINEER with some experience, preferably including shop work for inspection work. Duties would involve technical calculations, preparation of specifications, supervision of tests and some field inspection. Location: Toronto. Apply to File No. 1630-V.

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

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

MINING

MINING ENGINEER with 5 years experience in underground hard rock mining required by large industrial firm in Montreal, for subsidiary in Newfoundland. Duties to include underground mining, mapping, draughting and some surveying both underground and surface. Apply to File No. 1298-V.

MISCELLANEOUS

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

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

YOUNG ENGINEER required by firm located in Ontario to act as Internal Auditor. Duties include 6 months in the year visiting plants in Ontario and Quebec. Work would bring applicant into contact with all sales and manufacturing supervisions as well as office supervisors Apply to File No. 1608-V.

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

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

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

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

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

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

PLANT ENGINEER required by firm located 35 miles from Quebec City. Applicant would be obliged to take charge in general of plant maintenance and be responsible for a very considerable amount of expansion. Experience required in general manufacturing work and preferably with a working knowledge of French. Living accommodation available. Apply to File No. 1622-V.

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

TWO ENGINEERS OR DRAUGHTSMEN required by well established firm located 100 miles east of Toronto. One junior man required with about 1 or 2 years experience in making shop details, the other applicant should have 5 to 10 years experience in the design and detail of machinery and steel work required for the handling of material in bulk form. Apply to File No. 1626-V.

ENGINEERS required by chemical company in Ontario. Chemical engineers with 2 to 4 years experience in chemical or petroleum plant production. Two mechanical engineers, one with at least 5 years experience in chemical or petroleum plant maintenance and one with 1 to 3 years experience in chemical or petroleum plant design. Civil or mechanical engneer with 2 to 3 years experience in general plant constructions. Apply to File No. 1627-V.

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

ENGINEERS urgently required in Newfoundland for work on highways and bridges. Apply to File No. 1633-V.

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

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

CHEMICAL

CHEMICAL ENGINEER recent graduate is needed for process development or production work by a chemical and synthetic resin manufacturing firm situated in the Province of Quebec. Some experience in chemical production or synthetic resin manufacture would be advantageous. Apply to File No. 1535-V.

CHEMICAL ENGINEER required in Montreal for research and development work in inorganic chemistry. Apply to File No. 1540-V.

CHEMICAL ENGINEER required in Ethiopia to help in installing facilities for dehydration of alcohol and applicant must be an expert with full technical knowledge of the latest methods of dehydrating alcohol. Apply to File No. 1571-V.

TWO CHEMICAL ENGINEERS, recent graduates to act as development engineers, required in Province of Quebec. Duties to consist of technical problems in chemical plant operations. Apply to File 1572-V.

CHEMICAL ENGINEER required in Province of Quebec to act as plant chemist. Age 27 to 35 years. Duties to consist of supervision of the control laboratory and in chemical plant operations. Apply to File No. 1572-V.

CHEMICAL ENGINEER required in Province of Quebec, to act as production supervisor, with approximately 10 years experience in chemical plant production. Duties to consist of production supervision in a chemical plant. Apply to File No. 1572-V.

CHEMICAL ENGINEER required in Ontario to act as plant supervisor. Applicant should have four to eight years experience in chemical plant operations or allied industry. Age 30 to 40 years. Duties to consist of supervision of operations in coal tar distilling and extraction of coal tar chemicals. Salary open. Apply to File No. 1572-V.

ENGINEERS WANTED

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

CHEMICAL ENGINEER, recent graduate required in Montreal to act as production engineer in the production planning of chemical plant operations. Apply to File No. 1572-W.

YOUNG CHEMICAL ENGINEER required by chemical manufacturer in Montreal. Applicant would be obliged to spend one or two years in office then sell to the paint and rubber trade. Apply to File No. 1581-V.

YOUNG CHEMICAL ENGINEER required by varnish and insulator manufacturer located in Ontario. Duties include quality control work and some plant engineering. This is a new position and offers excellent opportunities. Apply to File No. 1589-V.

CIVIL

CIVIL ENGINEER, five to ten years experience in hydraulic testing to do turbine testing required by large public utility in the Province of Quebec. Good future for the right man. Applicant should state age and experience. Salary open. Apply to File No. 1364-V.

CIVIL ENGINEER required by firm of inspection engineers in Montreal for land surveying and instrument work on airports and general building constructions. Apply to File No. 1565-V.

CIVIL ENGINEER with at least five years experience in structural design and draughting required by large architectural office in Montreal. Salary according to qualifications. Apply to File No. 1574-V.

YOUNG CIVIL ENGINEER required by large organization in Montreal with some experience in reinforced concrete design. Apply to File No. 1576-V.

ELECTRICAL

ELECTRICAL ENGINEER, required in Montreal capable of making surveys of complete electrical installations in existing plants, recommending improvements, of designing, ordering and preparing drawings for complete electrical installations in new plants. Applicant would be the electrical engineer for company and its subsidiaries. Salary open. Apply to File No. 1453-V.

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

FOUR JUNIOR ELECTRICAL ENGINEERS with radar experience required by large firm in Montreal. Apply to File No. 1556-V.

GRADUATE ELECTRICAL ENGINEER required in the Province of Quebec as sales engineer for established wire and cable company. Experience in power field desirable. Salary open. Apply to File No. 1570-V.

GRADUATE ELECTRICAL ENGINEER required in Montreal for inspection work. Applicant should have some experience in the manufacturing industry and must be bilingual. Age range to 35 years. Apply to File No. 1573-V.

SENIOR ELECTRICAL DESIGN ENGINEER required to head up electrical design in West Coast pulp and paper mill, including hydro electric station and townsite. Previous paper mill experience desirable but not a requisite. Applicant should have at least five years responsible industrial experience and must be capable of assuming all responsibility for the complete electrical engineering of all projects. Starting salary about $5,060.00 commensurate with experience. Apply to File No. 1582-V.

ELECTRICAL ENGINEERS with experience in electronics and radar for positions in Ottawa. Salaries open. Apply to File No. 1588-V.

ELECTRICAL DESIGN ENGINEER required by manufacturer of industrial equipment in Toronto. Applicant should have about five years experience. Apply to File No. 1590-V.

MECHANICAL

MECHANICAL DRAUGHTSMEN required by large coal mining firm in the Maritimes for simple designing, layout and detail drawings for ordinary colliery plants screening equipment. Hoists, simple steel structures etc. Salary open. Apply to File No. 1332-V.

MECHANICAL ENGINEER, required in Ontario with sales ability and experience by manufacturer of air conditioning and ventilating equipment. Age 35 to 45 years. Apply to File No. 1470-V.

MECHANICAL ENGINEER required by large chemical company in Province of Quebec. Applicant should be bilingual and have preferably one or two years experience in refrigeration, steam and brine. Reply giving full details of qualifications and experience. Apply to File No. 1534-V.

TWO YOUNG MECHANICAL ENGINEERS required in Ontario. Recent graduates would be considered. Excellent opportunities to gain experience and good prospect for promotion. Apply to File No. 1537-V.

YOUNG MECHANICAL ENGINEER required by a large firm in Montreal. Applicant should have some industrial experience. Duties include sales and service work. Apply to File No. 1538-V.

GRADUATE MECHANICAL ENGINEER required by a Montreal firm to do time study and or methods work. Applicant should have one to two years experience in methods or general products problems and be preferably bilingual. Salary open. Apply to File No. 1561-V.

JUNIOR MECHANICAL ENGINEER required by automotive industry in Ontario interested in administrative training, prior to tentative selection for overseas service in subsidiaries. Also openings in general engineering department. Apply to File No. 1567-V.

MECHANICAL ENGINEER required by public utility company located in Toronto, for inspection during manufacture of hydraulic turbines and associated power plant equipment. Not less than five years shop experience required and engineering training preferred. Must be willing to travel extensively. Duties commence immediately. Salary commensurate with experience. Apply to File No. 1575-W.

MECHANICAL DESIGN ENGINEERS required by West Coast pulp and paper mill. Previous pulp and paper experience desirable but not necessary and consideration will be given to all applicants with industrial experience. Salaries from $3,600.00 upwards commensurate with experience. These are permanent appointments in a well established mill. Apply to File No. 1582-V.

METALLURGICAL

FOUNDRY METALLURGIST required in British Columbia. Applicant should have broad experience in research work. Apply to File No. 1118-V.

METALLURGIST required in Province of Quebec. Applicant should have some knowledge of foundry practice, heat treating and die designing. Apply to File No. 1580-V.

MISCELLANEOUS

MECHANICAL OR CIVIL ENGINEER, required for Toronto office of firm located in Montreal with three to five years industrial experience to include background of welding knowledge. Work includes process development and promotion in welding field. Salary open. Apply to File 1415-V.

LONG ESTABLISHED CANADIAN MANUFACTURER offers an attractive opportunity to an experienced sales engineer. Equipment handled, overhead cranes and allied equipment. State experience in full first letter. Apply to File No. 1448-V.

TECHNICAL SALES REPRESENTATIVE, for the Province of Quebec. Applicant should be conversant with foundry practice or have sufficient metallurgical knowledge to act as a service representative for the sales of chemical compounds and coatings to foundries. Salary open. Apply to File No. 1452-V.

EXPERIENCED DESIGN ENGINEER required by a large Western Canadian steel fabricating shop. Must be experienced in design of boiler and pressure vessels. Material handling equipment, structural steel. Apply to File No. 1502-V.

SENIOR DESIGN ENGINEER required in Ottawa, with a degree in Mechanical or Chemical engineering. Applicant should have a minimum of 5 years experience in mechanical design particularly with reference to chemical plant equipment and process. Apply to File No. 1507-V.

AN ENGINEER (Electrical and Power) and an engineer (Construction Design) up to $5,700 for the Department of National Defence (R.C.A.F. at Ottawa). Details and application forms at Civil Service Commission Offices, National Employment Service Offices and Post Offices. Apply to File No. 1532-V.

ENGINEERING DEPARTMENT, of two machine newsprint mill requires the services of a design engineer and draughtsman. Applicant should be between 30 and 40 years of age, hold a degree in mechanical engineering from a Canadian University and have at least 10 years experience in design work. Paper mill experience not absolutely essential but would be desirable. In reply send complete details, references and recent photo. Apply to File No. 1533-V.

MECHANICAL OR ELECTRICAL ENGINEER required by large firm in Montreal. Duties include co-ordination of construction activities with special reference to electrical and mechanical equipment. When construction completed applicant would be plant engineer. Plant experience necessary. Salary according to qualifications. Apply to File No. 1539-V.

MECHANICAL DRAUGHTSMAN with engineering status preferred, thoroughly acquainted with the design and shop detailing of dust collecting systems, including layout and proportioning of ducts and selection of equipment, required in Ontario. Field experience would be advantageous. Apply giving full particulars of experience to File No. 1544-V.

TWO JUNIOR MECHANICAL ENGINEERS OR DRAUGHTSMEN required by firm in Ontario. Applicants would be required to work on design and installation drawings for pulp and paper machinery, piping etc. Engineers should have at least one years experience on machinery, and equipment, design and layout, not necessarily in the pulp and paper industry. Draughtsmen should have 2-5 years draughting experience. Salaries $250.00 to $350.00. Apply to File No. 1547-V.

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

NATIONAL RESEARCH COUNCIL REQUIRES organic and physical chemists, to assist in the synthesis of organic compounds containing isotopic tracers, also the investigation of catalyst activity in the oxidation of ethylene. Chemical Engineers, to assist in plant operation. At least honour in B.Sc. preferably M.Sc. in chemistry or chemical engineering required. Salary range $2,640.00 to $3,500.00, depending on qualifications and experience. Apply to File No. 1552-V.

BUSINESS for SALE

Small, well established electrical maintenance business in Montreal for sale at moderate price. Excellent opportunities for expansion under progressive management. Thorough investigation invited. Apply to File No. 1635-V.

ASSISTANT DYKING COMMISSIONER required by Department of Lands Victoria, B.C., to assist in administration and management of dyking and drainage districts in Fraser Valley. Must be Civil engineer graduate, eligible for full registration in B.C. At least 3 years practical experience as registered engineer in responsible charge of engineering projects, preferably related to dyking and drainage. British subjects, not over 45 years, except ex-service men, who are given preference. Salary $5,376.00 rising to $5,976.00 per annum. Apply to File No. 1553-V.

A LARGE ORGANIZATION is offering the position of Scientific Editor at a salary up to $3,660.00. Applicants should have a degree in science or engineering; they should have some knowledge of editing, and the writing and compiling of scientific research manuscripts. Further information may be obtained by writing Box No. 1274. Station B, Ottawa, Ontario. File No. 1554-V.

ENGINEER, required versed in the mining and milling of iron ore (magnetite). The ore is presently in an open pit, grinding to about 200 mesh and electrical separation as concentrates for the manufacture of sponge iron. Location Ontario with excellent working conditions. Age about 35 years. Apply to File No. 1557-V.

ENGINEERS required by large automotive industry in Ontario, for their production engineering department. Experience on methods, process, layouts, specifications and installation is desirable. Apply to File No. 1567-V.

PROCESS ENGINEERS, draughtsmen and tool and die designers required by automotive industry in Ontario. Applicants should have preferably experience in the automotive industry with a knowledge of heavy layout. Apply to File No. 1567-V.

PRODUCTION SUPERVISOR to train for the position of works manager of small operation in Western Canada. Some experience in manufacturing required. Applicant should have a preference for administration of a small operation rather than technical. Age 30 to 40 years. Apply to File No. 1572-V.

PLANT ENGINEER required in Ontario, with a minimum of five years experience in chemical plant or paper mill maintenance and engineering supervision. Age 30 to 40 years. Duties to consist of supervision of maintenance and plant engineering. Salary open. Apply to File No. 1572-V.

MECHANICAL ENGINEER

We want a young aggressive mechanical engineer, B.Sc. Canadian University for position as service manager.

Must be capable of dealing with public and of instructing men in overhaul and maintenance of diesel equipment.

Apply by letter only. State age, height, weight, marital status, military service, university, religion, business experience and enclose photograph. Apply to File No. 1652-V.

DESIGN ENGINEERS required by large industrial organization in Montreal. Must have some experience in hydraulic and reinforced concrete design. Apply to File No. 1577-V.

FRENCH FIRM well known in Canada for its first class cemented carbide products: diamental and diaferid dies and tools, wants commission representative. Specialties, tips for tools, tipped tools, wire and tube drawing dies, wearing parts etc. Write to Agence Havas Dijon (France) No. 40326. Apply to File No. 1578-V.

SALES ENGINEER required by manufacturer in the Province of Quebec. Applicant would be obliged to estimate contracts and have some metallurgical knowledge. Apply to File No. 1580-V.

PATENT LAWYER required by automotive industry in Ontario, with engineering background, for trade mark and patent work. Apply to File No. 1583-V.

TOOL ENGINEER required by large automotive plant. Mechanical preferred. Senior position as supervisor in tool engineering department. Age 30 to 45 years. Apply to File No. 1583-V.

ENGINEERS AND DRAUGHTSMEN required by automotive industry in Ontario. Openings in field staff, foundry design, mechanical design, piping design, electrical design, construction design. Junior and Senior personnel required. Salaries open. Apply to File No. 1583-V.

CITY ENGINEER required by city located near Montreal. Applicant must be bilingual. Position will offer opportunity for promotion to city manager. Apply stating age, qualifications and salary expected to File No. 1585-V.

TECHNICAL DIRECTOR wanted for paper company producing from 100% rag to 100% sulfite papers. Applicant should be a graduate chemist or chemical engineer and must be bilingual. Surroundings are ideal and living conditions very good. Mills located near Montreal in the Laurentian Mountains Apply to File No. 1586-V.

GRADUATE CHEMICAL OR MECHANICAL ENGINEER required in Montreal. Applicant should have about 5-10 years experience. Some experience in construction, together with the installation of equipment, piping etc., estimating, layout of equipment, flow sheets and design of individual pieces. Applicant should also be familiar with the engineering procedures covering job cost control, together with the preparation of specifications. Apply to File No. 1587-V.

SALES ENGINEER required in Montreal for the sale of scaffolding material. Payment on commission basis only. Permanent position or part time employment offered. Must be bilingual. Apply to File No. 1591-V.

Situations Wanted

MECHANICAL ENGINEER (Sask. 1947) Age 28, married, family 1. At present employed near Montreal, desires position with good future, in Western Canada. Five years varied experience including sound background in maintenance engineering. Interested in plant or shop design, engineering and development or sales and service. Willing to undergo training period with Eastern company with good prospect of eventual employment in Western Canada. Apply to File No. 60-W.

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

GRADUATE CIVIL ENGINEER AND LAND SURVEYOR with proven ability to carry out responsiblities. Available on short notice. Over 23 years of wide experience on four continents. Experience includes design layout and field supervision of: roads, dams, buildings, drainage, irrigation works. Veteran C.R.E. and E.A.E., married, bilingual. Situations held in Canada: chief of survey—parties, resident engineer. Abroad: as district and assistant chief engineer for over 19 years in the British, Turkish, Iraqi, Government Services. Apply to File No. 489-W.

SCIENTIST WANTED

OTTAWA, ONTARIO

Applicant should be a graduate in engineering or science, preferably with post-graduate training in aeronautical engineering. A wide knowledge and at least five years' experience in aeronautics is essential. The applicant must have served in the R.C.A.F., preferably in a position of responsibility in aeronautical engineering or armament work. Experience in research and development work will be considered an additional qualification. Must have ability to work well with others, tact and good judgment, Canadian Citizen.

***Duties:* The chief duty of this position is to coordinate research programmes in aeronautical engineering in government laboratories and universities.**

***Salary:* $3600-$5700 depending upon qualifications and experience.**

***Apply to:* Box 1274, Station B, Ottawa, Ontario.**

ELECTRICAL ENGINEER, S.E.I.C. McGill University 1950 (Power Option). Four years service with R.C.A.F. as radar mechanic and technical officer. Experience during summer; inspector of high-speed production lines in Canadian factory and Civil Service inspector of watthour meters. Desire work in power or communications fields. Age 30, single. Location preference Montreal or southern Ontario. Available immediately. Apply to File No. 821-W.

CIVIL ENGINEER, 23 years, McGill 1950. Have had one summer on road construction and two on hydro-electric development. Now employed but seeks change. Desires position in industry or construction anywhere in Canada. Apply to File No. 1234-W.

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

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

DETAILER-CHECKER in structural steel, reinforced concrete. Available for immediate employment on hourly, per diem, or month basis. Permanent position as structural engineer desired. (M.E.I.C. P.Eng). Location and starting salary are secondary factors only. Apply to File No. 1935-W.

INDUSTRIAL CHEMICAL ENGINEER, M.E.I.C., B.Eng. (McGill 1936, M.B.A. (Harvard 1938), P.Eng. (Ontario). Veteran R.C.A. Married. One child. Age. 36. Seeking employment in Nova Scotia only. Presently employed as general manager and sole executive of small business comprising seventy employees. Other experience includes teaching of industrial management and cost accounting in University. Would prefer similar employment or in larger organization as production manager, labour director, or comptroller. Present income based on profit and willing to work on same basis. Willing to purchase or invest in small business. Willing to accept temporary employment and to travel to Nova Scotia at own expense for interview. Apply to File No. 2584-W.

GRADUATE MECHANICAL ENGINEER (Jr.E.I.C., P.Eng. Quebec) desires part time employment with consultant or others in mechanical or structural fields. Interested in designing, checking, estimating or draughting. Available evenings and week-ends in Montreal district. Apply to File No. 2909-W.

MECHANICAL ENGINEER, P.Eng., McGill 1944. 8 years industrial experience. shop fabrication experience, wage incentive installation, timestudy, production and cost control, plant supervision, excellent experience in welding field, methods, cost estimating, design. Sound business background and organizing ability in volume production and job contract. Desire industrial, sales, or plant engineering. Available four weeks. Apply to File No. 2920-W.

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

MECHANICAL AND INDUSTRIAL ENGINEER graduate 1944, Jr.E.I.C., P.Eng. Ontario. Seven years varied engineering, production and cost analyzing experience in building products, basic steel foundry and machinery manufacturing. Desires permanent position in lines of industrial engineering for general manufacturing administration. Available on short notice. Apply to File No. 2955-W.

MECHANICAL ENGINEER, Sask. 1944, P.Eng. Age 29. married, desires position with responsibilty and opportunity for advancement. Experience includes four years supervising maintenance and construction in the pulp and paper industry, one year in the Engineering Department of a large textile mill and two years as a supervisor for a contracting firm in the oil fields and oil refineries. Have speaking knowledge of French. Apply to File No. 3313-W.

GRADUATE ELECTRICAL ENGINEER, McGill 1950. Age 23, single, bilingual. Presently employed but desires position with good future in Montreal. Diversified experience in telephone line, road and building construction. Available on short notice. Apply to File No. 3166-W.

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

CHEMICAL ENGINEER, age 21, graduate McGill University 1950. Western Canadian now in Montreal would like position in Winnipeg or vicinity. Available immediately. Apply to File No. 3327-W.

ELECTRICAL ENGINEER, Queen's 1949, S.E.I.C. Seek change to the design, draughting or production engineering in the electrical or electronic field. Experience includes, prewar: watthour meters, industrial control and switchgear apparatus; post war: electronic development in research laboratory. Age 32, married, no dependents. Will consider any location offering opportunity for advancement. Apply to File No. 3328-W.

ELECTRICAL ENGINEER, S.E.I.C. Graduated in May 1950 from University of Manitoba. Age 25 and single. Two years experience with R.C.A.F. electrical and radio equipment. Two summers experience in electrical power distribution field. Also experience in aircraft mechanical overhaul field. Desires position in power or communications field. Available immediately. Apply to File No. 3329-W.

CIVIL ENGINEER (Man.) 1948 Jr.E.I.C. with experience in topographical surveying, airport runway construction, and hydrology, desires position in hydraulics or with construction firm. Apply to File No. 3336-W.

CIVIL ENGINEER, B.Sc., Jr.E.I.C., P.Eng. (Quebec) age 25, married, with car. 3 years experience including design, detailing, and estimating concrete and structural steel with architects, steel fabricators, concrete fabricators and engineers and contractors also liaison work with customers, architects and contractors. Desires relocation offering opportunity for design and liaison work with responsibility. Western provinces preferred. Available within three weeks of notification. Apply to File No. 3340-W.

ELECTRICAL ENGINEER, S.E.I.C., Manitoba, 1950. Married, veteran, age 29, temporarily employed in electronic development, desires more permanent position, preferably in industry or communications. Experience includes four years in the wireless trade R.C.A.F. and four summer's work on electrical substation installation. Will work anywhere in or beyond Canada. Apply to File No. 3341-W.

EXPERIENCED CHEMICAL ENGINEER from Sweden specializing in manufacturing of Macrocellular Building material such as blocks, slabs, girders, insulating boards etc. wishes to make contacts with manufacturers or research institutions who are interested to exploit and/or research the raw materials such as ashes from power station, oil shale, washery slagg etc. using lime as basic component. Apply to File No. 3343-W.

MECHANICAL ENGINEER, S.E.I.C., at present employed in Montreal would like part time employment evenings and week-ends. Designing, draughting, estimating etc. Apply to File No. 3344-W.

ELECTRICAL ENGINEER, S.E.I.C., B.E. N.S.T.C. 1950. Age 32, married. Pre-graduation experience: Four years power house installation, operation and maintenance. (Diesel driven generators). Supervised installation and maintenance of refrigeration equipment in modern cold storage plants. Two summers general field engineering work with a large construction company. One year as Assistant Utilities Superintendent (Water, Power, Sewage & Refrigeration) in connection with airport maintenance. Available immediately. Apply to File No. 3346-W.

ELECTRICAL ENGINEER, S.E.I.C. University of New Brunswick 1949. Completed Canadian General Electric test course in spring of 1950. Married. Age 23. Interested in design or production engineering, preferably around Toronto. Apply to File No. 3347-W.

ELECTRICAL HEATER SPECIALIST, graduate engineer, formerly employed by United States Company, designing and supervising the manufacture of electrical heaters, desires position with electrical concern doing similar work. Apply to File No. 3348-W.

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

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

TENDERS

for Construction of a Reinforced Concrete Wharf

AUCKLAND HARBOUR BOARD, N.Z.

Tenders are invited for the construction of a reinforced concrete piled jetty 1200 feet long by 310 feet wide and steel sheet-pile breastwork 760 feet long at Auckland, New Zealand.

Tender documents and plans may be obtained from Auckland Harbour Board, Auckland, New Zealand, or Mr. J. A. Malcolm, N.Z. Trade Commissioner, Room 609, Sun Life Insurance Building, Montreal, Canada.

Tenders close at Auckland, New Zealand, 6th February, 1951.

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

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

MECHANICAL ENGINEER, M.E.I.C., M.I.AE.SC. B.Eng. McGill 1940. Age 31. Presently employed good executive position in aircraft industry. Desire to broaden experience in production and business administration in other industries. R.C.A.F. for 5 years as engineer officer and 5 years in technical and administrative work on maintenance of aircraft with varied experience in design work, engineering supervision, direct supervision of labour force, budgeting, cost control, personnel and union relations. Extensive study since leaving university including establishment own business as a sideline has given good background. Interested in permanent position with future and can offer proven organizing and administrative ability with willingness to learn. Apply to File No. 3366-W.

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

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

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

LIBRARY NOTES

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BOOK REVIEW

PUBLIC SPEAKING CAN BE EASY ... FOR ENGINEERS, TOO:

Engineers' Council for Professional Development. New York, c1950. 24 pp., paper.

The engineer is so regularly taken to task for his incompetence on the speakers' platform that even the most ardent admirers of the profession will admit that, by and large, engineers are not good public speakers. Actually, the really competent speaker is a rare bird in any group, professional or otherwise, and the engineer is perhaps no more lacking in this regard than a good many of his similarly trained contemporaries.

Since it has been amply demonstrated that the engineering course is an excellent basic training for management and non-technical executive responsibility, more and more engineers are recognizing their deficiencies in the non-technical abilities required of managers and executives, and some progress is being made. In this field of public speaking some of the groups in the Institute, notably the Junior Section of the Montreal Branch have organized classes, and the enthusiasm with which these have been supported testifies that engineers are anxious to improve their speaking ability.

The Engineers' Council for Professional Development has been active through its Committee on Information and has produced a valuable little booklet entitled "Speaking Can Be Easy—for Engineers Too". It comprises twenty-four pages in a convenient 6 in. x 9 in. format and is written in a concise but informal way with cartoon illustrations to lighten the reading and maintain the informal approach. Undeniably, it packs much valuable guidance into 50 minutes' reading time.

Under a section on "The Speaker" it covers such points as types of presentation, planning and preparation, audience contact, platform manners, and others. A second section on "Meetings" offers pertinent guides for chairmen.

The booklet is no substitute for practical experience and, if you have been thinking of these matters and have enrolled, or plan to enroll, in one of the many speaking courses available we would not suggest that you buy this book instead. We do think, however, that it would be a valuable adjunct to a practical course in speaking. If you have not yet decided to do something about your ability before an audience, this little book might serve to get you underway.

It can be had by sending your order to headquarters with a remittance of 70 cents payable at par in Montreal.

W.D.L.

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Chemical Thermodynamics:

Frederick D. Rossini. New York, Wiley, c1950. 514 pp., paper.

Electronic Valves, 4 Volumes:

Eindhoven (Netherlands), N. V. Philips' Gloeilampenfabrieken, 1949. V. 1—**Fundamentals of Radio-Valve Technique.** *J. Deketh. 535 pp., illus., cloth* V. 2.—**Data and Circuits of Receiver and Amplifier Valves.** *The Publishers. 409 pp., illus., cloth,* V. 3.—**Data and Circuits of Receiver and Amplifier Valves (First Supplement).** *The Publishers. 213 pp., illus., cloth.* V. 4—**Application of the Electronic Valve in Radio Receivers and Amplifiers.** *B. G. Dammers and others. 416 pp., illus., cloth.*

Elements of Oil Reservoir Engineering:

Sylvain J. Pirson. Toronto, McGraw-Hill, 1950. 441 pp., illus., cloth.

Elements of Internal Cumbustion Turbine Theory:

H. T. Adams. Toronto, MacMillan, 1949. 178 pp., illus., cloth.

Evolution of Scientific Thought from Newton to Einstein; 2nd. ed.:

A. d'Abro. New York, Dover, 1950. 481 pp., cloth.

LIBRARY REGULATIONS

Hours

	Oct.-Apr.	May-Sept.
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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.

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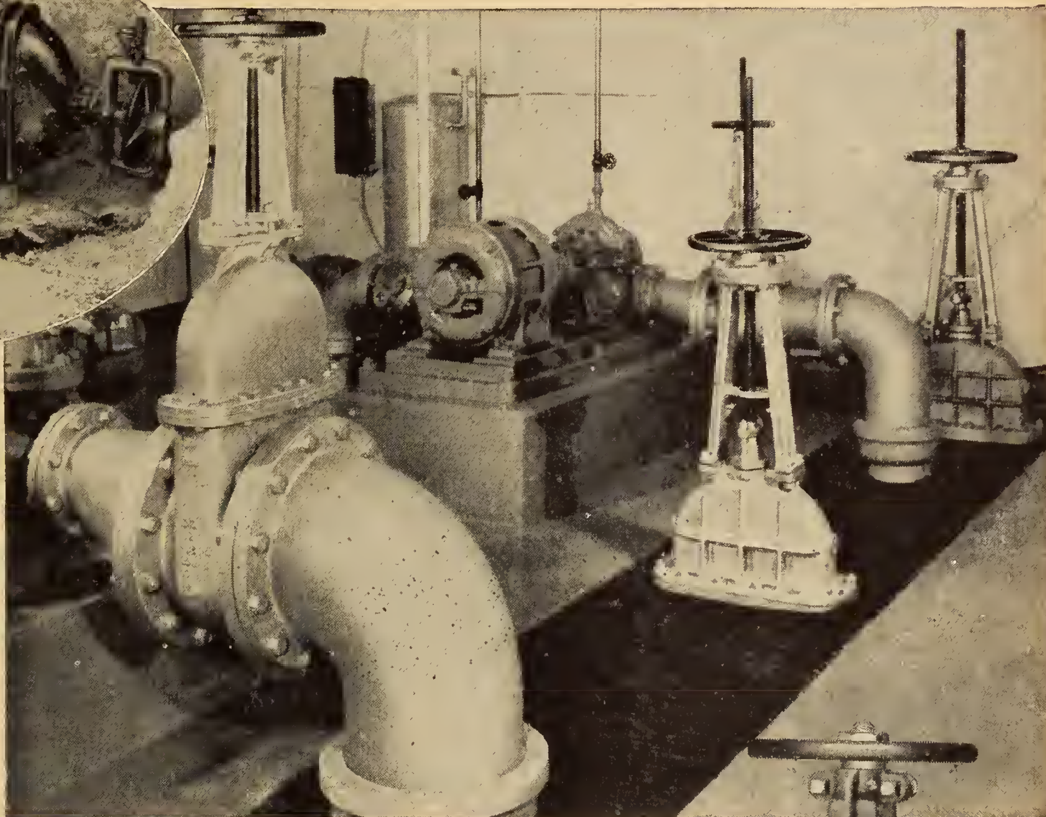

(*Right*) Raw Water Inlet to high service pumps in suburban water plant, equipped with Crane low pressure gate valves

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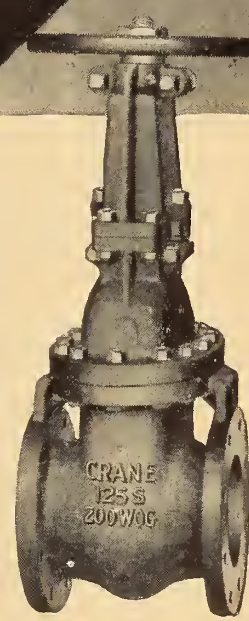
(*Right*) No 465½, Outside Screw and Yoke, Flanged —Brass Seats, Brass Stem—one of the sturdy well-proportioned Iron Body Wedge Gate Valves from the Crane line which are providing long and dependable service to Canadian industry. See Crane 41 Catalogue literature.



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Heat Insulation:
Gordon B. Wilkes. New York, Wiley, c1950. 224 pp., illus., cloth.

How to Subdivide for Housing Developments:
Harold Spence-Sales. Ottawa, Community Planning Association of Canada. 1950. 36 pp., illus., paper.

Human Use of Human Beings; Cybernetics and Society:
Norbert Wiener. Boston, Houghton Mifflin, 1950. 241 pp., cloth.

Linear Integral Equations:
William Vernon Lovitt. New York, Dover, 1950. 253 pp., cloth.

Petroleum Production Engineering: Petroleum Production Economics:
Lester Charles Uren. Toronto, McGraw-Hill, 1950. 639 pp., cloth.

Response of Physical Systems:
John Dezendorf Trimmer. New York, Wiley, c1950. 268 pp., illus., cloth.

Rural Electrification Engineering:
U. F. Earp. Toronto, McGraw-Hill, 1950. 313 pp., illus., cloth.

Solidification of Castings, a Review of the Literature:
R. W. Ruddle. London, Institute of Metals, 1950. 116 pp., illus., cloth.

Symposium of Metallurgical Aspects of Non-Ferrous Metal Melting and Casting of Ingots for Working:
London, Institute of Metals, 1949. 168 pp., illus., cloth. (Institute of Metals Monograph and Report Series No. 6).

Symposium of Electronics in Research and Industry:
A. G. Peacock ed. London, Chapman, 1949. 199 pp., illus., cloth.

TV Installation Techniques:
Samuel L. Marshall. New York, Rider, c1950. 330 pp., illus., cloth.

Unit Operations:
George Granger Brown. New York, Wiley, c1950, 611 pp., illus., cloth.

TECHNICAL BULLETINS, ETC.

Corporation of Professional Engineers of Quebec. Official Lists of Members:
July 1950.

National Research Council of Canada. Building Code. Bulletins:
No. 1—1950.

National Research Council of Canada. Division of Building Research. Addresses:
No. DBR-1—Building Research. An Outline of the Tasks Ahead, by Robert F. Legget. No. DBR-2—Building Research in Canada, by Robert F. Legget. No. DBR-4—Building Research Progress Report 1949, by Robert F. Legget.

...Building Notes:
No. 1—Vermiculite, by E. V. Gibbons. No. 2—Instructions for Observation of Groundwater Levels on Housing Sites. No. 6—Modular Co-ordination.

...Reports:
A Note on Galloping Conductors, by F. Cheers.

...Technical Reports:
No. 1—Directory of Commercial Testing Laboratories in Canada, compiled by E. V. Gibbons. No. 3—Report on Space Requirements for Scientific Research Laboratories, by J. Lorne Gray.

...Translations:
No. TT-61—Electro-Kinetic Phenomena and their Application to Soil Mechanics, by W. Schaad. No. TT-62—Snow and Avalanches in Winter 1945/1946, by Edwin Bucher and Melchior Schild. No. TT-66—Discussion of Avalanche Defence Works, by Edwin Bucher. No. TT-95—Moisture Content ond Heat; Insulating Properties of Building Materials, by G. Hobohm. No. TT-96—Swedish Test Hut Research Program, by Nils Holmquist. No. TT-97—The economic Possibilities of the Heat Pump, by P. E. Wirth. No. TT-131—Embedded Pipes; Static Investigation of Embedded Conduits, by Adolf Voellmy. No. TT-134—Yield Point of the Semi-Infinite Solid in Case of Local Loading, by K. Hruban.

Quebec Province. Department of Mines. Maps:
No. 850—Mining Properties in Chibougamau. No. 855—Mining Properties in Western Quebec.

U.S. Bureau of Mines. Information Circulars:
No. 7568—Methods of Excavation and Roof Support Used in Some Recently Constructed Tunnels, by S. P. Polack.

U.S. Geographical Survey. Water Supply Papers:
No. 1070—Public Water Supplies in Southern Texas. No. 1082—Surface Water Supply of the United States 1947; Part 2: South Atlantic Slope and Eastern Gulf of Mexico Basins. No. 1086—Surface Water Supply of the United States 1947. Part 6: Missouri River Basin. No. 1094—Surface Water Supply of the United States 1947. Part 14: Pacific Slope Basins in Orcgon and Lower Columbia River Basin.

PAMPHLETS, ETC.

Briquetting of Alberta Coals:
W. A. Lang. Canadian Institute of Mining and Metallurgy, 1950.

Current Statistics on Coal in Canada:
C. L. O'Brian. Canadian Institute of Mining and Metallurgy, 1950.

Dry Cyaniding in Surface Combustion Furnaces:
Surface Combustion Corporation, Toledo, Ohio.

Dry (Gas) Cyaniding in "Surface" Continuous and Batch Type Furnaces:
Surface Combustion Corporation, Toledo, Ohio.

Facts About Brazil:
Brazilian Government Trade Bureau, Montreal.

Operation and Maintenance of Hand-Fired Cast-Iron Central Heating Boilers:
David Kut. Reprint from The Industrial Heating Engineer, London, May-June, 1950.

Recommendations for the Standardization of the Radiographic Examination of Welded Joints in Mild Steel Pressure Vessels:
British Welding Research Association. Reprint from Welding Research, Vol. 1. No. 3.

Refrigerant Tables, Charts and Characteristics:
American Society of Refrigerating Engineers, New York, 1950. Reprint from the ASRE Basic Data Book.

Special Tax on Private Companies Undistributed Income, for Company Officers, Accountants, Lawyers:
CCH Canadian Limited, Montreal, 1950.

BOOK NOTES

Prepared by the Library of The Engineering Institute of Canada.

A.S.T.M. PUBLICATIONS:

American Society for Testing Materials, 1916 Race Street, Philadelphia, Pennsylvania:

Appendix (1950) to A.S.T.M. Manual of Engine Test Methods for Rating Fuels. 32 pp., $1.00.

This appendix, issued January 1950, was prepared by the Division on Combustion Characteristics of A.S.T.M. Committee D-2 on Petroleum Products and Lubricants. It includes ehanges through 1949 in the 1948 A.S.T.M. Manual of Engine Test Methods for Rating Fuels.

Data on Corrosion-and Heat-Resistant Steels and Alloys, Wrought and Cast. 84 pp., $2.50.

These new tables of data deal with the composition and properties of the wrought corrosion-resistant and heat-resistant ehromium and chromium-niekel steels and alloy castings. The data for the different steels have been eondensed to the simplest form to provide a ready reference for both the maker and user of the steels.

Specifications for Steel Flat Products. $2.25.

This new eompilation includes 39 speeifieations for steel flat products: plate, strip, sheet, and related materials. The materials covered are widely used for structural purposes, and for boiler and pressure vessels. For convenience, a number of the standards relating to stainless steel, wrought iron, and metallic coated sheets are given also.

Standards on Electrical Insulating Materials (with Related Information). 670 pp., $4.85.

The quality requirements for a wide range of electrical insulating materials and the test methods issued by A.S.T.M. are widely applied both in the production and the use of these materials. Some idea of the eoverage may be gathered from the following subjects covered: Insulating Shellac and Varnish, Mineral Oils for Electrical Insulation, Insulating Papers, Solid Filling and Treating Compounds, etc.

Standards on Gaseous fuels. 100 pp., $1.15.

This special publication contains the 3 standardized methods developed by the A.S.T.M., for determining: The Calorific Value of Gaseous Fuels, The Specific Gravity of Gaseous Fuels, and Measuring Gaseous Fuel Samples. In the last two eases, variant methods are explained.

Standards on Industrial Water. 142 pp., $1.75.

This compilation brings together in convenient form the various A.S.T.M. standard methods of sampling, analysis, and testing of industrial water for use of all those interested in this field. Included are 26 methods which cover sampling, analysis, corrosivity tests, methods of reporting and general testing methods.

Standards on Mineral Aggregates, Concrete, and Nonbituminous Highway Materials. 240 pp., $2.25.

Thirteen of the standards are specifications for various types and properties of aggregates and these materials are also covered in 27 test methods and definitions of terms. The specifications for ready-mixed concrete is included, and there are 21 widely used tests and definitions given for concrete.

Standards on Rubber Products (with Related Information). 653 pp., $4.75.

This book includes all the standard and tentative test methods and specifications pertaining to rubber products, which have been issued through the A.S.T.M. Committee on Rubber Products. Standards cover Processibility Tests, Chemical Tests of Vulcanized Rubber, Aging and Weathering Tests of Rubber, Hose and Belting, Automotive and Aeronautical Rubber, Electrical Protective Equipment, etc.

Strength of Wrought Steels at Elevated Temperatures. 112 pp., $3.00.

This 1950 Report gives a great wealth of information and data on the chemical and physical properties of wrought steels at elevated temperatures. One of the important features is the fact that standard commercial grades of steel are covered, the latest data on tensile, creep, and rupture properties being given. The first part of the report covers the plain carbon and alloy steels containing molybdenum and up to 3 per cent chromium; the second part covers the ferritic and austenitic steels with more than 5 per cent chromium.

Symposium on Accelerated Durability Testing of Bituminous Materials. 184 pp., $2.00.

This work deals with the subject of predeterminating how long the material will withstand the effects of weathering. Much technical research has been devoted to accelerated tests and this paper summarizes much of the work, noting latest trends. In general, the symposium papers cover all bituminous materials, and their uses for both highway and roofing purposes.

Symposium on Dynamic Stress Determinations. 64 pp., $1.50.

The purpose of the symposium was to present in a single source pertinent information on the scope, applicability, possibilities and limitations of electronic measurng and recording devices. This publication will be of interest to those who may have to undertake such tests or have to apply the results obtained.

Symposium on Evaluation Tests for Stainless Steels. 236 pp., $2.50.

During this symposium, special attention was focused on two features: first, the significance of results of the laboratory evaluation tests with relation to practical experience under diverse service conditions and, second, the effects on behavior of the alloys on and in use, of lowering carbon contents to extremely low limits.

BRITISH STANDARDS:

British Standard Institution, 24/28 Victoria St., London, S.W.1.

B.S. 18: 1950 — Tensile Testing of Metals, 2/6.

WILEY BOOKS

DATA-PACKED FOR ENGINEERS

HANDBOOK OF EXPERIMENTAL STRESS ANALYSIS. *Edited by* M. Hetényi, *Northwestern University.* Written by 31 experts. Contains all existing experimental methods for the determination of mechanical strength. 1950. 1,077 pages. 820 illus. $19.50.

STEAM TURBINES AND THEIR CYCLES. *By* J. Kenneth Salisbury, *General Electric Company.* The essentials of design of steam turbines. Contains an original and highly practical cycle evaluation method. 1950. 645 pages. 221 illus. $11.70.

Kent's MECHANICAL ENGINEERS' HANDBOOK, TWELFTH EDITION. Vol. I, **POWER.** *Edited by* J. Kenneth Salisbury, *General Electric Company,* with 80 contributors. 1950. 1,459 pages. 1,024 illus. $11.05. Vol. II, **DESIGN AND PRODUCTION,** *Edited by* Colin Carmichael, *Editor, Machine Design,* with 92 contributors. 1950. 1,660 pages. 1,459 illus. $11.05. The standard handbook for mechanical engineers, authoritative in its field since 1895. Revised and enlarged. Each volume may be bought separately.

INDUSTRIAL INSTRUMENTATION. *By* Donald P. Eckman, *Cornell University.* Presents principles and methods of measurement for temperature, pressure, rate of flow, and composition. 1950. 396 pages. $6.50.

GAS PRODUCERS AND BLAST FURNACES. *By* Wilhelm Gumz, *Battelle Memorial Institute.* The mechanism of the gasification process, from basic facts to a generally applicable calculation method. 1950. 316 pages. $9.10.

HEAT INSULATION. *By* Gordon B. Wilkes, *The Massachusetts Institute of Technology.* Technical and laboratory data for more effective insulation. Much material on reflective insulation is original. 1950. 224 pages. $5.20.

REFRIGERATION ENGINEERING, SECOND EDITION. *By* the late H. J. MacIntire *and* F. W. Hutchinson, *University of California.* From theory to today's commercial equipment—a wide coverage, brought up to date and largely rewritten from the successful first edition. 1950. 610 pages. $8.45.

Pender's ELECTRICAL ENGINEERS' HANDBOOK, FOURTH EDITION. *Edited by* Harold Pender, *University of Pennsylvania.* Vol. I, **ELECTRIC POWER,** *with* William A. Del Mar, *Phelps Dodge Copper Products Corporation.* 1950. 1,716 pages. $11.05. Vol. II. **COMMUNICATION-ELECTRONICS,** *with* Knox McIlwain, *Hazeltine Electronics Corporation.* 1950. 1,618 pages. $11.05. A compact collection of practical data, charts and tables prepared by scores of specialists in all branches of electrical engineering. Each volume may be bought separately.

PRIMARY BATTERIES. *By* George Wood Vinal, *National Bureau of Standards.* Complete and thorough coverage. The first comprehensive book on the subject since 1915. 1950. 336 pages. $6.50.

ELECTROMAGNETIC FIELDS: THEORY AND APPLICATION. *By* Ernst Weber, *Polytechnic Institute of Brooklyn.* Vol. I, **MAPPING OF FIELDS.** All the different means of obtaining field distributions that can be derived from potential functions. 1950. 590 pages. $13.00.

THEORY OF THE INTERIOR BALLISTICS OF GUNS. *By* J. Corner, *Research Scientist, British Ministry of Supply.* A fresh approach, with new data revealed by advanced research techniques. 1950. 443 pages. $10.40.

SURVEY OF MODERN ELECTRONICS. *By* Paul G. Andres, *Illinois Institute of Technology.* Examines the practical application of electronic principles in industry today. 1950. 522 pages. $7.43

RESPONSE OF PHYSICAL SYSTEMS. *By* John D. Trimmer, *University of Tennessee.* Considers instruments, regulators and servos; also biological and sociological entities. 1950. 268 pages. $6.50.

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This standard contains the definitions of the principal terms relating to the tensile strength of materials, the forms of standard tensile test pieces, and the standard methods of procedure for tensile testing.

B.S. 328: 1950—Twist Drills and Combined Drill and Countersink, 6/–.

An important innovation in the specification is the emphasis of "preferred sizes" and the quotation of the alternatives in the tables covering the drill gauge and letter sizes of twist drills. The dimensions of self drive holding tapers are mentioned in an appendix.

B.S. 482: 1950—Wrought Iron and Mild Steel Hooks, 5/–.

In this edition of the 1945 edition, the internal shape of eye-hooks for use with chain has been amended and the projection of the point of the hook in all trapezoidal eyehooks has been decreased. Among other additions is an alternative Figure and Table for the shanks of trapezoidal shank hooks with integral collars where of increased internal diameter for small loads.

B.S. 598: 1950—Sampling and Examination of Bituminous road Mixtures, 4/–.

This standard includes methods of examination for specific gravity and voids, soluble binder content, water content, and content of mineral aggregate. It also includes a method for the recovery of soluble bitumen and describes the pat stain test.

B.S. 811: 1950—Cycle Threads, 3/–.

This new edition includes complete tables of tolerances for the cycle threads for bolts and nuts and also for special applications, such as those related to steering columns, hubs and sprockets, and bracket cups. For spokes and nipples the basic dimensions only are included, tolerances still being under consideration.

B.S. 870: 1950—External Micrometers, 2/6.

The present revision of the 1939 Standard, represents an extension to cover micrometers of 0 to ½ in. and from 12 in. to 24 in., with their corresponding metric equivalents, and also provides for micrometers with interchangeable anvils and various measuring ranges up to 24 in. or 600 mm.

B.S. 1453: 1950—Steel Filler Rods for Gas Welding of Mild Steel, 1/–.

British Standard 1453 covers rods for applications in which a minimum butt weld strength of 28 tons per sq. in. is required and supersedes a tentative specification produced as Appendix A to B.S. 693: 1940—Oxy-acetylene Welding in Mild Steel. It does not cover steel rods for general welding purposes.

B.S. 1620: 1950—Dimensions of Screened Magnetos (G, K and M Types), 2/6.

The Standard lays down dimensions for large and small magnetos for small single-cylinder and twin-cylinder engines and also for small magnetos for multi-cylinder engines. It also includes dimensions for keyways and tapers, and all the necessary tolerances which affect interchangeability.

B.S. 1639: 1950—Simple Bend Test, 2/–.

Although the simple bend test is widely used to give a ready qualitative assessment of the ductility of a metal, it is not generally appreciated that certain features of the test, probably because of its simplicity, have to be given due consideration. It is hoped that these notes will be of assistance in this respect.

B.S. 1647: 1950—pH Scale, 2/–.

The object of this Standard is to ensure that, when different workers refer to a stated measured value of pH, they mean the same thing within ± 0.005. The Standard makes it clear that this degree of accuracy is only attainable with aqueous solutions at temperatures between 0°C and 60°C, and that oxidizing agents or other highly reactive materials tend to reduce this accuracy.

B.S. 1650 Pt. 1: 1950—Industrial Capacitors for Connection to Power Frequency Systems, 2/6.

Part 1 covers all impregnated paper dielectric fixed capacitors normally rated in kVAr, for connection to power frequency systems, and relates to continnuously-rated capacitors for power factor correction.

B.S. 1651: 1950—Industrial Safety Gloves, 4/–.

This Standard is designed to canalize the demand for safety gloves from more than two hundred different types now commonly supplied, each type in several sizes, into a range of seventeen preferred types, each supplied in a minimum range of sizes. The gloves specified are designed to provide adequate protection, and also to overcome weak points existing in the past.

B.S. 1655: 1950—Flanged Automatic Control Valves (Face-to-Face Dimensions), 2/6.

The Standard has been devised primarily to cover the face-to-face dimensions of automatic control valves of the conventional pneumatic diaphragm operated single or double beat type, with a recommendation that other control valves should also comply with the standard.

ADVANCED SURVEYING V. 2, 2nd ed.:

William Horace Rayner, Toronto, Van Nostrand, 1950. 369 pp., illus., cloth, $5.40.

The principal condition that this revision attempts to meet is the growth of the subject of photogrammetry. For example, the Master Parallax Table in this volume displaces the approximate tables formerly used, and yields exact differential parallax values. The aim has been to treat those applications of photogrammetry which are most common to engineering construction projects rather than the highly specialized mapping procedures, and which can be taught with inexpensive equipment. To this end, a large number of both problems and drawing-room exercises are given.

ANALYSIS AND DESIGN OF EXPERIMENTS, ANALYSIS OF VARIANCE AND ANALYSIS OF VARIANCE DESIGNS:

H. B. Mann. New York, Dover, c1949. 198 pp., cloth, $2.95.

This book offers to the mature mathematician with no background in statistics a method of grasping the analysis of variance and variance design within a reasonably short time. For the student and teacher in either graduate or advanced undergraduate courses, it provides a helpful textbook on the subject. For the practical experimenter and statistician, it serves as an excellent guide to the methods used in the analysis of variance and in the construction of variance designs.

ELECTRICAL AND RADIO DICTIONARY, INCLUDING SYMBOLS, FORMULAS, DIAGRAMS AND TABLES, 4th ed.:

Carl H. Dunlap and others. Toronto, General Pub. Co., c1950. 133 pp., cloth, $2.50.

This book contains more than just the definitions of technical words used in electrical, radio, and television work; it is intended as the means by which the beginner becomes familiar with the words, terms and symbols used by the electrical engineer, the expert, the technician and the electrician. It will supplement ordinary dictionaries by bringing out the special significance and value of the words as applied to electricity, electronics and radio.

ENGINEERING INDUSTRIES ASSOCIATION CLASSIFIED DIRECTORY, 3rd ed.:

Engineering Industries Association. London, The Association, 1950. 424 pp., cloth, 32/6.

Indexed and cross-indexed in the greatest detail the Directory, as far as possible is a complete record of the Members of the Engineering Industries Association, and their products up to December 31st, 1949. Its contents have been so arranged that names and addresses of members, their telephone numbers and the diversity of their manufactures are readily available to buyers, both at home and overseas.

ESTIMATING MANUAL FOR HEATING AND PIPING SYSTEMS:

H. A. Erickson. New York, Scott-Choate, Toronto, MacLean-Hunter (Canada), 1949. 112 pp., diags., charts, tables, cloth, $3.75.

This manual provides, in tabular form, practical labor data for those who are concerned with estimating the cost of assembling, fabricating and installing the material required for the construction of heating and piping systems in the building industry. It includes tables of time periods for various job operations.

HOW TO PLAN PENSIONS: A GUIDE BOOK FOR BUSINESS AND INDUSTRY:

Carroll W. Boyce. Toronto, McGraw-Hill, 1950. 479 pp., cloth, $6.50.

This book is intended to provide background information and to be a guide to action for the man who must decide pension policy, or sits on pensions committee, or has to handle pensions grievances. It is not intended to provide the actuarial, financial, and legal information required by technicians in those specialized fields of pension planning and administration.

HYDROLOGY, THE FUNDAMENTAL BASIS OF HYDRAULIC ENGINEERING, 2nd ed.:

Daniel W. Mead. 2nd ed. rev. & enl. by Mead and Hunt, Inc., McGraw-Hill Book Co., New York, 1950. 428 pp., illus., diagrs., charts, maps, tables, 9¼ x 6¼ in., cloth, $9.10.

Completely revised since its first publication in 1919, this standard text now also provides sections covering recent developments, such as: a discussion of the Bergeron analysis of meteorological phenomena in terms of air masses, a new approach to evaporation theory and methods of measurement, the new techniques and possible consequences of producing artificial rainfall, methods of weighing precipitation records, the application of the theory of probability to hydrologic data, and the application of statistical theory to flood frequency.

JET PROPULSION: TURBOPROPS:

Volney C. Finch. Millbrae, California, National Press, 1950. 256 pp., illus., cloth, $5.00.

This exposition of the new aircraft powerplant was planned on the Engineers' Council for Professional Development postwar specification for engineering study, and is a collection of recent applications of generic principles to the development, design, construction, operation, and evaluation of the turboprop. This book does not deal with fundamentals alone, nor does it omit descriptive matter on current turboprops that may become obsolete in a short time. It is well illustrated with plans, diagrams, power curves, etc.

PATENT TACTICS AND LAW, 3rd ed.:

Roger Sherman Hoar. New York, Ronald Press, c1950. 352 pp., cloth, $7.00.

The present book, completely revised to meet the revolutionary changes that have taken place in patent law, is a treatise upon patent tactics, plus a translation into plain English of so much of patent law as will enable a business executive, an engineer, or an independent inventor to understand and to cooperate with his attorney when dealing with a specific patent problem. This book is intended for business executives, engineers and inventors. It contains numerous references and citations.

STATIONARY COMPRESSION IGNITION ENGINES. PRINCIPLES AND APPLICATIONS:

C. H. Bradbury. London, Spon, 1950, 226 pp., illus., cloth, 24s.

This book has been specially compiled to fill the gap between the orthodox textbook on heat engines, and the book which deals with design and general descriptive matter. Formulae and definitions are grouped in a special chapter, and are therefore readily accessible. The book contains a chapter on "Noise and its elimination". Combustion, Fuel Injection and Supercharging are treated, as well as Noise Problems, Vibration, Foundations, Maintenance and Operation.

THEORY AND DESIGN OF ELECTRON BEAMS:

J. H. Pierce. Toronto, Van Nostrand, 1949. 197 pp., illus., cloth, $4.75.

This book represents an effort to collect together with reasonable orderliness the minimum amount of theoretical material necessary for a good understanding of electron flow and electron focusing in devices other than electron microscopes and image tubes. The author has tried to present material so that it can be understood without references to other sources. No attempt is made to deal with problems of experimental technique. Much material on electron optics is included, and some emphasis is put on space charge and thermal velocities.

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.

ACHEMA JAHRBUGH, Jahrgang 1940/50, edited by H. Bretschneider.

Published by Dechema, Deutsche Cesallschaft fur chemisches Apparatewesen, Frankfurt am Main, Germany. 704 pp., illus., diagrs., tables, 8¼ x 5¾ in., paper, apply.

This yearbook contains a survey of the performance and manufacturing programs of the firms which manufacture chemical apparatus in Germany. One section contains brief articles by scientific and technical leaders. There are alphabetical listings of firms and of products.

DICTIONARY OF METALLOGRAPHY.

By R. T. Rolfe, 2 ed. rev. Chapman & Hall, Ltd., London, W.C.2, England, 1949. 287 pp., tables 8¾ x 5½ in., cloth, 18s.

Intended for engineers and metallurgists, this dictionary lists 1,350 terms used in the branch of science dealing with the constitution and structure of metals and alloys and their relation to metallic properties. Some electrical terms are given but chemical, physical and magnetic terms are mainly excluded, and only the main systems of alloys are treated. For full explanation the definitions in many cases have been made more extensive than in normal dictionary practice.

ELECTROMAGNETIC FIELDS, Theory and Applications, Volume I. Mapping of Fields.

By E. Weber. John Wiley & Sons, New York; Chapman & Hall, London, 1950. 590 pp., diagrs., charts, tables, 8¾ x 5¾ in., cloth, $10.00.

This book presents a survey of the methods of mapping the distribution of static electric and magnetic fields that can be derived from potential functions. Following a study of basic relations, the analytical, experimental, graphical and numerical methods are considered. These methods are applicable to problems of stationary heat flow, stationary flow of incompressible fluids, stationary electric current flow, and gravitation as well as to the major illustrations of electric and magnetic fields.

ELECTROMAGNETIC THEORY.

By O. Heaviside with introduction by E. Weber. Dover Publications, New York, 1950. 386 pp., diagrs., tables, 12½ x 9 in., cloth, $7.50.

This reissue of a classic scientific work includes the three original volumes in one book by using somewhat oversize pages and a reorganized format. Suitable page numbering allows reference to the text from the original contents pages which are also included. A critical and historical introduction precedes the text together with a biography, both with lists of references to further reading.

FORTSCHRITTE IN STAHLBETON durch hochwertige Werkstoffe und neue Forschungen.

By R. Saliger. Franz Deuticke, Vienna, Austria, 1950. 138 pp., illus., diagrs., charts, tables, 10 x 6¾ in., paper, $3.20; S 48; sfr. 12.

The technology and mechanical properties of steel reinforcing-bars for concrete are analyzed in considerable detail, with particular consideration given to the value of high-quality steels for reinforcement. Topics covered include tensile strength, ductility, slipping resistance, crack formation, and the importance of certain qualities to the strength of beams, columns, and structures as a whole. The types of bars and the research results are mainly European. There is a bibliography.

HANDBOOK OF EXPERIMENTAL STRESS ANALYSIS.

Edited by M. Hetényi. John Wiley & Sons, New York; Chapman & Hall, London, 1950. 1,077 pp., illus., diagrs., charts, tables, 9¼ x 6 in., fabrikoid, $15.00.

This comprehensive reference book, written by thirty-one authorities in the field, contains all the major experimental procedures that are being used in the investigation of mechanical strength. The methods included range from mechanical gages to X-ray analysis. Topics of interest, such as residual stresses, interpretation of service fractures, and analogies are also included. In the appendix three theoretical subjects—theory of elasticity, dimensional analysis, and precision of measurements—are treated. Brief annotations are given to the references which are found at the end of each chapter.

HISTOIRE DE LA MECANIQUE. (Bibliothèque Scientifique 16).

By R. Dugas. Editions Dunod, Paris; Editions du Griffon, Neuchatel, Switzerland, 1950. 649 pp., diagrs., tables, 9 x 6¼ in., cloth, 5,300 frs.

Part I deals with the forerunners and pioneers of the field of mechanics, covering the important men, schools of thought, fields of activities, and developments from the Greeks and Arabs to the time of Kepler in the 17th century. The formulation of the classical mechanics during the 17th century is discussed in part II, with parts III and IV covering the organization and development that took place during the 18th and 19th centuries. Part V takes up the 20th century concepts: the relativity theory; quantum mechanics; wave mechanics; and the various developments of statistical mechanics.

INTRODUCTION TO EXPERIMENTAL STRESS ANALYSIS.

By G. H. Lee. John Wiley & Sons, Inc., New York; Chapman & Hall, Ltd., London, 1950. 319 pp., illus., diagrs., charts, tables, 9¼ x 6 in., cloth, $5.50.

Theory, instrumentation and basic techniques are covered for the most commonly-used methods: mechanical and electrical strain gages, with particular attention to the resistance wire strain gage; the photoelastic method; brittle-lacquer techniques; the membrane and electrical analogies; the Beggs deformeter and other miscellaneous methods. The final chapter deals with the evaluation of experimental errors and the transmission of these errors through computational operations.

RATIONALISIERUNG ALS WELTBEWEGUNG in Spiegel ihrer Begriffslehre.

By H. von Haan. Orell Füssli Verlag, Zürich, Switzerland, 1949. 81 pp., 9 x 6 in., paper, 6 Sw. Frs.

Portraying scientific management as a world movement, this book presents a survey of the various systems now in use. It also provides a comparison of English, French, German and international terminology. The principal doctrines and laws of scientific management are also discussed.

SERVICING CIRCULAR-SCALE INSTRUMENTS.

By J. Spencer. Instruments Publishing Co., Pittsburgh, Pa., 1949. 90 pp., illus., diagrs., 8 x 4½ in., cloth, $1.50 (Canada, $1.75).

A reprint in book form of a series of articles which appeared in the magazine "Instruments", this manual covers both d-c. and a-c. instruments, including electrodynamic types, power factor meters, and synchroscopes. Trouble charts and a check list of essential tools and equipment are provided.

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	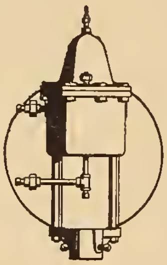	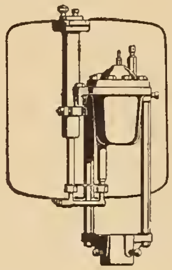	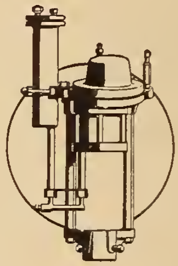	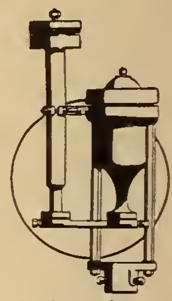
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17	Forged Steel	1800	10"–400"
8	Forged Steel	1500	50"–400"
6	Forged Steel	3500	100"–200"

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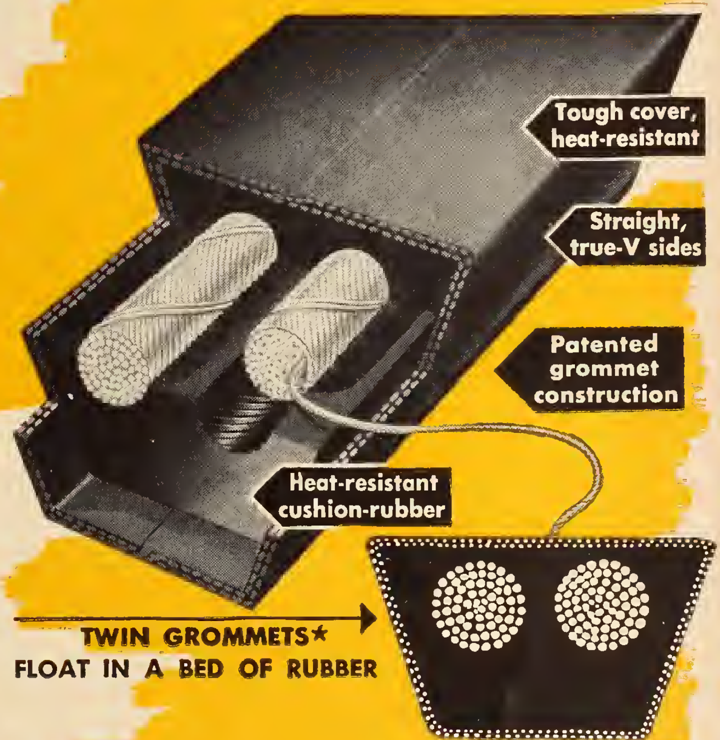

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Business & Industrial Briefs

A Digest of Information

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The Editor

New Equipment and Developments

British Capacitor Sales. — Following the recent shipment of a 15,000 k.v.a. bank of power capacitors for the Shawinigan Water & Power Company, British Insulated Callender's Cables Ltd. have now received a further large order for a 20,000 k.v.a. bank of capacitors. The capacitors are for operation at 10.3 kv. and have been ordered by the Aluminum Co. of Canada for installation on another section of the Shawinigan Water & Power system.

●

Festival of Britain Entrance. — The main entrance to the Festival of Britain Exhibition next year is to be roofed with laminated timber arches shaped like a parabola, each arch containing 25 separate layers of wood. Made from wood specially presented to the Festival by the British Columbia timber industry, they are the largest arches of this kind ever constructed in Europe.

●

Small Reduction Gears.—Crofts (Engineers) Ltd., of Bradford, England, manufacturers of power transmitting machinery for over sixty years, have developed a new line of small power worm reduction gears with a wide application for small conveyors, exhibition displays, agitators, mixers, laboratory equipment, etc. According to information received from the Company "The outstanding feature of these versatile little units is the use of a standardized main body, fitted with loose-feet which, when assembled in position, make the gear unit standard, inverted, or vertical. These universal mounting type reduction gears cover all powers up to 2⅛ hp, in ratios from 5-1 to 60-1."

These gears are stocked in Montreal by Britenco Ltd., 3524 St. James Street West, Montreal.

●

Hydraulic Coupling.—The Twin Disc Clutch Company, Racine, Wisconsin, announces the model HUD Disconnecting Hydraulic Coupling which is a new type of hydraulic drive which "dumps" the hydraulic fluid when desired to serve as its own master clutch and provide a complete disconnect between the prime mover and the load.

With the exception of provisions for the disconnecting feature, the new unit is similar to other twin disc double-circuit hydraulic couplings in both design and operating characteristics.

To act as its own master clutch, the new coupling is capable of dumping the hydraulic fluid in from one to four seconds, depending upon the speed of the coupling. When a control valve is actuated, to cut off the oil supply, the hydraulic fluid is rapidly released into a reservoir through four differential pressure dump valves, which are located in the outer diameter of the coupling. Complete information may be obtained by writing to the manufacturer.

●

Airhydropump.—Interesting opportunities are offered by the development of the Airhydropump, as this apparatus delivers liquid at any desired pressure within limits at the expense of a relatively small quantity of compressed air taken from the usual air line to be found in most engineering shops.

Manufactured in complete range of both single and double acting models, these pumps operate not only automatically but at definite pre-determined hydraulic pressure.

The single acting models range in size from those with an output of 56 cubic inches per stroke at 400 lb. per sq. inch pressure for an air-hydraulic ratio of 1 to 4 to an output of 2 cubic inches per stroke at 15,000 lb. per sq. inch pressure for an air-hydraulic ratio of 1 to 246. The double acting models range from 112 cubic inches per stroke at 230 lb. per sq. inch for a ratio of 1 to 2.37 to 6 cubic inches at 15,000 lb. per sq. inch for a ratio of 1 to 161.0.

The maximum permissible air pressure on any pump is 100 lb. per square inch, but the control valve will deal with line pressures up to 120 lb. per sq. inch. Manufactured by Charles S. Madan & Co. Ltd., of England, the sales representatives in Canada are Peacock Brothers Limited, P.O. Box 6070, Montreal, Que., who have descriptive literature on this equipment.

●

Fire Prevention.—A record class of 46 fire students — more than twice the size of any previous class — has just been graduated from the Ansul Chemical Company's customer fire training school in Marinette, Wis. Among those participating were members of the Royal Canadian Air Force; General Electric Co.; Imperial Oil Ltd., and other prominent manufacturing concerns.

●

Winter Auto Driving.—The National Research Council, makes the following recommendation with respect to the winter driving of automobiles.

If a vehicle can be kept in a warm garage at night the use of 10 W oil, with no special precautions except to maintain the battery properly, is generally satisfactory. When a car is allowed to stand in subzero temperatures until both engine and battery have reached air temperature, the lowest point for easy starting is about zero to 10°F below.

In more severe conditions, the vehicle operator may use 5 W oil or 10 W plus 10 per cent kerosene, and a block heater if the car is kept outside or in an unheated garage. Without heat, but with the use of 5 W oil and assuming a fully charged battery the lowest starting point, when all parts are chilled to this temperature, is about 20 to 25 degrees below zero. However, if provision is not made to keep the battery warm or to recharge it periodically, trouble will generally be experienced. Also there is some doubt whether 5 W oil can be used satisfactorily in any equipment heavier than passenger cars.

In the case of vehicles which must be operated under still more severe conditions, the following alternative is recommended — If the vehicle can be operated every day, provision for keeping the battery warm as previously suggested plus a properly designed dilution system, should be adequate down to 40 or 45 degrees below zero — if the vehicle must stand at low temperatures for longer periods, provision must be made by the use of gasoline or similar heaters for either keeping it warm, or for warming it up quickly when needed.

●

New Canadian Manufacture.—John Bertram and Sons Co. Ltd., have made an agreement with E. W. Bliss Co., of Canton, Ohio, whereby the Canadian Company will build a complete line of Bliss mechanical presses.

The purpose of the affiliation is to allow Bliss' Canadian customers to take advantage of Bertram's extensive manufacturing facilities and, at the same time, utilize to the fullest the Bliss Company's 90-years of experience in the design of power presses.

Canadian inquiries for Bliss presses will continue to be handled through the Bliss Canadian office which is located in the Canada Building, Windsor, Ontario.

●

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B Bank of Canada Montreal, Que.

C All-oluminum Bridge, Arvido, Que.

D Pine River Bridge, Pine River, B.C.

E Avalon Telephone Building, St. John's, Newfoundland.

F Internotianal Avi-otion Building, Montreol, Que.

G Nationol Research Laboratory, Saskatoon, Sask.

H Hotel Laurentien, Montreal, Que.

I Vocational School, Winnipeg, Man.

STRUCTURAL DIVISION*
DOMINION BRIDGE
COMPANY LIMITED
Established 1882

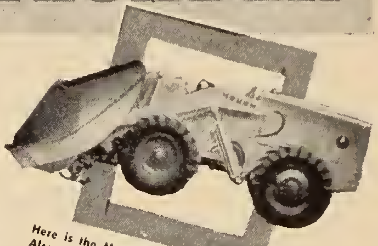
Plants at: **VANCOUVER, CALGARY, WINNIPEG, TORONTO, OTTAWA, MONTREAL.**
Associate Companies at: **EDMONTON, SAULT STE. MARIE, QUEBEC, AMHERST.**
**Other Divisions: MECHANICAL, BOILER, PLATEWORK, WAREHOUSE.*

In the Winter — a drift-busting brute for the Snow Belt . . it's a Model HM "PAYLOADER" equipped with "V" or Reversible Blade Plow.

In the Spring, Summer and Fall — with regular bucket it's an all-around excavating, earthmoving, loading and bulk materials handling tool.

The Model HM as a snow plow has the power, traction and speed ranges to crawl through heavy drifts or swoosh through lighter snows at speeds up to 16 mph. Four, big, pneumatic-tired wheels *with power on all four* provide the push that puts snow in its place — off the highway. Powerful hydraulic control exerts up to 3 tons of lifting capacity for "break-out" or tremendous down-pressure to dig in fast. Power-boosted rear wheel steering is easy and responsive . . four speeds in reverse as well as forward assure slow or fast action in either direction. All-weather cab is optional.

For summer or snow, for all-season *go* the HM "PAYLOADER" is a year-round tax saver Get the full facts from your Hough "PAYLOADER" Distributor



Here is the Model HM with "V" Snow Plow. Also available with Reversible Blade Plow.

Equipped with regular bucket, the Model HM is a fast snow loader. Interchange of bucket and plow is quickly accomplished.

CATALOGS on the big 1½ yard Model HM or the four smaller sizes of "PAYLOADERS" are available, without obligation.

Distributors for Province of Quebec

Chas. Cusson Limited

Quebec - MONTREAL - Val d'Or

D. H. & S. Produce New Crawler.—Dominion Hoist and Shovel Co. Ltd., Lachine, Quebec are now producing a ¾ yard Crawler Machine.

This Canadian built machine is known as the Dominion 380. The design incorporates new large-diameter uniform pressure cone swing clutches. For cool operation, these clutches are finned to assure rapid heat dissipation. Another feature is the new drum shaft assembly which incorporates a planetary-gear reversing mechanism for the crowding operation of the shovel. The split chain sprocket lends itself to quick removal for conversion to drum laggings suitable for pullshovel, clamshell, or dragline. The new "Gooseneck" pullshovel attachment has been designed for effective digging up to a depth of 20 feet. This feature is creating a great deal of favourable comment. The 380 is heavier than average ¾ yard machines with an arrangement of mechanism which minimizes dead weight. Power is supplied by an International Harvester Ud-14-A four cylinder Diesel engine which develops 68 hp. at 1150 r.p.m. This unit has an electric starting system. Ball and roller bearings are installed on all continuously- moving shafts. The standard tread links are 22 in. wide and driven by self-cleaning tread sprockets. For operation in soft ground, 27 in. swamp pads are available.

●

Cable Splice Welder.—Erico Products Inc., 2070 East 61st Place, Cleveland 3 Ohio, has developed the Cadweld splice welder for joining welding cable, quick connectors, and terminal lugs to give 100 per cent efficient cable connections.

The process is a method of welding copper to copper in which no outside source of heat is required. Powdered copper oxide and aluminum are dumped into a small graphite crucible and ignite by means of a spark. The molten copper flows over the cable ends in the graphite and these, too, become molten. In a few seconds, the cable ends are welded together in a solid homogeneous copper nugget.

It is first necessary to prepare the cable by stripping approximately one inch of insulation from each end to be joined. Both ends are then placed in the welder, butted together under the center of tap hole and the clamp-type crucible locked. A flint spark gun ignites the mixture and in about ten seconds the weld is completed.

The welder is available in two sizes, the first designed to handle 1/0 and 2/0 cable and the second 3/0 and 4/0 cable. The manufacturer will be pleased to send complete information.

●

Concrete Saws.—Clipper Manufacturing Co., 2800 Warwick St., Kansas City 8, have announced a new line of concrete saws. Tests have shown that concrete sawing is completely practical and economical on the smallest patch jobs as well as on production sawing of contraction joints on streets and highways. The cutting speed is 12 feet per minute in asphalts, and up to 5 feet per minute —1 inch deep — in limestone concrete. The maximum depth of cut is 6½ in.

Illustrated literature on these new saws is available.

●

C.G.E. Test Course.—Graduate engineers representing 11 universities are included in the 1950 test course at Canadian General Electric Co.

The course provides graduates in electrical and mechanical engineering with a broad study of the electrical industry and a knowledge of the design, manufacture, installation and performance—testing of almost all the products of the Canadian General Electric Company. In the second year of the course, the new engineers are attached to one or more of the engineering or commercial departments of the Company moving into jobs for which they show the greatest aptitude.

●

Asphalt Spray Bar.—A new non-clogging, no-drip asphalt spray bar to fit all distributors has been announced by the Wm. Bros. Boiler and Manufacturing Co. of Minneapolis, Minn. The bar, which is known as the Bros. Spraymatic is specially built for handling heavy bitumen material. It is a full-circulating, 3-section, hot bar, designed to eliminate non-uniform distribution, leaky valves, fat and lean streaks and clogged orifices.

Among the exclusive Bros. Spraymatic design features are the positive end-to-end circulation system accomplished by means of a centre partition the length of the bar; the new, non-clogging, self-screening nozzles and the ring packed, non-leaking 45 deg. swing joints.

●

Canada-U.K. Trade.—The following item is an extract from the Economic Record which is issued by the United Kingdom Information Office, 10 Albert St., Ottawa, Canada. (October, 1950)

"By unpegging the Canadian dollar and allowing it to find its own level, Canada has taken a bold step. For some 20 years the world has become accustomed to pegged currencies and the free market has been at a discount. Obviously, such a move could only have

(*Continued on page 1037*)

BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 1034*)

been made in the knowledge of the firm backing of a Canadian economy, stronger, more active, and more productive than at any previous period of Canada's history. Some of the dreams of increased multilateral trade with freely convertible currencies may yet be realized.

"For Canadians, the move should mean cheaper purchases overseas. For that reason there should be more trade between Britain and Canada. But Canadians will want to know whether Britain can go on 'delivering the goods'; whether Britain's new defence programme, with its vast demands on industry and manpower, will not mean that the goods will no longer be available to Canadians in their present quantity and quality. Obviously there is going to be less available in Britain. *But Canadians are to have first pick of what is available. They can order and rest assured that their orders will be given preference and put to the head of the list.*"

●

Spectacle Frames.—Walter Berger & Cie, 7 Place de Bordeaux, Strasbourg, France, are manufacturers of mouldings for spectacle lenses (meniscus and torics).

They are anxious to get in touch with Canadian companies which are interested in these products.

●

Constant Speed Grinder.—The South Bend Lathe Works, South Bend 22, Indiana, have developed a constant speed precision grinder for internal grinding which will maintain a more constant wheel speed under varying loads than was previously obtainable.

The new grinder is powered by a standard type, constant speed, continuous duty 1/6 hp. 3450 r.p.m., a-c motor. The motor is compound belted, through an intermediate shaft, to obtain a quill spindle speed of 30,000 r.p.m. Tests have shown that less than 1000 r.p.m. drop in spindle speed occurs when taking cuts as heavy as .003 in. on a side in hardened steel. Power loss is negligible. Complete information on this grinder is available. Communicate with the manufacturer.

●

Cement Plant Expansion—The St. Marys' Cement Co. Limited announce that their four year plan of expanding and modernizing the plant facilities at St. Marys will be somewhat retarded due to the frequency conversion of power in western Ontario. One kiln with an annual capacity of 720,000 barrels was brought into production in the spring of 1949. An additional kiln, of the same capacity, and the necessary crushing and grinding equipment are expected to be in operation early in 1952. When the expansion is completed the plant will then have an annual capacity of 2,100,000 barrels.

●

U.K. Steel Production.—United Kingdom steel production for the first three quarters of 1950 reached an all-time high of 12,117,000 tons. This figure is 530,000 tons more than in the same period of 1949.

●

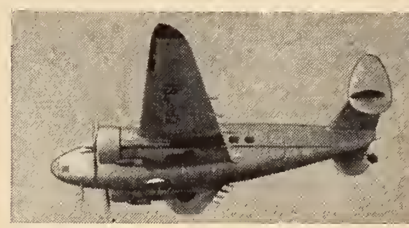
with the mid-century exploration tools of AIR SURVEY!

As the pace of Canadian development accelerates, so grows the demand for detailed information about the country's features and resources. To keep up with this demand for speed and accuracy in mapping, new aerial survey techniques have been developed which go far beyond the standard methods of even five years ago.

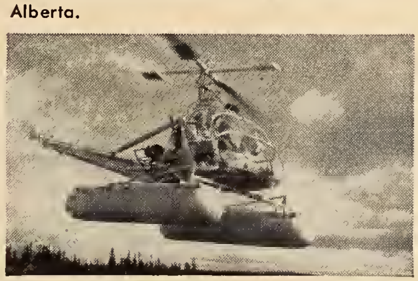
The science of aerial survey in 1950 involves the use of post-war electronic instruments like the airborne magnetometer and the airborne profile recorder . . . it utilizes the unique capabilities of the helicopter . . . it employs the skilled services of geologists, forestry engineers, and technical experts in a dozen different fields.

The Photographic Survey Corporation, and its affiliated companies, offer to business, industry and government Canada's most modern and complete air exploration service. In Canada, *only* P.S.C. can place at your disposal a skilled photogrammetric staff, trained in the use of *all* modern precision plotting instruments.

THE AIRBORNE MAGNETOMETER, developed in P.S.C.'s modern electronic laboratory, provides geophysical evidence of mineral and oil deposits . . . has been used to speed the hunt for Canada's buried riches in Newfoundland, Quebec, Northern Ontario and Alberta.



THE AIRBORNE PROFILE RECORDER, uses a narrow radar beam transmitted downward from the "dish", shown mounted on the underside of an aircraft, to measure the clearance between 'plane and ground . . . records a "profile" of the earth's surface along any given line.



THE HILLER 360, Canada's most economical and versatile helicopter, is used by P.S.C. to fly ground surveyors to otherwise inaccessible locations . . . makes possible rapid compilation of ground control necessary in an accurate air survey.

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SURVEYS FROM THE AIR—a general guide to methods and applications.

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GROUND PROFILES BY RADAR—useful data on the new PSC Airborne Profile Recorder.

We will also be pleased to add your name to the mailing list for the PSC AIR SURVEY NEWS, a periodical publication to keep you up to date on new developments in a fast-growing field. Write to: Dept. "K".

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Alchem engineers are experts in scientific treatment of industrial water. They are always ready to place their fund of knowledge and experience at your disposal.

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WATER TREATMENT ENGINEERING AND CHEMICALS

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Atomic Energy Heating.—Plans are being made to use the intense heat generated in the atomic energy "piles" to heat the building at Britain's Harwell Experimental Establishment. If the project is successful, scientists foresee the possibility of thus heating entire towns situated near atomic establishments.

●

Government Civilian Projects—In a statement made by Robert Drummond, president of the Canadian Construction Association, on October 18th, it was said "The Canadian Construction Association feels that shortages of materials and labour are already so serious that superimposing the defence programme on the present civilian demands means that governments at all levels, Dominion, Provincial, and Municipal, should commence immediately to cut back their civilian public projects by 50 per cent."

"We believe," said Mr. Drummond, "that the forecast expenditure of $1 billion for defence next year, of which construction will be a substantial part, calls for paring in half government budgets for civilian public works. Their expenditures this year will run to $1 billion of the total $3 billion construction programme. By making an immediate start to reduce these public expenditures to $500 million in the coming year, governments can make a vital contribution to the execution of the direct defence construction programme, the related construction in aircraft and other expanding defence plants, the freight car, hydro, mining, and other programmes closely related to defence. In addition, the aircraft, munitions, motor vehicles, and other defence orders will themselves drain large quantities of steel, lumber, and other material ordinarily going into construction."

●

British Auto Export.—Britain's motor industry is now exporting four vehicles for every minute of the working day.

●

Mobile Radio.—To meet the increasing demand for sturdy, economical, 2-way mobile radio communication equipment, Canadian General Electric Company are now producing a new 10-watt combination. Specially engineered to meet today's operating needs, the equipment provides low-cost operation and top reliability for all communication needs—police and fire departments; transportation systems such as taxis, trucks, and railroads; utilities, construction, oil field, and forestry operations. The equipment is easy to install and can operate from the standard battery system of a car or truck. A feature is keen selectivity to prevent interference from adjacent channels. Complete information may be obtained from any C.G.E. office.

●

Electrical Engineers Slide Calculator.—Of special interest to the maintenance engineer, motor design engineer, transformer engineer, and motor rebuilder is a new slide rule, the "Datarule".

In making any change in coils or winding—whether in the form of frequency, voltage, number of turns, connection, speed, or size of wire—or in testing or determining the effect of such a change in existing design, the Datarule indicates the effects of such change on the other related factors in coil or winding design, thus eliminating the lengthy computations otherwise necessary.

As an example, in making a voltage change on an existing coil or winding, the Datarule will show the number of turns needed, the resulting resistance, the size of wire needed, the proper connection data; or for motors, the change in torque, idle amperage resulting, and the size of capacitor needed.

The rule is 12 inches in length by 2⅞ inches wide and is solidly constructed of clear plastic sheet. It has four fixed scales and two scales on the slide, with hairline of transparent vinylite. Special features of the Datarule include the finder table appearing at the bottom of the face of the rule and the fact that the reverse scales are printed in red to simplify reading.

The rule was designed by Samuel Heller and is marketed by Brownell Distributors, 308 Canal Street, New York City. It sells at a very moderate price.

●

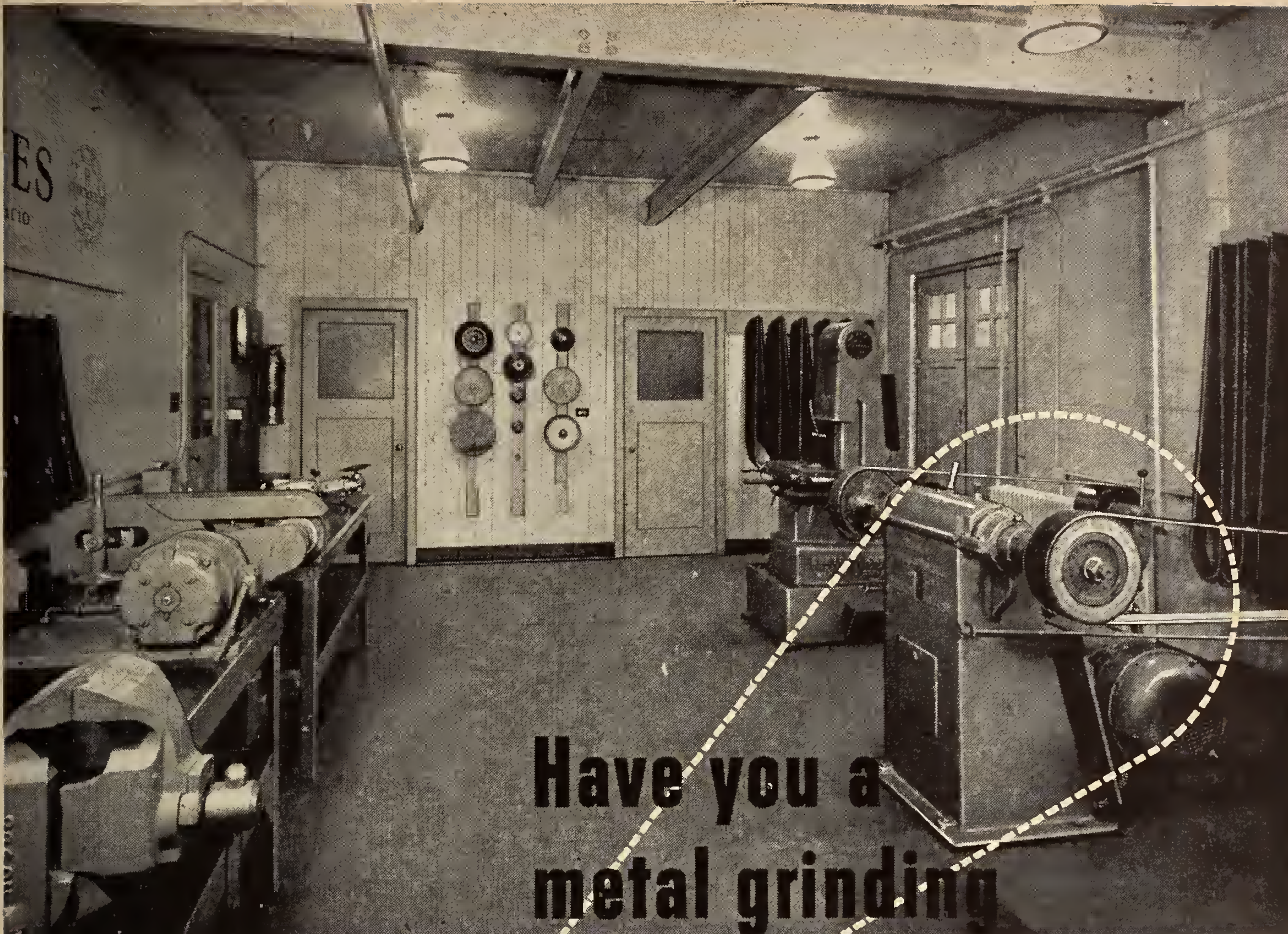
Hepburn Warehouse.—John T. Hepburn Limited, engineers and manufacturers, have announced the establishment of a new Warehouse Steel Division at 1799 St. Clair Avenue West, Toronto. The division was formerly situated at the Company's Dupont Street plant.

●

Sign Of The Times?—The Westinghouse Electric Corporation's Elevator Division announced on October 16th, that it had received a contract for the installation of a two-ton freight elevator for the B. C. Remedy Company, producer of headache powders and tablets.

●

Prestressed Concrete.—Mr. Donovan Lee, consulting engineer, of London, England, and Messrs. McCall and Co.



Have you a metal grinding or polishing problem?

No cost or obligation is involved to have our Clinic take metal grinding and finishing problems off your hands, iron out the difficulties and present you with the answers.

The Clinic, at 2326 Dufferin St., Toronto is under the supervision of trained abrasive technicians. They have at their disposal the latest types of equipment including Backstand Idlers (floor type) by Canadian Hanson and Van Winkle, Ford Smith and Delta with special bracket, BG-8 Porter-Cable Wet Grinder, Sommer and Maca Wet Grinder for glass grinding, Delta and Porter-Cable Belt Sanders, Sterling Sander, Skil Sander, Nu-Matic Sander and Portable Disc Sander.

Please avail yourself of the services of the new Clinic whenever you have a job that requires investigation. Just consult our sales representative in your territory. Arrangements will be made to send components to the Clinic where we will conduct experiments and make a complete detailed recommendation on the most efficient coated abrasive to handle your job.

CANADIAN DUREX ABRASIVES LIMITED DUREX **BRANTFORD, CANADA**

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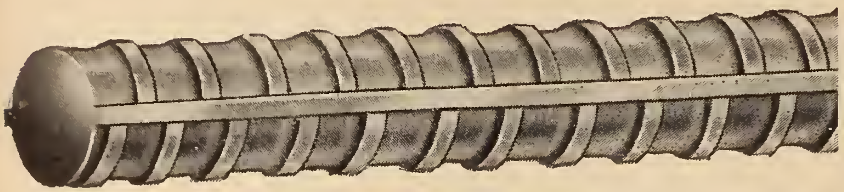
DESIGN FOR HIGH TENSILE STRENGTH RAIL STEEL
HIGH-BOND
WITH THE NEW SPECIAL ANCHORAGE DEFORMATIONS



ASTM-A305-49 DIMENSIONAL REQUIREMENTS

Number of Bar	Equiv. Section	Wt. Lbs. Per Ft.	Nominal Dimensions* Diam.	Area	Perimeter	Minimum* Height of Lugs
3	⅜" O	.376	0.375	0.11	1.178	0.015
4	½" O	.668	0.500	0.20	1.571	0.020
5	⅝" O	1.043	0.625	0.31	1.963	0.028
6	¾" O	1.502	0.750	0.44	2.356	0.038
7	⅞" O	2.044	0.875	0.60	2.749	0.044
8	1" O	2.670	1.000	0.79	3.142	0.050
9	1" □	3.400	1.128	1.00	3.544	0.056
10	1⅛" □	4.303	1.270	1.27	3.990	0.064
11	1¼" □	5.313	1.410	1.56	4.430	0.071

* Note: All dimensions are in inches.

Specifying Rail Steel reinforcing bars to ASTM A16-35 and CSA G31 insures average elastic limit of 50,000 psi. Take advantage of high strength steel by using high design stresses—up to 30,000 psi.

Eliminate Hooks by specifying deformations to meet ASTM A305-49, thereby obtaining more than double former bond strengths and considerable reduction in bending and placing costs.

Achieve crack control by building with concrete bars having "Special Anchorage" rolled into every inch of length. The new, closely spaced high deformations of A305 Rail Steel bars prevent the microscopic cracks in concrete from accumulating into visible cracks in regions of maximum tension. The high elastic limit of Rail Steel prevents unusual elongations under unpredictable overloads.

Get the full story of Rail Steel in the coloured film "Rail Steel in the World of To-day" available without cost. Write for application blank to Burlington Steel Company Limited.

Copies of ASTM A305-49 available on request

BURLINGTON STEEL CO. LIMITED

319 Sherman Ave. North **Hamilton, Ontario**

Ltd., of Sheffield, England have recently introduced a new system of prestressed concrete, which, it is claimed, possesses advantages over those currently in use.

This new system uses an alloy reinforcing steel with an ultimate tensile strength of some 155,000 lb. per sq. in., and with high corrosion resistance. It has no marked yield point, but is relatively ductile, having about an 8 per cent elongation in 8 in., and is practically without creep. Its E is about 25,000,000 lb. per sq. in.

Combined with this new reinforcing material are new devices for prestressing reinforcing bars in larger sizes than the wire so often used in prestressed construction and positive means for anchoring them at the ends. A highly interchangeable system of steel moulds has also been developed for casting beams of either I or U sections. Full information may be obtained by addressing either Mr. Donovan Lee, 66 Victoria St., London, S.W.1, or McCall & Co. (Sheffield) Ltd., Box 41, Templeborough, Sheffield, England.

●

Concrete Blocks.—Monsanto (Canada) Limited, 425 Saint Patrick Street, Montreal, announce that, by the addition of a small amount of a surface active agent, denser, stronger, and more uniform concrete blocks and bricks can be manufactured.

The chemical, a liquid wetting agent, is said to permit the use of less water by increasing its efficiency and at the same time the plasticity required to properly mould blocks and bricks is improved. In addition, it is claimed, use of the wetting agent results in cleaner equipment, lighter coloured products, and better dispersion of cement. About eight ounces of the chemical are added to a five-bag cement mixture. For complete information communicate with the Company.

●

New Trane Plant.—Trane Company of Canada Limited, makers of heating and air conditioning equipment, have purchased a ten acre site at Horner and Carson Streets in Etobicoke, west of Toronto. A new plant is being erected on this site. The first building, of steel, glass, and concrete construction, is expected to be ready for occupancy by March 1951. 420 feet long with an area of 40,000 square feet, this building will house equipment for mass producing heating elements for Trane convector-radiators. All extended surface for heating and cooling—blast heaters, direct expansion coils, wall-fin heaters, etc.—will be manufactured here, and assembly lines for unit heaters, projection heaters, torridors, climate changers, unit ventilators and centrifugal fans will be installed.

The new Trane plant will conform to the standard being set by modern factory designers. It will be a one storey building utilizing the latest conveying equipment for efficient horizontal layout. To provide plenty of light and ventilation the construction will consist of alternate high and low bays rather than a continuous flat roof. The main office and Plant No. 1 will remain, for the time being, at the present address on Mowat Ave., Toronto. The new building is to be known as Plant No. 2 and will employ about one hundred men.

●

Bepco Motors.—Bepco Canada Limited are now in a position to supply a complete range of motors with the latest NEMA ratings, NEMA dimensions, and shaft extensions. These motors are available for any enclosure—protected, drip-proof, splash-proof, T.E. fan-cooled, and for any characteristics— squirrel cage or wound rotor, normal or high torque, high slip, frequent reversals, variable or multi-speed, continuous or intermittent rating.

●

Plastic Boats.—By the use of a composition of glass fibre and resin, a North England firm of yacht builders has just built a 16-ft. boat with a hull weighing only 40 lbs. and moulded entirely from one piece. The boat is the first of its kind in the Country and opens up possibilities of mass producing sea-going craft of larger types.

Construction is simple. Layers of glass fibre are placed over a concrete mould which resembles an upturned hull. Another mould is then laid over the top and the resin drawn through the matrix of glass under vacuum. The resin has an accelerator added which causes it to set after impregnation. Further details may be obtained from the United Kingdom Information Office, 10 Albert Street, Ottawa, Canada. Refer to item No. 182.

●

Allis-Chalmers Expansion.—Canadian Allis-Chalmers Ltd., have just acquired Canadian sale and manufacturing rights for the complete line of sawmill machinery developed by the Prescott Company of Menominee, Michigan. This line of

"Non-Stop Flights"

Inclined belt conveyor delivering rock to dryer building. In background: belt conveyor from track hopper to shuttle belt conveyor over wet rock storage.

Drives for inclined belt conveyor and reversible shuttle conveyor, which carry rock to storage piles.

42" wide setting belt conveyor with idlers of special design to remove material from return run of belt.

at Lowest rate fares, with

LINK-BELT BELT CONVEYORS

Continuous, steady transportation, day-in and day-out, is assured for phosphate rock on the belt conveyors shown in these photographs — and for sand, gravel, ore, coal and other bulk materials at many other installations. All are enabled to travel in large quantities, at high speeds, over long distances with minimum power and attention required.

Link-Belt designed and furnished the belt conveyor equipment, clod breaker and other handling machinery for wet rock storage and reclaiming, soda ash, ground phosphate rock and treble superphosphate at this plant. Many complex problems were solved by ingenious applications of belt conveyors.

With Link-Belt Belt Conveyors you get not only properly designed terminal drive machinery and the most modern idlers and pulleys, but engineering experience to produce the proper relationship between the various components. Our engineers will gladly furnish recommendations.

LINK-BELT LIMITED

Plant and Factory Branch Store — 731 Eastern Ave., Toronto 8. • Factory Branch Stores — Montreal 15: 945 Beaumont Ave. • Vancouver: 550 Beatty St. • Swastika, Ont.: 8 Boisvert St. • Winnipeg: Mumford, Medland, Limited, 576 Wall St. Halifax: Austen Bros. Limited, 118 Hollis St. • District Sales Office — Hamilton: 41 King William St. • Foundry at Elmira, Ont.: 19 Church St., E.

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IDLERS • TRIPPERS • BELTS • PULLEYS

BEARINGS • DRIVES

Anticipate Your Needs for Seamless Steel Mechanical Tubing

Tube Miles are loaded with orders and deliveries are growing more extended.

Warehouse Stocks are low, and getting lower.

Users' needs are growing rapidly, for their usual as well as for new and urgent re-armament requirements.

LYMAN

Our main source — the National Tube Co., maker of Shelby Tubing—is the largest producer in America—or in the world.

We also draw on British Tube Mills, and on the Warehouse Stocks of Shelby Distributors in all the leading U.S.A. cities.

Scan your certain — your probable—and your hoped for — needs for some months ahead, and send us your inquiries as early as you can.

LYMAN TUBE & BEARINGS LTD.

Montreal Toronto
Winnipeg Edmonton
Vancouver New Glasgow, N.S.

equipment includes log deck machinery, carriages, band mills, edgers, and resaws.

The Prescott Company of Menominee, Michigan, recently took over the sale and manufacture of the complete line of sawmill machinery previously marketed by the Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Therefore Canadian Allis-Chalmers, under this new agreement, will continue to service their many Canadian customers for sawmill machinery and offer them the extended line of the Prescott Company.

•

Electrolysis Meter.—A new model, the B-3, of the Multi-Combination Meter for electrolysis, corrosion, and cathodic-protection testing, is now available from the manufacturer, M. C. Miller, 1142 Emerson Avenue, West Englewood, N.J. It is small, compact, and low-priced compared to the previous model 5, although it has a low range of 2 millivolts and special mirror scales 3.9 in. long. The accuracy is 1 per cent.

With this equipment, practically all measurements encountered in electrolysis and corrosion investigations and cathodic-protection testing in field and laboratory can be made. By use of a circuit selector switch, the two high-sensitivity d-c instruments can be connected into a variety of measuring circuits for measurement of potentials, current, resistance, and soil resistivity. Internal batteries with switch and coarse and fine controls can be used to supply and control current for test purposes. Voltmeters, or voltmeter and ammeter can be used separately or simultaneously. Polarity reversing switches are provided for both current and potential measurements.

Weight of the instrument is 13 pounds and it is mounted in a sturdy case.

•

BARBER ENGINEERING PRODUCT HIGHLY PRAISED

The approval committee of the International Harvester Co. of Chicago, has formally approved the Malo Loader Dozer, Models 9 and 14 which are manufactured by the Barber Engineering and Supply Co. Ltd., of Calgary, Alberta.

The history of the Malo Loader is interesting since it is less than four years since John H. Malo, the inventer, submitted to J. E. Barber, a detailed sketch of his machine. Appreciating that the unit had possibilities, Mr. Barber approved investigation by the engineering dept. and the manufacture of pilot models. On the completion of the pilot models, R. C. Lounsbury of Industrial and Road Equipment, Calgary, was invited to look at the unit. Mr. Lounsbury felt that the overhead operation and Dozer Blade combination had a definite place in the volume material handling field and was instrumental in getting the units into the hands of users in the Province of Alberta. Sales were confined strictly to this Province until performance records were developed. The unit was found to be structurally very sound and with a few modifications it was decided that it could be sold on a national basis with every confidence in its performance.

Sales Areas Expanded

The first sales of Loaders beyond the Province of Alberta were made in Vancouver in 1949, and in July of that year Chas. Cusson Ltd., of Montreal introduced the first Malo Loader to the eastern market. Since that time, expansion has necessitated a representative for Ontario, Quebec, New Brunswick, and Nova Scotia, and C. F. Taylor was transferred to Montreal in August of this year.

Completely Hydraulic

The Malo Loader Dozer is a combination machine and is completely hydraulic. The loading operation is overhead and the dozer blade is interchangeable with the loading bucket. This blade is conventional in every respect, having an angling blade with 25 degrees angle either right or left and the regular tilt feature. The Malo Loader is sold as a complete unit and the price includes both bucket and dozer blade.

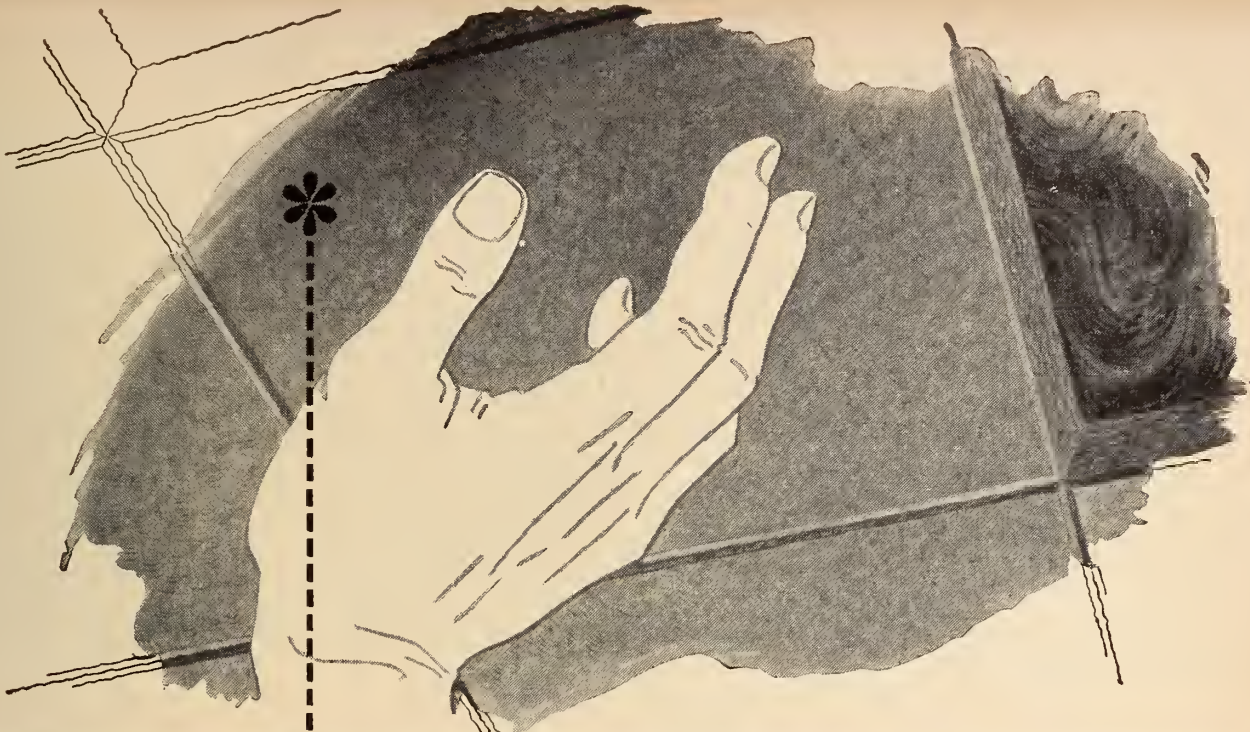
Attachments Being Developed

One of the interesting features of the loader is the fact that it is mounted on standard tractors which do not require modification to accommodate the equipment. All installations to date and all performance records developed have been on standard units. At the present time, the engineering dept. of Barber Engineering and Supply Co. Ltd., is developing four new attachments for adaptation to the Malo Loader, which will increase its utility. Plans are being formulated to improve present production lines and expand the plant to take care of the volume of business on hand and anticipated for the year 1951.

U.S. Distribution Arranged

It was only in February of this year that a presentation of the machine and a report of Canadian activity and performance records were submitted to the engineering dept. of International Harvester at Melrose Park. In checking over the approved list of manufacturers under the International listings, it is interesting to note that Barber Engineering and Supply, Calgary, are the only Canadian organization listed therein. The industrial division of International Harvester of Canada are the exclusive sales agents for the Malo Overhead Loader Dozer in Canada.

Electrical Receptacles. — A new, safe interlock receptable for hazardous locations has been developed by Panellit Inc., 7218 No. Clark St., Chicago 26, Ill. The unit is a simple, economical outlet receptacle with many safety features until now only available in costly, explosion proof equipment. The Panellit interlock receptacle is available in capacities up to 20 amperes. Complete literature describing the receptacle is available on request. •



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Publications

For copies of the publications mentioned below please apply to the publishers at the addresses given in the items.

Please mention *The Engineering Journal* when writing.

Fire Control Booklet.—An educational booklet on fire, suitable for distribution to fire protection personnel, has been published by Ansul Chemical Co. "Fundamentals of Fire Extinguishment" is a 4-page illustrated discussion on what fire is, classes of fire and proper methods of extinguishing.

Originally introduced as an aid in training salesmen, the publication has been widely requested and used by fire departments, industrial fire brigades, insurance companies and other fire protection groups. For copies apply to Ansul Chemical Co., Marinette, Wisconsin.

●

Rapistan Equipment. — A 36-page, 3-color catalogue presenting the entire Rapistan line of industrial casters, platform trucks, and hand trucks, is now available from the Rapids-Standard Co., Inc., Grand Rapids, Mich. The new catalogue gives complete specifications of the equipment, plus tips on choice of models, best suited to various handling problems. A detailed index provides a complete picture of the entire line for easy selection. When requesting copies apply to Dept. CT50, The Rapids Standard Co. Inc., 342 Rapistan Building, Grand Rapids 2, Michigan.

●

Metal Coating Publication. — "Nukemite" is the title of a publication offered by the Nukem Products Corporation, Buffalo 20, N.Y. Nukemite is a synthetic resin, acid and alkali resistant coating.

The manufacturer claims that the product affords protection from severe corrosive conditions to metal, concrete and wood surfaces exposed to chemical attack. The resin film, it is claimed, is leak proof, odorless and non-contaminating. It is also claimed that it is in no way similar to oil base paint except in the method of application. For copies of the publication describing this product apply to the manufacturer and ask for the publication by name.

●

Annealing Process. — The Cycle Annealing Process, an improved annealing procedure in which time-temperature programme control is used for the annealing of steel forgings and other parts, is described in an attractive new Surface Combustion technical bulletin.

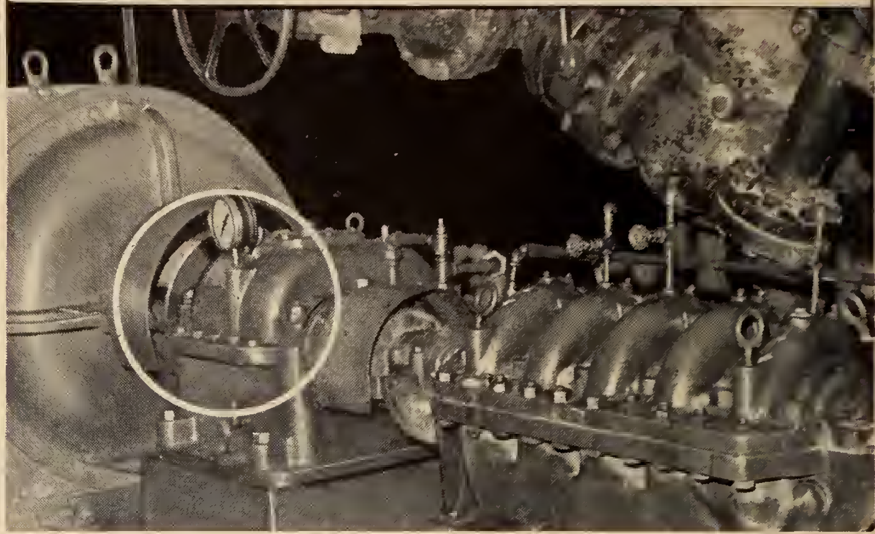
This bulletin, which is well illustrated, describes the metallurgical background and process equipment for modern cycle annealing. Radiant tube-fired and direct-fired installations are described. The effect of cycle annealing in shortening processing time, providing accurate control of metal structure and improved machinability is presented in detail.

Copies are available on request to Surface Combustion Corporation, Toledo I, Ohio. Ask for Bulletin SC-146.

●

(*Continued on page 1048*)

No jolt! No shock! No danger!



The BLM Automatic Clutch eliminates the ravages of starting shock and dangerous overloading — in any type of transmission drive — through natural, centrifugal force. Just step on the starter — or press the button — BLM does the rest. Installation shown is BLM Type SRC-50 Clutch in drive to speed reducer to centrifugal pump.

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Working Floor-spoce Requirement	$16^1/_{10}$ sq. ft.	$20^1/_{10}$ sq. ft.
Net Weight without trocings	435 lbs.	1,100 to 1,200 lbs.
Active Copocity	3,000 trocings	It takes 30 Plon Drawers to equal this capocity of one Planfile.
Inoctive Copacity	5,000 trocings	
Height	36 Inches	51″ to 98¾″
Minimum Aisle Required	24 inches	42 inches
Accessibility	All drowings eosily occessible at slightly higher thon desk top level.	Only 9 drowers, 900 trocings, within range of eosy occessibility.
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Note: The first cost of o Plonfile is 52% less thon o stock of 30 Plan Drawers.

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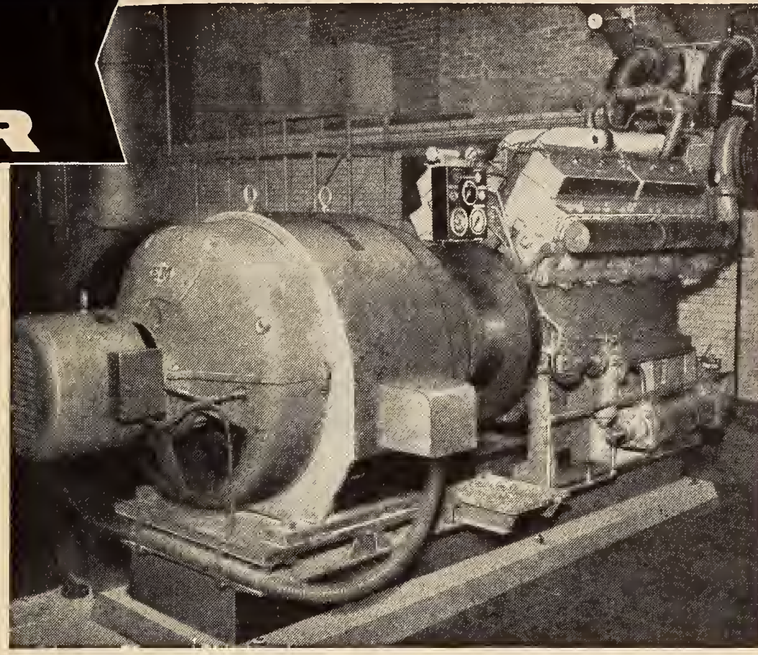

Can you cope with demands for emergency power? The dependable and economical way is with a Paxman diesel alternator set, as exemplified by this installation of 400 k W output for the City of Regina. Typical of the many sets giving reliable and efficient service in Canada on emergency and continuous duties.

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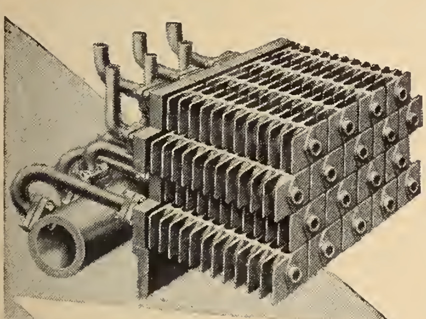
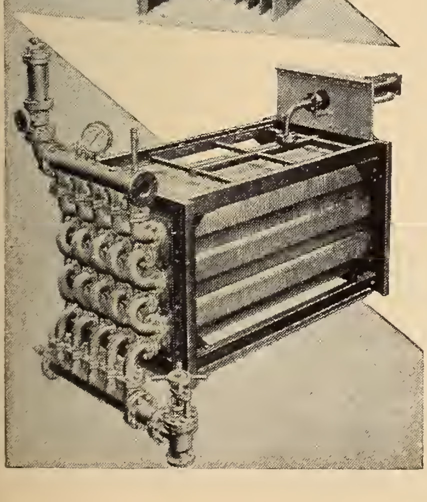
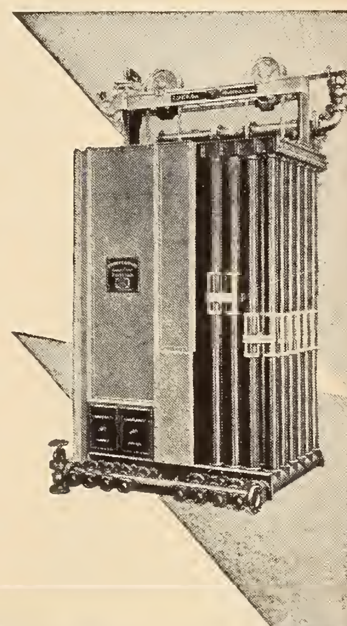




Left: Green's Premier Diamond Economiser (Type 12) with cast iron gilled sleeves shrunk on steel tubes and arranged in shallow tiers. This design combines the advantages of extended and compact heating surface, controlled gas flow and complete facilities for inspection and cleaning, with a steel tube construction suitable for all working pressures.

Right: Green's cast iron Vertical Tube Economiser gives high performance, large water capacity and trouble-free operation under all types of combustion conditions.

Left: Green's Premier Diamond Economiser (Type 25) is eminently suitable for medium pressure installations where the extended heating surface design in compact form is required.



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BUSINESS AND INDUSTRIAL BRIEFS

(*Continued from page 1044*)

Ruston & Hornsby Publications. — Ruston & Hornsby Ltd., of England have been represented in Canada for many years. Their Toronto address is 36-38 Lombard Street, Toronto 1, Ont. The Canadian Company offers Journal readers a number of excellent technical publications. These are listed below:

"*Power*" in which is described Ruston Horizontal Oil Engines. This bulletin contains 32 pages of highly informative material.

"*Ruston Pressure Charged Oil Engines*". This 44 page publication has been prepared to advance a type of engine that has been fully proved under service conditions over a number of years.

"*Ruston Marine Oil Engines*". In this publication is described the Mark 2VSHM and Mark 3VSHM engines which are intended for use in small craft.

"*Ruston Vertical Oil Engines*". These engines are of 3, 4 and 6 cylinders and range from 30-90 b.h.p. The engines described are particularly suitable for installation in confined spaces where it is impossible to use larger and heavier units and on portable plants such as air compressors, welding sets, etc. This is a 16 page publication.

"*Ruston Oil Engines 3½ to 2,410 b.h.p.*" These engines are intended for stationary, portable and mobile duties. They are supplied in 63 sizes and are of high speed and medium speed vertical engines and slow speed horizontal units. This is an 18 page publication.

"*Underground Haulage*". This bulletin describes oil engined locomotives for underground work. It covers the entire range of Ruston and Hornsby locomotives intended for use in mines.

"*Oil-Engined Shunting Locomotive*". This 16-page publication describes the construction and advantages of oil-engined shunting locomotives manufactured by the Company.

All the above mentioned publications are beautifully produced and are highly informative. The information they contain is concisely and attractively prepared.

Dust and Fume Collectors. — The American Wheelabrator and Equipment Corporation offer a bulletin "American Dustube Dust and Fume Collectors in the Mining and Metallurgical Industries". This 8-page bulletin describes the operation of cloth tube type collectors employed in recovering values in gases from roasters, sintering machines, induction furnaces, etc. Apply to the Company at 14 South Byrkit Street, Mishawaka, Indiana, and ask for Bulletin No. 282.

Earth Excavator.—Bulletin No. 400 is just released by Marion Power Shovel Co., of Marion, Ohio, describing the Marion type 43-M machine, an all-purpose one cubic yard excavator. Marion 43-M features described in the bulletin include, ease of front-end conversion; 22 important friction points equipped with ball or roller bearings; shafting of alloy steel; machine-cut, heat-treated gears; forged crawler rollers and crawler pads; etc. Ask for Bulletin No. 400.

Portable Conveyor.—Bulletin No. 374 (8 pages) describes the complete range of the Barber-Greene Model 374 Heavy Duty Portable Conveyor. The bulletin lists the fields of use and the products handled, and it contains a series of sketches showing applications in industry and construction. Accessories such as feeders, screens, hoppers, etc., are pictured and possible usage is described. Construction features are illustrated and their operational advantages are described. Copies are available from Barber-Greene Company, Aurora, Illinois.

Hockey Schedule.—Ferranti Electric Ltd., Mount Denis, Toronto 15, Ont., offer a pocket type schedule for the National Hockey League Games 1950-51.

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a Saddle

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Conduit for underground cables must meet most rigid of engineering specifications. Claims are not enough — it's *performance* that counts. The conduit which will do the job must have the following vital properties:

LOW COEFFICIENT OF FRICTION — For long runs between manholes, for non-interference with contraction and expansion at peak and off-peak loads, Cornwall Underground Fibre Conduit gives the best performance because its walls are essentially non-abrasive and uniformly smooth. Fibre Conduit is *kind* to cable sheathing!

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HIGH PERFORMANCE — Built in 1929 for the sole purpose of supplying the electrical industry with Fibre Conduit, our Cornwall plant has supplied a product of such quality that nearly every *conduit installation in Canada today* features Cornwall Underground Fibre Conduit. Keeping abreast of industrial development, Cornwall Underground Fibre Conduit has had the unqualified confidence of the electrical industry for over 20 years. This is ample proof that, with conduit, it's performance that counts.

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Atlas Asbestos Handbook.—Atlas Asbestos Company Ltd., 110 McGill Street, Montreal 5, Que., has recently released a new publication "Atlas Moulded Seals Handbook—Design and Installation Data."

This is a very up-to-date handbook and the information it contains is well presented. The publication is divided into six sections — O-Ring Packings — Homogeneous V-Rings — Homogeneous U-Cup Packings—Fabric Reinforced V-Packings — Fabric Reinforced Piston Cups—Installations. The volume in its present form consists of 56 pages. However, when applying for copies of the publication please be sure to give your correct postal address so that the Atlas Company may make out a stencil and arrange to send you additional and revised sheets as they are produced. When applying for copies of this publication please do so on your official letterhead.

●

Dust Collectors.—T. C. Chown Ltd., 1440 Saint Catherine St. W., Montreal 25, Que., are Canadian representatives of the Aerotec Corporation and the Thermix Corporation of Greenwich, Conn. These U.S. companies are manufacturers of dust and fly ash collectors. Catalogue No. 601, a two-colour twenty-page publication, gives a complete description of the collectors manufactured by the Aerotec Company and it is highly recommended to those who have smoke, dust, or fly-ash elimination problems. The Thermix Corporation publishes at regular intervals a publication "The Project Engineer". This publication should be of interest to a number of Journal readers. For copies of any of the Thermix and Aerotec publications apply to the Canadian agent at the address given above.

●

Sarco Steam Equipment.—Sarco Canada Limited, 496 Church Street, Toronto, Ont., offers a 64 page publication entitled Sarco Steam Hook-ups.

A new sixth enlarged edition, of this publication is now available. The publication assembles for handy reference all the information needed to judge when and where steam traps or temperature control should be used, what types to select, and how to size and intall them correctly. Included in the publication are tables and charts directly associated with such problems, but not usually found all in one place. The publication has been divided into four main groups Industrial Steam Traps, Building Heating, Industrial Temperature Control Water Blending. When applying for copies please do so on your official letterhead.

●

Garlock Packings.—The Garlock Packing Company of Canada Ltd., 620 Cathcart Street, Montreal, offers a new two-colour bulletin entitled "Garlock Packings and Gaskets made of Teflon". The packings and gasket materials described are fabricated in the Garlock factories from a tetrafluoroethylene resin developed by E. I. duPont de Nemours and Company and marketed by that organization under the name of "Teflon". These Garlock packings and gaskets are entirely unaffected by any acid and are highly resistant to all organic solvents and alkalies. They operate at temperatures from below —90 deg. F. up to 500 deg. F. and have high mechanical strength and a low coefficient of friction within that temperature range.

Garlock produces several types of braided and moulded "Teflon" packings for use on valves, pump rods, or shafts and other equipment. For gasketing flanged joints of all kinds, including glass and porcelain flanges, Garlock envelope gaskets made of a suitable Garlock gasketing material encased in "Teflon" or gaskets made of solid "Teflon" are available in required sizes and shapes. For copies of this highly informative bulletin please apply to the manufacturer at the address given above.

●

Pump Publication.—Canada Pumps Ltd., of Kitchener, Ontario, have recently issued a new bulletin No. 976-D which covers their new line of CS, CM and CL pump units.

These units were designed to incorporate the following characteristics:

(a) Wide hydraulic capabilities.

(b) Ruggedness—capable of handling chemical applications as well as water.

(c) Accessibility for servicing.

The bulletin illustrates and describes in detail the construction, lists ratings, and shows dimensions. Copies are available. Address inquiries to the manufacturer.

●

Fan Folder.—Joy Manufacturing Co. (Canada) Ltd., have recently issued bulletin No. J-600 in which are described Joy Axivane Fans, custom designed for aircraft ventilating systems. For copies apply to the Company, at Galt, Ontario.

●

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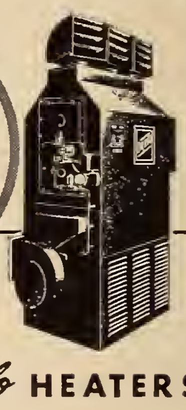

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Roofers Supply Booklets.—The Roofers Supply Co. Ltd., offer Journal readers copies of the following publications:

"Roofing Specifications — A.I.A. 12 Roofing." This reference manual has been prepared for the convenience of those concerned with the design and construction of all types of roofing. The data contained in the manual is based on many years of experience in the roofing field. It contains pertinent information on most types of roofing protection. It provides useful information on flat deck gravel roofs, steep roofs, cold application roofs, slate and tile roofs, sheet metal roofs and flashings, as well as many variations of these basic types. The publication is well produced and side indexed in such a manner that it will fit into a standard drawer-type letter file.

"Rosco Window Wells", a four page folder describing these easily installed metal window wells.

"Rosco Signs" a 24 page publication devoted to the description of street name plates, traffic, parking, and crossing signs and signs of a similar nature.

"Rosco Corrugated Steel Culverts" a 16 page publication produced to give the prospective purchaser complete details on the culvert manufactured by the company.

The above and any other of the publications produced by the company may be obtained by applying to the Roofers Supply Co. Ltd., 840 Dupont St., Toronto.

Appointments and Transfers

R. M. Husband.—Dr. R. M. Husband has been appointed assistant professor of Cellulose Industries at the University of Toronto. As a member of the chemical engineering staff, Dr. Husband will further that department's work in the important field of pulp and paper and allied industries. He is a graduate of the University of Saskatchewan.

E. P. Geary.—Edward P. Geary has been appointed executive vice-president of Atlas Steels Ltd., of Welland, Ontario. Mr. Geary has been a vice-president and the general sales manager of the Company since 1947.

S. McCready.—Canadian General Electric's chemical division has recently established the Glyptal and Insulation Section with S. McCready as its manager. Mr. McCready is widely-known in the chemical and electrical industry. For a number of years he was on the staff of the National Research Council.

Industrial Fans.—Aerex Limited of Sheffield, England, designers and manufacturers of Industrial Fans and Fan Systems, announce the opening of a Canadian branch with Sales and Engineering offices at 225 Mutual Street, Toronto, Ontario. Canadian manager is A. H. Blake, and the assistant manager is A. B. Ballagh, both formerly of the B. F. Sturtevant Company of Canada Limited.

Aerex Limited offer to engineers, mine operators and general industry, specialized experience in the best Canadian and American practice relating to the problems of cooling, ventilating, temperature control, blowing, drying, vapour and fume control, and dust and refuse collection, and complete facilities for the installation of its line of axial flow fans, centrifugal fans and dryers.

R. G. Johnson.—Richard G. Johnson, has been appointed construction consultant for the Canadian Commercial Corporation, Ottawa. Mr. Johnson's services have been made available on loan by the Canadian Construction Association, of which he is general manager. Commenting on the appointment the Right Hon. C. D. Howe, Minister of Trade and Commerce, said "We are fortunate in securing the services of a man who is so intimately connected with the construction industry in Canada to guide the expanded defence construction programme".

Hydra-Clene Appointment.—Hydra-Clene Corporation of Canada, Ltd., Montreal, have been appointed exclusive Canadian manufacturers and distributors of the products manufactured and sold in the United States by Aquadyne Corporation.

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Spun Rock Wool is the ideal insulation against heat—affording approved thermal insulation up to 1,000°F. Spun Rock Wool is easily installed, never packs down—never corrodes metals. Saves steam and fuel, cuts costs. Write for samples and information.

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THE JOURNAL OF THE ENGINEERING INSTITUTE OF CANADA

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W. D. LAIRD, M.E.I.C.
Assistant Editor

L. F. GRANT, M.E.I.C.
Field Secretary
236 Avenue Road, Toronto.

E. J. BLANDFORD
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★ ★ ★

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14,725 copies of this issue printed

IT IS THE PRESIDENT'S privilege at this time of year to greet the members of the Institute through the columns of *The Engineering Journal*. This I do with great pleasure.

This society through its membership has reached even the most remote parts of this great Canadian Commonwealth. It has become a part of the fabric of our national life, and its usefulness and its opportunities increase with the years. It is indeed a great experience to see the Institute as one can see it only by visiting all branches and meeting with great numbers of members from coast to coast.

Looking ahead I foresee that our opportunities to serve the profession — and in particular the young engineer — will continue to increase. Our part in the development of the young man is one of the most important duties we have to perform. The senior engineers and the Institute in combination can make him a better engineer and a better citizen. He must be protected in his right to live and work in Canada. Much of this depends upon his employers who in most instances are themselves engineers. These young engineers are among the most valuable assets of our country. We must not be careless in our handling of them lest, because of our thoughtlessness, they wander off to other fields which at the time look greener.

Canada has work for all its engineers, in fact there will be opportunities for countless numbers yet to be graduated or even born. The last frontier has not been reached in this country and to the young man who has courage and some pioneering spirit, Canada is indeed the land of opportunity. It is important that the supply of students for engineering schools be not lessened else we cut off the very life-blood of our progress.

My visits to branches in the maritimes and the west convince me more than ever that it is these things to which we must give our attention. Our phenomenal natural resources must be linked with our technical manpower to the boundless benefit of all. The Institute has a positive part to play in bringing this to pass.

At the year end it is fitting that we should contemplate these things so that in the year to come we may do a better job. It is my earnest wish that the work of the Institute may continue to expand and that every one of us may have a part in meeting the continuing and new challenges.

May I express also the wish that each and every one will have a very Happy Christmas and that the New Year will bring both opportunity and achievement to all.

JAMES A. VANCE, M.E.I.C.
President.

Canada's First Subway

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

W. H. Paterson, M.E.I.C.
Chief Engineer,
Toronto Transportation Commission,
Toronto.

Early and deliberate planning of the Toronto Subway, started six years ago, gave engineering and operating officials an unusual opportunity to review and criticize designs, thus avoiding costly mistakes and delays. Briefly tracing the reasons for adopting a subway system for Toronto, the author outlines the location and the general type of structure to be used, and discusses the method of construction, traffic diversions, maintenance of utilities, track, control system, signals, cables, and above ground stations. Completion is scheduled for Christmas 1953.

Faced with the necessity of renewing worn-out tracks and equipment on Yonge Street, the Toronto Transportation Commission is replacing this service with a Rapid Transit Subway. When the Commission was established in 1921 by a Provincial Act, the city turned over to the Commission its powers and privileges for the construction and operation of transit facilities. In that year, the tracks were rebuilt and extended on Yonge Street, the only through street serving a growing community in North Toronto of about 12,000 people. Today Yonge Street is still the only through street to this community, which has grown to over 100,000.

Since its establishment in 1921, the Commission has been providing transportation in the City of Toronto at a 6¼ cent fare with free transfers. It now operates about 1,000 street cars, 500 buses, 100 trolley coaches and carries over 300 million passengers a year. Yonge Street is the main artery of this system of surface transportation, and after 29 years of operation the tracks and equipment must be replaced. New surface tracks and cars would cost over $12 millions, and would perpetuate for 25 years traffic conditions that are intolerable and service that is not acceptable, with speeds downtown as low as 6 miles per hour.

In 1943, the Commission retained the services of Mr. Norman D. Wilson, Toronto consultant on transportation planning, and set up a small staff to prepare a plan of rapid transit for Toronto. (Fig. 1) In 1944, the Commission retained the services of DeLeuw, Cather & Co., of Chicago, to advise on the design of structures. A Rapid Transit Department was created, and general plans for the Yonge and Queen Street subways were completed that year.

Early in 1945, with preliminary planning completed, the Commission authorized the preparation of contract drawings and documents for the Yonge Street Subway. This early and determined decision is probably the most outstanding feature of the entire project, as it gave both engineering and operating officials an unusual opportunity to review and criticize designs before their incorporation in contract plans.

The decision of the Commission was approved by the City of Toronto in January, 1946, when it voted 10 to 1 in favour of the Rapid Transit proposal. Practices in other properties, both in North America and in Europe were studied, but nothing was adopted until all were convinced that it was the best that could be done, using modern materials and construction methods.

Yonge Street Subway—Location and Grade

The Yonge Street subway starts on Front Street at the Union Station, about 1,200 feet west of Yonge Street. From here it extends to Yonge Street, then north under Yonge Street about 5,800 feet to College Street, which is about the northerly limit of the downtown area. North of College Street the alignment swings east about 150 feet (Fig. 1), and follows a private right-of-way to a terminal at Eglinton Avenue.

This private right-of-way was adopted for several reasons among which are better gradient, savings estimated at $6 millions, and better transfer arrangements at cross-town lines. This last feature is extremely important, as about 75 per cent of the subway passengers will transfer to or from surface vehicles. Because of this heavy transfer movement, it was desirable to locate the track at the highest possible level, to make the transfer to surface vehicles as short and convenient as possible. To protect utilities, however, a minimum cover of 8 feet was provided at all locations where utilities were encountered.

The alignment is generally straight with easy curves, all of which are spiralled according to standard A.R.E.A. practice. There is one short radius curve, 400 feet, which occurs at Front and Yonge Streets. Vertical curves are generally easy and the maximum grade is 3.5 per cent.

Structure

For the subway structure a reinforced concrete box section was adopted (Fig. 2). The typical subway section between stations has an overall width of 32 ft. 6 in., an overall depth of 17 ft. 8 in., and an inside width of 13 ft. 6 in. for each track, with a clearance over the top of rail of 13 ft.

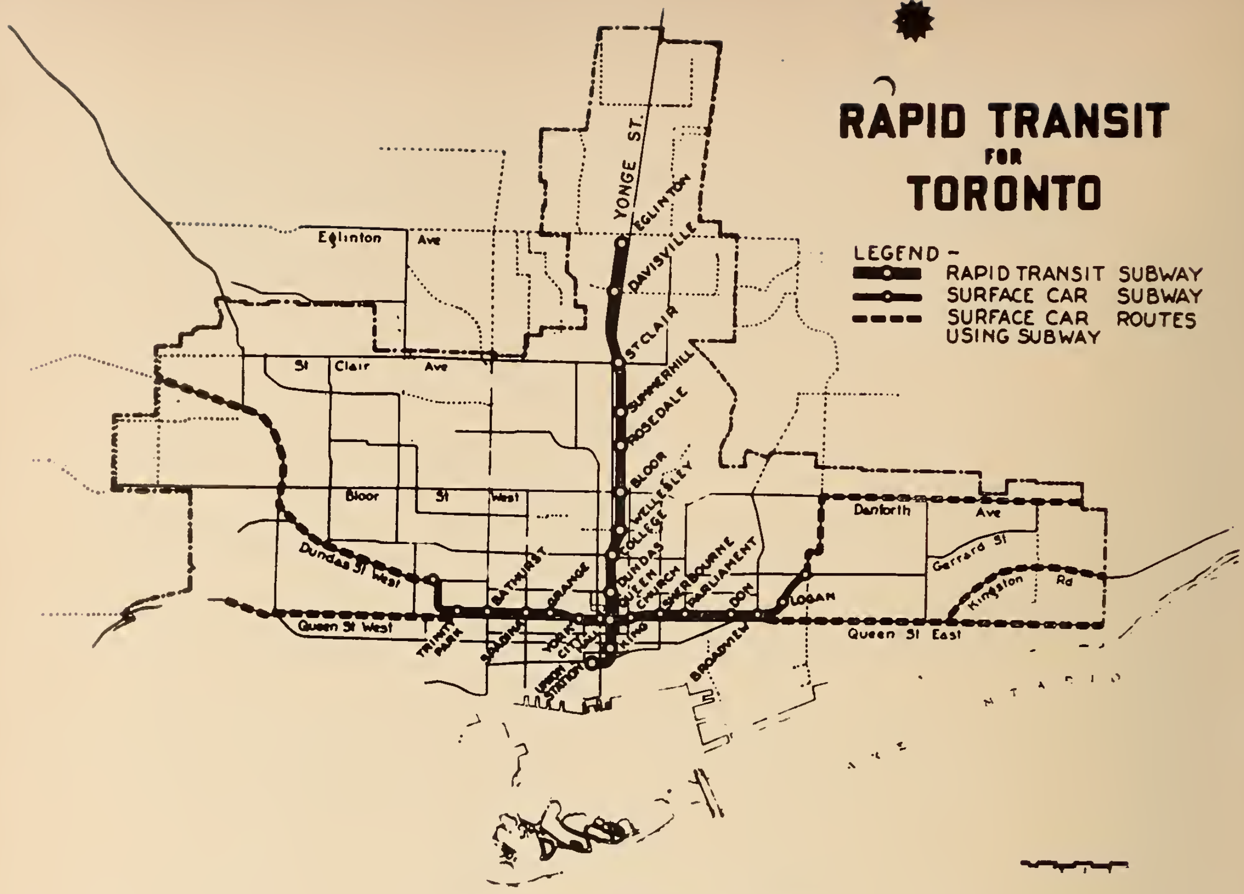


Fig. 1. Plan for Toronto subways.

Openings 5 ft. wide, by 7 ft. high at intervals of 15 ft., are provided in the centre wall, to serve as refuge bays for workmen and to relieve air pressure caused by the movement of trains. A continuous walkway, two feet wide is provided along the outside wall of the structure just above the track level.

At Station sections (Fig. 3), the subway structure is 52 ft. 4 in. wide and 18 ft. 3 in. high, with a clear space of 23 ft. 5 in. between columns. This clear space permits platforms 11 ft. 10 in. wide by 500 ft. long, without a single column to interfere with the movement of passengers. The centre line support is provided by steel columns at about 13-foot centres, opening up the station structure to permit full view of its entire width.

The open cut sections have been designed with two to one slopes. The typical section will have a width of 44 feet at the bottom of the slope, and an overall right-of-way width of 120 feet. To carry cross streets over the open cut a fixed frame reinforced concrete bridge has been designed, with a typical span of 48 ft. 4 in. and a minimum vertical clearance above the top of rail of 13 ft.

Station platforms will be 500 feet long, to provide for ultimate operation of trains of ten 48-foot cars. Platforms at all stations except terminals will be located at the side of the station, and will be 11 ft. 10 in. wide. Stations will be located at all main intersections, and there will be twelve stations on the Yonge Street Subway. Plans for all the mezzanine stations include escalators, as well as stairs for the convenience of passenger movement. Escalators will also be provided for passengers transferring between the Yonge Street subway and the Queen Street subway, which intersect at the Queen Street Station. The Queen subway will pass underneath the Yonge Street subway at this point.

Method of Construction

In preparing the contract plans and documents, every effort was made to define the structure without restricting the contractor in the free use of his ingenuity in devising methods and plant. However, there was little doubt that the successful contractor would drive H-columns along the outside, or net line of the structure, and would use these columns to carry beams which would span the street to support a temporary timber deck. In this case the deck structure would carry the two tracks of the Yonge Street surface car line, with all other normal street traffic.

Because of the nature of the design, it was concluded that a centre support for the deck beams would be undesirable. Engineering estimates and preliminary progress schedules were based on the use of a rolled steel deck beam over the track structure, and a field welded truss over the station structure. The contractor followed this procedure rather closely, with variations in the way of improvements which he introduced, and which are described in a supplementary paper.

Traffic Diversions

To reduce interruptions to traffic to a minimum, and to facilitate progress of the work, the Commission developed a system of traffic diversions which would give the contractor uninterrupted use of a section of the street for a stated time. These plans, after being checked by the police, fire and other civic officials, were incorporated in the contract documents. In accordance with these plans, which have been modified by mutual agreement, street cars and vehicular traffic have been diverted over other routes during the period required for the installation of decking. The work of removing and reinstalling track and overhead for these diversions is done by Commission forces.

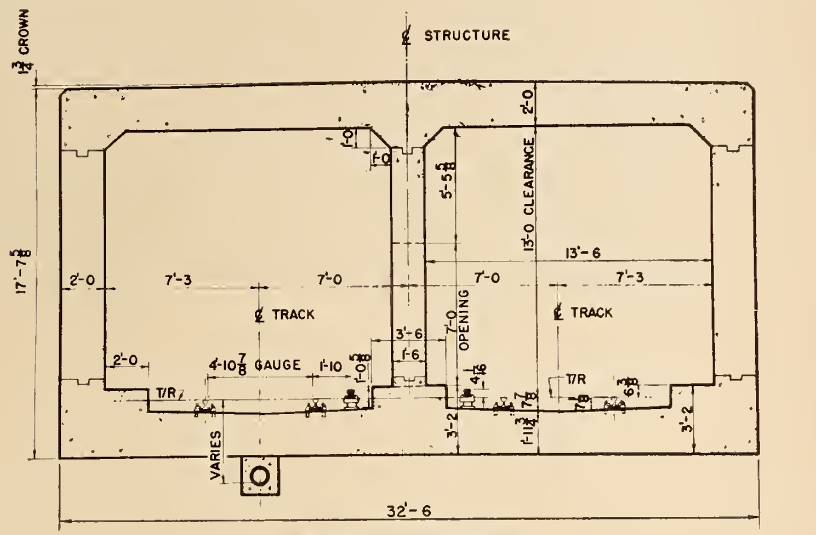
Maintenance and Restoration of Public Utilities

Knowing that the maintenance of public utilities during subway construction is a major item, the Commission recognized and approached this problem at an early date. The complexity of the problem was reduced by the good offices and records of Toronto's Public Utilities Co-Ordinating Committee. This Committee, made up of representatives of the various utility companies, had been established to arrange and co-ordinate the occupancy of the street below pavement level. It maintains a staff and prepares plans showing the existing location of the various utilities. This unique committee and its records have been a tremendous help in planning the Yonge Street subway.

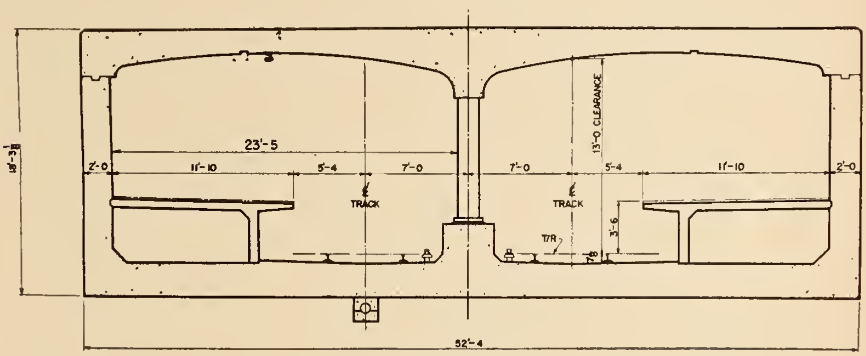
The Commission made agreements with the various utility companies, which basically provide that the Commission will pay the value of plant destroyed based on replacement cost less depreciation, and will also pay for maintenance during construction. The utility company will then build such new plant as it desires. Under these agreements, and in the hands of a capable contractor, the work has progressed with surprisingly few consumer complaints.

Bell Telephone cables during the time of handling are put under gas pressure. If a cable sheath is damaged, the gas pressure not only keeps water from entering the cable, but the loss of pressure gives an immediate indication of trouble. This arrangement prevented four cases of serious trouble at one intersection during the decking operations going on over one week-end.

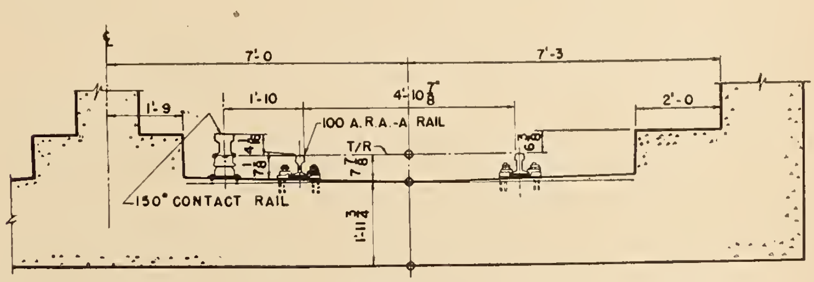
To avoid possible explosions, all gas mains are removed from the cut. It is usual practice to build



SECTION BETWEEN STATIONS



SECTION AT STATIONS



SUBWAY TRACK

Fig. 2. (Top) Section through Subway between stations.

Fig. 3. (Centre) Section through Subway station.

Fig. 4. (Bottom) Section through modified C.N.R. bridge type track to be used for the Toronto subway.

Fig. 5. The track design for the Subway was developed from the design shown in this illustration. It is a type that has been used by the C.N.R. on bridge decks.

temporary mains above ground, permitting existing mains to be cut off and purged. With the assistance of the Consumers' Gas Company a plan was developed, by which mains were placed below ground in parallel streets to maintain adequate supply in the area, and small temporary feeders were installed below the sidewalk, adjacent to the buildings. This plan, which was included in an agreement made with the Gas Company, has worked out satisfactorily to both parties and with very limited interruptions to the service.

Track

Original track design of the Yonge Street Subway provided for half ties set in concrete, a common practice in many subways on this continent. In Figure 5 is shown a type of track which has been used by the Canadian National Railways on bridge decks for as long as 15 years. This track utilizes a malleable iron plate bolted directly to the concrete deck of the bridge. A cushion for the rail is provided by a rubber pad under the plate.

Insulation of this track for signalling purposes is obtained by using fibre bushings around the hold-down bolts and fibre washers under the springs. The bolt holes in the plate are slotted, to allow sufficient lateral movement to obtain accurate gauging of track, and after the track has been set to gauge the bolt holes are filled with lead. Vertical control is obtained by the use of shims underneath the plate.

After carefully considering various types of subway track construction, a modification of the type of track used by the C.N.R. on bridges was finally adopted, except under special work and in the open cut, where it will be necessary to use wooden ties and ballast. By adopting this track design (Fig. 4), the depth of the structure was reduced by 12 inches, with a resulting saving well over $500,000.

Ventilation

Ventilation of the Yonge Street subway follows normal practice, using the piston action of the trains to force air in and out of the subway through vent shafts. Vent shafts are located at both ends of stations and mid-way between stations on both sides of the subway. Fans and louvres will be installed to control the movement of air, and to supply fresh air when trains are not operating.

Electrical Equipment and Lighting

Power for the operation of trains will be 600 volt d-c, fed to the trains by a positive contact rail. Power will be supplied by the Commission's substations, so located that very little positive feeder will be required. Incoming power will be received at each substation at 13,200 a-c volts, and will be converted to 600 volts d-c by mercury arc rectifiers.

The subway will be illuminated throughout by fluorescent lighting. Lighting intensities will be higher than those now generally used in subways. The proposed intensities for the various areas are as follows:

	Foot Candles
Mezzanine or control areas	7.5 to 12.0
Stairways and escalators..	10.0 to 12.0
Loading platforms	7.5 to 12.0
Train tubes	1.0

Emergency lights will be installed, and in the event of a power failure these lights will be automatically and instantaneously fed from storage batteries.

Supervisory Control System

A supervisory control system of modern design will be installed, and thereby all breakers supplying traction power to the subway will be under the control of a centrally located load dispatcher. This system will also incorporate a chain of emergency alarm boxes, spaced 500 to 800 feet apart throughout the subway.

If an emergency occurs which necessitates passengers leaving the train, the "pulling" of any one of these boxes will automatically cut off the power to the third rail in that section and send in an alarm to the load dispatcher. A telephone will be located adjacent to each

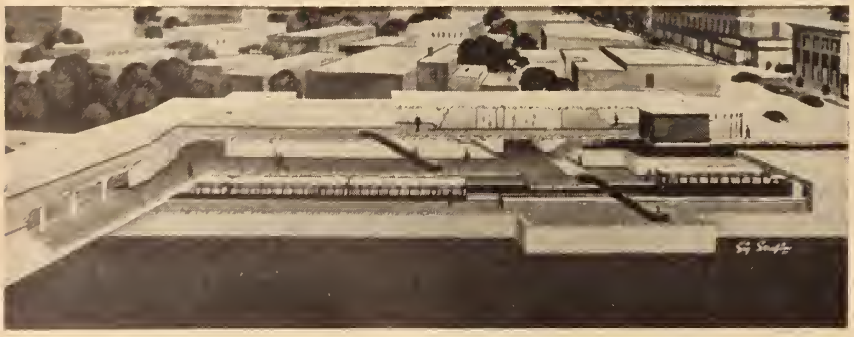


Fig. 6. St. Clair Station. At this station a cross-town surface street car line will load and unload passengers at each track. The street car platforms are connected with the subway platforms by escalators and stairs.

alarm box for the communication of details of the emergency.

The control of ventilating fans and the indications of failure of any pump or auxiliary power supply will also be obtained through the supervisory control system.

Signals

The operation of the trains in the subway will be protected by automatic wayside signals of the three aspect colour light type. According to usual operating custom, green will indicate a clear track and permit full speed; amber will indicate only one clear block and permit progress at reduced speed, prepared to stop; red will indicate an occupied track and cannot be passed except after coming to a full stop. A train stop mechanism will be associated with each signal to enforce obedience to the red aspect.

Speed controls on down grades will automatically enforce speed regulations. Normally the interlocking plants at both north and south terminals will function automatically; however, it will be possible to operate them manually if warranted.

All yard approach signals will be semi-automatic. Occupancy of the track will be automatically indicated, but switch movements will be manually controlled. The automatic interlocking feature associated with each switch and signal will prohibit conflicting train movements.

Arrangement of Cables

As shown in Fig. 3, no duct bench is provided in the Yonge Street subway. All cables will be racked in the wall of the structure, where they can be easily inspected and maintained. This is an adoption of European practice, and results in considerable saving over usual American practice which generally provides a bank of ducts on one or both sides of the subway.

Above Ground Stations

One of the most interesting features of the subway is the unusual transfer facilities provided at stations north of College Street. These stations, which are on private right-of-way, are designed as attractive above ground buildings with special attention given to facilities for transferring passengers.

At Wellesley, Rosedale, and Davisville stations crosstown bus lines discharge passengers to platforms which are connected by stairways to the subway platforms. At St. Clair station, a loop track permits street cars of a feeder route to discharge passengers on a platform connected with train platforms by stairs and escalators. This movement will probably reach about 6,000 passengers in a maximum hour.

At Bloor Station, the street will be widened to permit the construction of two covered platforms. Passengers from cross-town street cars will unload at these platforms and descend stairs leading directly to the train platforms. The terminal at Eglinton Avenue will have 10 separate bus loading platforms, all connected to a below-ground passageway, which leads to the centre platform of this station.

These stations will provide outstanding facilities for passengers who will move from surface vehicles to subway and vice versa, without having to pick up or present a paper transfer.

Contracts

The cost of the subway was originally estimated at about $30 millions exclusive of rolling stock. This estimate will, of course, be exceeded because of rising costs in labour and in materials.

The subway was divided in seven separate sections, to facilitate the planning and awarding of construction contracts. Sections 1 and 2 were awarded in 1949 to Pitts, Johnson, Drake and Perini. Sections 3, 4 and 5 were awarded in 1950 to Rayner Construction Ltd. Work will start on Sections 5A and 6 in 1951.

All work is scheduled for completion in four years, which means the Toronto Transportation Commission will be operating Canada's First Subway about Christmas Day, 1953. √

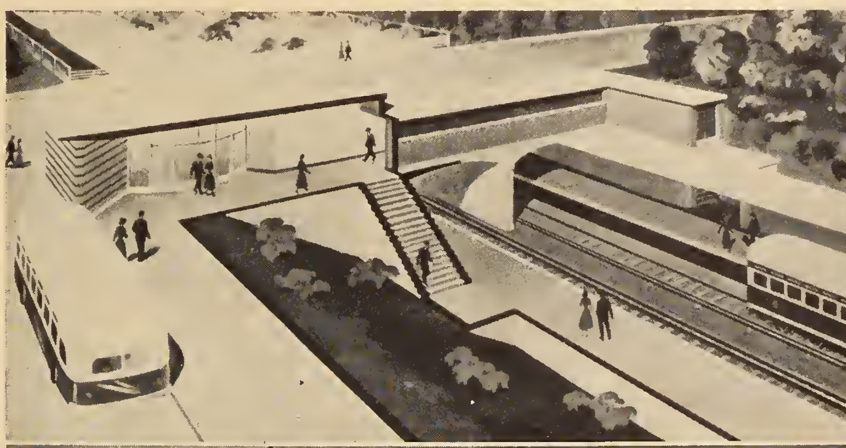


Fig. 7. (Top) Rosedale Station. This view illustrates the convenient transfer facilities which will be provided between cross-town bus routes and the subway at stations on the open-cut sections for the subway.

Fig. 8. (Bottom) Eglinton Station. A this north terminal of the subway a centre platform is used to permit the reversing of trains over crossover switches at the out-bound end of the station. There are 10 open bus loading and unloading platforms at the surface connected by stairways to passageway, providing access to train platform.

Toronto Subway Construction

Charles B. Molineaux

Pitts, Johnson, Drake and Perini,
Toronto, Ontario.

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

The new Toronto subway is being built mostly in clay over shale rock. About a third of the work will rest on rock, and the remainder bears on the clay. The bracing of the cut and the support of the temporary street surface, or "decking", is being done by what we describe as the "soldier-pile" method. This method first appeared on the American scene in 1928, and was described in Engineering News-Record that year as used by The Arthur A. Johnson Corporation on a subway job in Brooklyn. It has been in use ever since, and is the one most favoured for excavation methods where a large unobstructed working area is needed. It avoids holes in the permanent work, permits free passage for the steel forms, and does not call for costly and uncertain patches in the waterproofing.

The "soldier beam" method consists of driving steel I beams along the excavation line to a depth of from 6 to 8 feet below the subgrade (depending on soil conditions), and bracing across the top with steel I beams. As the excavation is removed, wood sheeting is placed between the flanges of the I beams in the manner of sheeting a pit. The sheeting is placed as the excavation is taken out, instead of being driven down with the excavation.

Each sheeting plank is left in the position where it is originally placed. In order to prevent movement of the ground it is usually necessary to pack sand behind the sheeting. This is done through openings between the planks. In clay material the sheeting is wedged back from the flanges of the I beams. In subway work it is usually necessary to excavate pits or a trench in advance of the driving of the soldier beams, in order to disclose the location of sub-surface structures and prevent damage to the same.

Fig. 1. Top lift excavation intersection King and Yonge Streets showing exposed utilities.

Street decking is carried on the soldier piles as supports, by the use of steel beams across the cut. To provide sufficient support for the decking a continuous cap is placed on top of the soldier beams, and the decking beams are placed on it. This serves not only to provide decking support, but also braces the top of the soldier beams not directly under the cross beams. In this particular instance the soldier beams were on 6-foot centres, and decking beams on 12-foot centres which meant that one intermediate soldier beam receives its top bracing from the cap. This space varies on different jobs, and occasionally there is a variation due to the presence of a subsurface structure that cannot be moved, giving a variation in the spacing of soldier beams. This of course does not greatly affect the work.

Due to the use of a reinforced concrete design here, it was felt that intermediate supports would be undesirable, and where the width of the cut was such as to make it impractical to use steel beams, a truss design for the decking support was originally prepared. After a number of these trusses had been installed it was found that the interference of subsurface structures, as well as the greatly increased depth of decking lift excavation, made the truss system rather undesirable. A system of rigger braces was therefore designed and used for the remainder of the work, except in cases where unusually long spans were encountered.

Some of the outstanding problems are definitely related to the fact that this is the first subway in Toronto and in Canada. The great public interest in the work, combined with the fact that it is being done in the very heart of a big city, makes it a conscious thing in the minds of everyone. From the very beginning of the work there has been no shortage whatever of "sidewalk superintendents", and though this may mean good public relations for the Toronto Transportation Commission, there are definitely times when it is a hindrance to the work. We are required to maintain a good circulation of traffic, and for the convenience of the work it is often necessary to limit the width of available sidewalk. A large number of onlookers makes the sidewalk very crowded, and it has been necessary to build a tight fence.

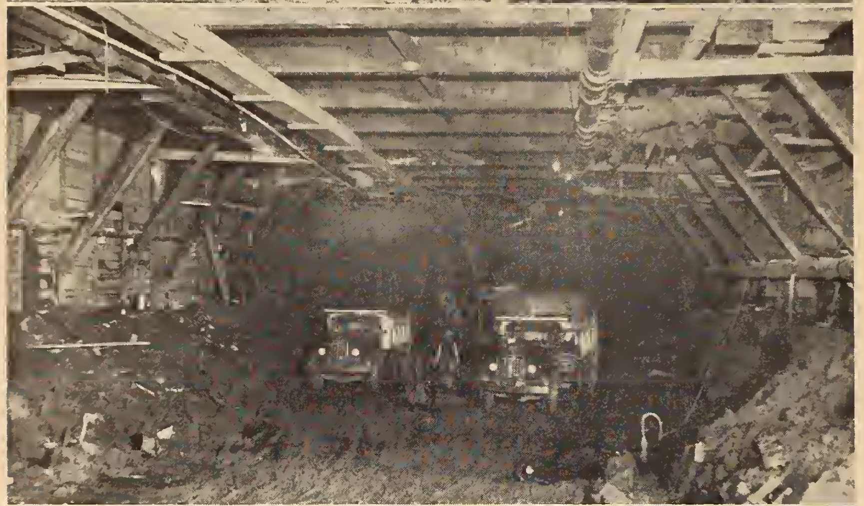
Our experience has been that where work of a similar nature has been done from time to time many things are taken for granted, and subcontractors in the various specialties are available and reliable. In a new field, however, it seems that unfamiliarity gives rise to so much doubt on the part of some of the organizations, that they are very indifferent to bidding. The only competition that can be stirred up is on the part of the smaller and less responsible companies. This has been particularly true in the matter of city ordinances which control hauling. The load permitted to be carried by an individual vehicle has definitely curtailed the development of hauling subcontractors, and most of this work seems to go to the individual owners of one or two trucks.

In our case, when a subcontractor able to undertake the entire job was found and given the work, these individual owners were so concerned about continuing with the "good thing" that they had, that they did everything possible to enlist the aid of city authorities, and for a time even succeeded in preventing the subcontractor from starting his work by preventing the issuance of city cartage licences. The press even took an active interest in the matter. The prospective subcontractor, as well as even certain men in public life, were put in such a poor light that it almost became a matter of civic morality to prevent this work from being done in a way that it usually is done.

Fig. 2. Panoramic view of Yonge Street looking north from Melinda. In the foreground may be seen the complete decking in this area and proceeding through the photograph may be seen top lift excavation and the temporary suspension of utilities operating in the King intersection area with track and track-bed removed from the area between King and Adelaide Streets. In the background may be seen the pile driver in operation between Adelaide and Richmond Streets.

An outstanding characteristic of this work was the owners' decision to discontinue street car operation and close off vehicular traffic in the areas being decked, in order to give the contractor a free way with the work. This provision was made a condition of the contract, and has been most beneficial to the operation and a real economy for the owner.

Although most people from the United States do not ordinarily think of Canada as being a foreign country, there are several minor problems in the existence of this friendly border. At the time the work was started, a Canadian dollar was worth almost exactly the same as an American dollar, and although it was necessary to make provisions for fulfilling the requirements of the Foreign Exchange Control Board, there was definitely no effect whatsoever on prices, salaries of key employees or any other such matters. Before the work was underway a month, however, Canadian currency was revalued at a discount of 10 per cent against American. Although items purchased locally were not affected by this change, imported items began to reflect the difference in increased prices. Imported key employees paid in Canadian dollars immediately began to feel that they should get additional



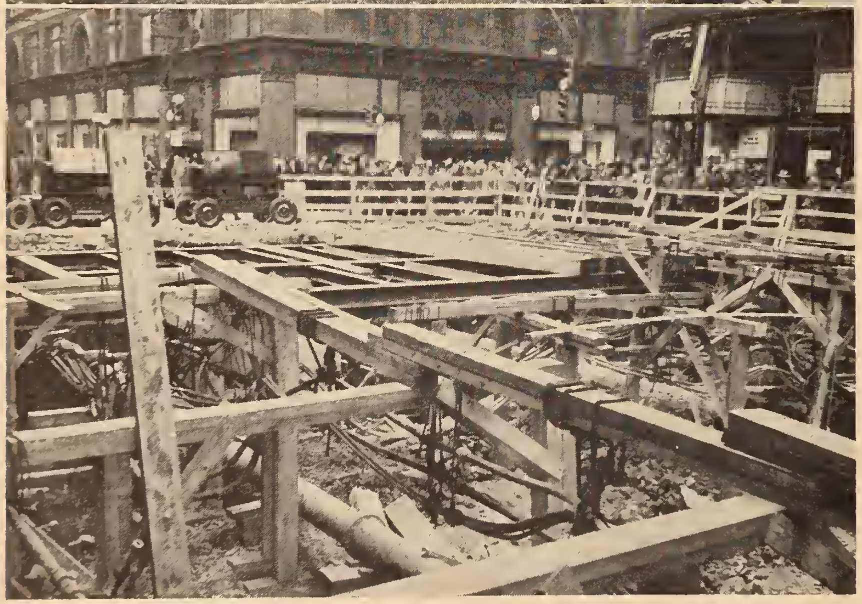


Fig. 3. (Top) Contract S-2 area. Intermediate lift completed in the foreground with backhoe operating in the background completing the final excavation.

Fig. 4. (Centre) Intermediate lift excavation operations. Temporary suspension of utilities may be seen at the top of the photograph.

Fig. 5. (Bottom) indicates the magnitude of the problem of handling utility installations during excavation.

compensation to take care of some part of the discount, since they had obligations outside of Canada that were payable in American dollars.

In most places in the United States where subways are built, the jack-arch and steel frame type of construction is preferred. Due however to the fact that steel beams are not rolled in Canada, the owner's engineers decided that more domestic material would be used in a reinforced concrete structure, and their design was so made. Although this does not exactly give rise to a problem, it does affect construction methods and has made for a new, and what might turn out to be a better, subway design.

Underpinning for this work involved nothing unusual for work of this nature, but there is a much higher percentage of more careful underpinning required, due to the fact that Yonge Street is an unusually narrow street for subway construction. There is a high percentage of old buildings with rubble foundations, many of which are laid up in lime mortar. The clay overburden is not reliable for loads of more than two or three tons per square foot. In many cases where an extensive system of beams would have been employed, a greater number of piers was found necessary due to this ground condition.

In the matter of available labour, quite a number of surprises were found. It is usual in a more urban area to find mechanics rather plentiful and common labour not too available nor too willing. The reverse was found in Toronto, where common labour is very willing and to date found to be fairly plentiful. Skilled men and mechanics seem to have permanent connections or are just not available in the area, and it has been very much of a problem to find skilled men for the work. For any work that is definitely special to this type of operation no one could be found, and quite some time had to be spent in training timbermen, riggers, and operators. However, in the underpinning work it was found after a short period of operation that miners who were available made excellent underpinners and quickly assimilated the special elements of this work. We have had as many as one hundred and sixty underpinners working at a time, and their work has been done efficiently and well. √

Fig. 1. The Vickers Viscount.

Ultra-Modern Transportation

Achievements of the British Aircraft Industry

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Staff Article

Part Two

Vickers and the Viscount

> The first article of this series considered the deHavilland organization and particularly the Comet jet airliner.
>
> This second article deals with a visit to, and discussion with officials of the Vickers Armstrongs plant at Weybridge, Surrey. The article first outlines the plant's history and then considers the question of propeller turbine engines against the pure jet. The balance of the material covers design and performance details of the Viscount aircraft.

Speaking of industrial empires—and that is what we were doing in the October *Journal* in the article on De Havillands—the Vickers organization is one of impressive proportions.

The parent company is Vickers Limited. The manufacturing companies include Vickers-Armstrongs Limited whose plants are located in many parts of the country. The shipyards are at Barrow-in-Furness and Newcastle - upon - Tyne; the engineering works are at Barrow - in - Furness, Newcastle - upon - Tyne, Crayford, Dartford, and Weymouth; the aviation works are at South Marston and at Weybridge.

The list of manufacturing companies contains eleven more names and the products include equipment for malting, seed cleaning and conveying, mathematical and optical instruments, steel and heavy machinery, rubber and plastics, lithographic printing machines, and brewing and bottling equipment. There are six sales companies, three in England and one each in India, Pakistan, and South Africa. The name Vickers is widely known throughout the world—and favourably.

Our particular interest on this occasion was centered on the plant at Weybridge, the home of the famous Viscount. A comfortable suburban train took us from Waterloo Station to Weybridge in an incredibly short time. Later we were not sure whether it was the speed of the train, the short distance, or the good company, but we were there almost before we realized we had started. The good company consisted of two railway ticket inspectors whom we persuaded to talk about their occupation. It seems that the Britisher is not above cheating the railroad. Our informants told us of the many methods used—all of them quite ingenious — and the methods used to catch them at it. Prosecutions run to thousands in a year, but the commuters never seem to get discouraged. The same

PROP-JET *or*	PURE JET
Moves a larger volume of air relatively slowly.	Moves a smaller volume of air relatively fast.
Operates best at medium altitudes (20-30,000 ft.) but remains economic during climb, descent and stand-off.	Operates best at high altitudes (35-45,000 ft.). Expensive in fuel during climb, descent and stand-off.
Speed (300-340 m.p.h.) makes possible noticeable improvements on existing airline schedules.	Speed (400 m.p.h. and more) revolutionizes long range schedules but is less valuable on medium stages.
Can operate economically under present ground control techniques.	Requires special landing arrangements under present ground control techniques.
Long-term development:— Increased speeds possible without radical change in airframe. Economy will improve still further with advances in fuel consumption and ground control.	Long-term development:— Improved fuel consumption and ground control may give greater flexibility and make pure-jet operation possible over a wider variety of ranges.

ingenuity applied against our ticket collecting methods here would produce appalling losses for the railways. In the interests of law and order we are not disclosing the passengers' ways of meeting the high cost of commuting.

Weybridge is in Surrey, a most delightful part of England. On the drive from the station to the plant it was difficult to shake off the feeling that we were about to spend a pleasant day in the open country. It was the month of May and everything was at its loveliest, which means a lot in England. However, the beautiful countryside with its green fields, magnificent trees and shrubs, and delightful homes suddenly came to a stop as we drove up to the front door of the tremendous plant of Vickers-Armstrongs Limited.

War Target

This plant has quite a history. It is situated on what was once the famous motor car racing course of Brooklands. A great deal of the track still shows. The plant was one of the great factors in the Battle of Britain. During the war it was heavily armed, but the Hun did get through once. A group of thirteen planes were picked up by radar stations but their path was toward London and not Weybridge, and so the gun crews at the plant were not "alerted". Suddenly the planes changed their course and headed straight for Vickers. Taking the gun crews by surprise they were able to fly very low and place their bombs on the target. The damage was considerable both to buildings and to workers, but not as bad as was reported that night on the air by the famous or infamous "Lord Haw-Haw" who said "the great plant of Vickers-Armstrongs at Weybridge is no more".

All but one of the planes were brought down by R.A.F. fighters before they could reach their home base. The plant continued to function, albeit under difficulties. Within the first week after the raid one plane was completed ready for test. The effects of the bombing are still quite noticeable in the concrete administration building where great cracks have been partially covered with plaster and paint. Other reminders of the war days are the several bomb shelters which one encounters in many places around the plant. It is difficult to realize the great handicap under which British industry laboured in those days, and the wonder is that they had the courage to battle on and on, even on to victory.

Comparisons

Before going through the plant we had the pleasure of meeting many of the persons responsible for design and construction. We were shown charts and graphs to indicate the superior performance of the turbo-propeller as compared to the piston engine and the straight turbo-jet. While the company officials were enthusiastic about the performance of this turbo-prop Viscount it must be stated that they gave due credit to the pure jet as exemplified in the Comet and the Jetliner. They pointed out that there are fields in which each is superior to the other.

Assuming that the replacement of the piston engine by some form of gas turbine is inevitable, the comparative economy of operating the two types of gas turbine power plant, turbo-prop and turbo-jet needs to be clearly appreciated before initial fleet replacements are considered. By now, it is contended that the propeller driving gas turbine is not an intermediate step to the pure jet engine. The fundamental difference between a reciprocating engine and a gas turbine is that the former has excellent, and the latter very poor, part load performance. In the air this means that the turbo-jet gives the most economic performance operating at its normal cruising altitude at its rated cruising speed. When either speed or altitude drop below these levels, the performance of the engine falls off rapidly in relation to its fuel consumption. The cruising altitude lies between 35,000 and 45,000 feet and roughly speaking, the turbo-jet aircraft must be used on stage lengths long enough for the economies of operating at optimum speed and altitude to outbalance the high cost of climb to and descent from those altitudes.

When, instead of using the exhaust gases for propulsion, power is obtained directly from the turbine to drive a propeller, the power of the complete unit falls, and with it the cruising speed of the aircraft. At the same time the part load performance of the complete power unit is greatly improved.

Performance

These arguments have been advanced almost from the beginning of jet development but now there is enough actual flying experience to prove the case. The Comet is a pure turbo-jet and has many hours of flying experience. The Viscount has turbo-propeller engines and has over 700 hours of flying time. These two experiences have shown that at high cruising speed, altitude, and distance the straight turbo-jet has the advantage over all other types. The speed to which this applies is from 500 miles per hour upward. It may go as low as 400 miles but that is where the argument starts. There is no doubt but that the turbo-prop sets up a more economical record at lower speeds and altitudes. Both are smooth and quiet in operation. In fact the Vickers company claim that in the Viscount they have eliminated 99 per cent of all external noise energy associated with ordinary aircraft.

History

The first Viscount was identified as number 630. The contract for its construction was received in March, 1946 and the plane flew in July, 1948—and with great success. It was run in test flights for over a year before its successor the Viscount 700 was fixed in design. The latter is largely identical with the former the principal difference being that the fuselage is longer and the power units are larger. The Viscount prototype has been given the greatest series of tests ever devised for a plane. The company is determined that when the machines are delivered to the customers, they will be as near perfect as man can make them. This is quite a different policy from that adopted by the company with its earlier great plane the Viking. However the conditions are quite different. At that time there was great urgency to get a plane onto the market, that would meet European needs so that American machines would not take over on every air route of the world. The Viking succeeded in doing just that even though there was a lot of trouble with the early models. Today there are many main line routes operating with British planes, which would seem to be logical outlets for these new brain children of British industry.

Incidentally American planes rushed through at the same time had just as many troubles as had the Viking, which all goes to show that you must "make haste slowly" in the aircraft business.

Production

The Viscount 700 is now in production. We saw many of them in several stages of construction. Also we saw the prototype which was being readied for her tropical tests at Khartoum. Since then we have heard she met these trying conditions "without batting an eye". British European Airways Corporation have ordered 28 planes. Main deliveries will be in 1953 but a certain number will be ready before that for tests over the routes where they will be working. It is expected eventually to turn out five per month.

The Viscount sells for about £180,000. On a basis of cost to weight this is about the same as the cost for a highly developed aircraft with piston engine. Considering the fact that this price must contain heavy charges for development work, which would not apply to the older type craft, it looks to be quite reasonable. Incidentally it is the first turbo-prop airliner to be certificated under the new formula of the International Civil Aviation Organization.

The Plane

The Viscount is a low wing monoplane of quite conventional design. It has a wing span of 94 ft. and a length of 81 ft. 2 in. It has a wing loading of 51.9 lb. per sq. ft. The fuel tankage is 1,720 Imp. gallons. The cruising speed is 316 miles per hour at 25000 feet. There is talk of getting this type of plane up to a speed of 500 miles per hour, but if that comes to pass it is likely that the improvements in the engine that make it possible, will apply also to the straight jet, so that the relative limits of speed between the two will not be changed.

All-up weight is 50,000 lb. with maximum pay load 12,500 lb. The plane is designed for three different kinds of interior layout, carrying in two cases 40 passengers and in the third for shorter distances, 48 passengers. It is good for 1,000 mile stages with full reserves of fuel adequate to reach an alterna-

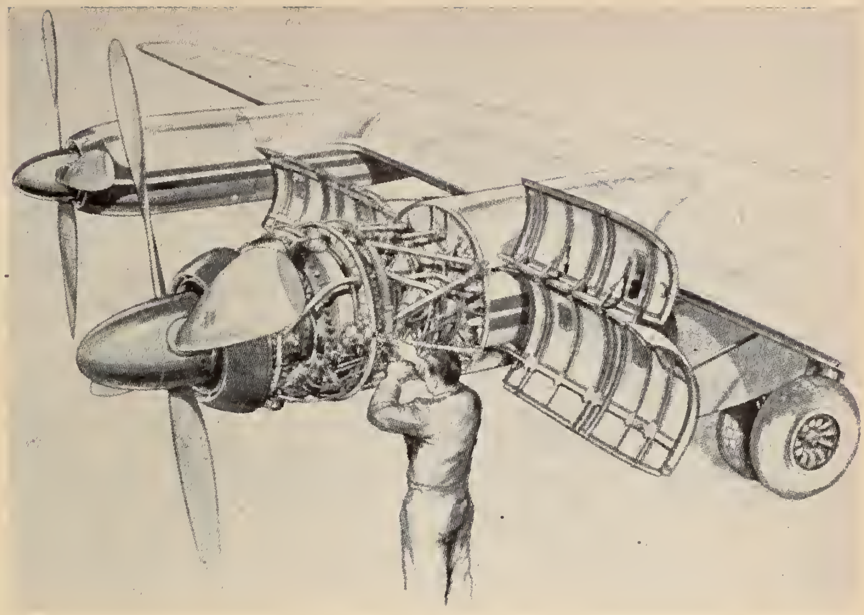


Fig. 2. Viscount power plant installation illustrating petal-type cowlings.

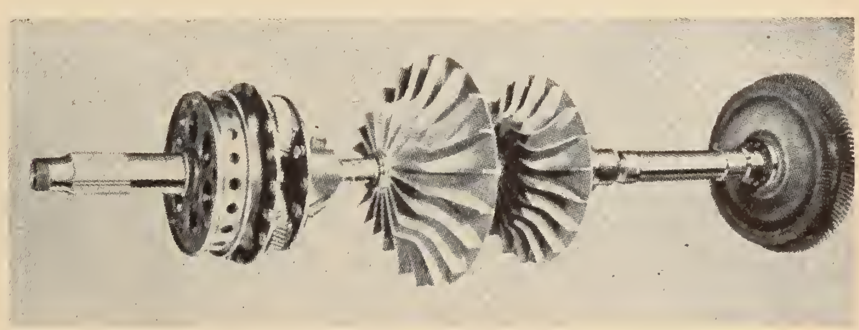


Fig. 3. Rotating component of the Rolls Royce Dart Engine — the propeller reduction gear to low and high pressure single sided centrifugal impellers and two-stage axial flow turbine.

tive airport and for a $\frac{3}{4}$ hour stand off at 5000 feet. The fuel is kerosene which is both cheaper and safer than gasoline.

The propellers are made by Rotol and are 10 feet in diameter. Two types are offered one of duralumin and the other of a composite type. The latter is built with a steel sheath attached to a basic duralumin blade to form a hollow leading edge wherein are mounted the electric de-icing elements.

The Engine

The Rolls-Royce Dart RDa3 turbo-prop engine develops 1400 horse power plus a jet thrust of 365 lb. There is one shaft which provides a common axis for two single-sided centrifugal impellers and a two-stage axial flow turbine. This unit drives the propeller through a reduction gear.

At maximum r.p.m. the mass air flow through the two-stage compressor is 20 lb. per second at a compression ratio of about 5.5 to 1.

The blades of the high and low pressure stages of the axial-flow turbine are carried on separate wheels by "fir tree" type serrated roots. The two wheels are coupled and bolted to a single shaft forming the direct drive to the compressor.

Controls

Only two cockpit controls are required, a throttle lever and a high pressure shut-off cock for stopping the engine. The aircraft can take off under full load with only three engines operating and can be operated under full control with only two engines running—in fact this is standard practice during stand-off. It can stop in much shorter distance than can other planes of the same weight.

Interior

It isn't possible to report on the interior decoration or fittings because at the time these features were just temporary in the prototype. Other planes were decidedly "open" for inspection. These were excellent conditions under which to see the structural features and the complicated system of wire conduits and ducts that ordinarily are hidden under the floor or above the ceiling. One noticeable feature was the large oval shaped windows, which we were told have been patented by the company. They are a great improvement over the peep holes built into older planes. Each window is an emergency escape outlet because it can be pulled in from the inside or pushed in from the outside after operation of a lever.

Airframe

An all-metal, stressed skin construction of light alloy is employed throughout. The fuselage is built up of open frames and stringers to which the plating is attached by rivets. The main plane skin, attached to the leading and trailing edge members so as to form a torsion box, is supported by a single built-up I-section main spar. Tail plane and fin are similarly constructed. Electrically - operated, double - slotted trailing-edge flaps extend from the wing root to the inboard end of the balanced Irving-type ailerons. The metal elevators and rudder are fitted with trimming tabs.

Landing Gear

The sturdy tricycle undercarriage consists of two main units housed in the inner nacelles and a castoring, steerable unit in the nose of the aircraft. All units, which are hydraulically operated, retract forward and are twin-wheeled for safety. Vickers oleo-pneumatic shock-absorbers of the latest design are incorporated. The nose wheel has dual hydraulic steering and is designed to give automatic self-centring for retraction and to absorb side shock loads when taxying. Duplicate hand and foot hydraulic brakes are fitted.

Before leaving Weybridge mention should be made of the huge pressure chamber, which was just reaching the finishing stages when we were there. It will accommodate the complete fuselage of the Viscount. It is reported to be the largest chamber of its kind in the world. It was designed and built entirely by the company.

There were some interesting features in one building which was devoted to overhaul and repair. None of the really new types were there, but some new and old Vikings were on hand to quicken one's pulse. We saw, both inside and out, a machine used by His Majesty George VI. As would be expected the plane has a lot of quite unusual features. It was with the greatest reverence and respect that we sat in the chair which had already, on numerous occasions, been occupied by His Majesty.

There were two other Vikings—both well seasoned—that were in for overhaul. They belonged to far eastern potentates. One of them had been operating for four years and this was its first overhaul.

In other buildings there were several other types of planes as well as the Viscount. For instance, they have a new fighter, the Supermarine 535, which it appears will be faster than anything yet flying in that class. A new crew trainer, the Varsity, was just going into production. It is a substantial looking twin engine affair that provides training facilities for a whole crew, including navigating, bomb-aiming, piloting and radio-radar signals. The flight deck accommodates the pilots, navigator and radio operator. Side-by-side dual controls are fitted. There is an underslung nacelle for the bomb aimer and his pupil—both in prone positions. The Engines are Bristol Hercules.

The new Supermarine Attacker is a descendant of a long line of distinguished antecedents such as various Schneider Cup winners and the Spitfire, the Seafire and the Spiteful. In 1948 with a full military load it made a new record for the 100 km closed-circuit of 564.9 miles per hour. In its present version it is powered with a Rolls Royce Nene turbo-jet mounted about midway along the fuselage. In the naval version it is fitted with an A-frame arrester hook for deck landings on carriers. It carries as fixed armament one pair of Hispano 20 m.m. cannon in each wing with a total of 624 rounds of ammunition. Also there is provision for combinations of rocket projectiles or bombs beneath the wings.

Other aircraft in the Vickers family include the Valetta which is a modification of the Viking for military duties, the Seafire a development of the Spitfire for carrier service, and the Seagull Amphibian, developed to supersede the well known Walrus and the Sea Otter.

Next

The next effort will deal with the Brabazon, the world's largest commercial plane, made at Filton by the Bristol Aeroplane Co. Limited. It's quite a plane, and has an important place in the scheme of things as related to main line air transportation.

FROM MONTH TO MONTH

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

Voluntary Contributions

Members will notice that on the account for fees which they will receive in January there is an extra line bearing the words "Voluntary Contribution". The purpose of this was explained on these pages in the November issue and with the account itself there will be a further explanation, but it is felt that no opportunity should be lost to bring this matter to the members' attention.

Simply told, the story is that the Institute needs more money to carry on its activities and Council does not wish to increase the amount of the annual fee. It is hoped that by voluntary contribution sufficient additional money can be raised to meet the situation.

This method of raising money is not new. The American Society of Civil Engineers has followed it for three years, and has secured quite substantial results. It has the advantage that those who feel they can give some additional support may do so, without working any hardship on those who feel they cannot.

It is not necessary to argue that the costs of operating the Institute have increased greatly in recent years. This increase springs not only from the higher costs of all articles and services which have to be purchased but from increased activities as well. The expanding opportunities for service must be met, particularly to the student and young engineer, and to do this a greatly increased income is essential.

In recent years many members have expressed a desire to make some further financial contribution to the Institute. It has been largely from the encouragement given by these people that Council has decided to invite voluntary contributions. You will have your opportunity to help when you receive your fees account shortly. Your assistance will be appreciated greatly by the Council.

New Address in Toronto

At the invitation of the Ontario Association of Professional Engineers, the Toronto office of the Institute has taken up new quarters in the building recently purchased by the Association at 236 Avenue Road.

Although the office on Bay Street was entirely satisfactory and most strategically located, it was agreed that there was much to be gained by a close association with A.P.E.O. in the same building. Co-operation between the national organization and the provincial licensing body has been particularly close in recent years and those engineers who are members of both organizations will find it advantageous to have them sharing the same quarters.

An invitation is extended to all members in Toronto or visiting that city to call at 236 Avenue Road to inspect the new office and to give the field secretary, Dr. L. F. Grant, or his assistant, Mrs. Wardle, an opportunity to be of service.

Sixty-fifth 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 1951 will be convened at Headquarters at eight o'clock p.m. on Thursday, January 25th, 1951, 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 Mount Royal Hotel, Montreal, on Wednesday, May 9th, 1951.

Cover Picture

The article "Ultra Modern Transportation" in this issue (Page 1063) deals with the Vickers Viscount turbo-propeller driven medium transport aircraft. The Viscount is one of the post-war developments on which Britain is depending to regain her place in the forefront of the world's civil aircraft industry. The cover illustration shows the Viscount performing normally with two port engines shut down.

"We Engineers are Queer People"

At the recent annual meeting of the Engineers' Council for Professional Development held in Cleveland, Ohio, some startling figures on the trends in student enrolment were presented by S. C. Hollister, Dean of Engineering at Cornell. The report showed an impressive reduction in numbers enrolling for engineering courses. The audience was greatly disturbed, and immediately discussed steps whereby the numbers could be increased substantially. One speaker observed, "We engineers are queer people. Here we are worrying about the reduction in the number of prospective engineers, and trying to find means to overcome it, when certain other professions are trying to control and keep down the numbers who are admitted to study in their fields."

There is nothing to be gained here in examining the purposes behind the policies of the other professions, but it is comforting to know that the engineer recognizes how essential it is to industry to have an adequate supply of engineers. He knows that the welfare of the world depends largely on industry and industry depends largely on the engineer. And so he does not thrill at the reduction in the number making competition for him, but he does worry that there may not be enough to do the nation's business. In the eyes of many people the engineers indeed must be "queer people".

Conditions in Canada

Fortunately the situation is not so serious in Canada, but the trend is apparent, and consideration should be given here as in the United States, to maintaining an adequate supply of the proper raw material. The figures are more complete for the United States, and Canadians may well profit from studying them, while getting a modicum of satisfaction from the better situation in Canada.

It is reported that the falling off in the United States is due to the counselling given high school pupils. Over a period of three or four years they have been told that engineering was overcrowded, and that they had better look elsewhere for a career. In Canada too there have been many who feared that too many engineers were being turned out, and many students at both the high school and the university level have been disturbed if not diverted in their planning by such counselling. It is a matter of some satisfaction that the officers of the Institute have never preached that gospel. They have held that the progress of Canada was such that the opportunities for engineers would increase along with the increasing number of graduates.

What Are the Figures?

Dean Hollister reported that his study was based on a survey of 34 institutions, made up of a variety of types of universities and colleges in a variety of places from coast to coast. Over the previous three years the freshman enrolment in these institutions had been about 50 per cent of that for the whole country, and therefore it was reasonable to use the current figures of these institutions as a basis for estimating the figures for the entire country.

Here is the tabulation as to freshman enrolment:

Year:	34 Institutions	Entire Country
1940	16,407	33,175
1947	27,124	57,507
1948	22,735	47,672
1949	19,189	36,508
1950	14,057	26,500*

* Estimated.

The number of high school graduates in the same years and the percentage enrolling in engineering courses are:

Year:	H.S. Grads (Millions)	Per Cent to Engineering
1940	1.22	2.7
1947	1.08	5.3
1948	1.19	4.0
1949	1.27	2.9
1950	1.23	2.2

In the immediate future years there will be a gradual decrease in high school graduates totalling 10 per cent by 1953 after which the present number will be reached again by 1958.

An estimate was made of the total enrolment based on analysis of the published data on classes for the preceding two years. This resulted in an estimate of overall undergraduate enrolment of 130,000.

The engineering profession in the United States needs about 20,000 engineering graduates annually for civilian peacetime needs alone. The present emergency will convert many of the peacetime needs to emergency needs of industry; and in addition the military needs are to be added to civilian requirements. It is estimated that a minimum of 30,000 graduates from engineering schools will be required each year to supply the total needs.

The total undergraduate enrolment in 1948 was 226,000 and in 1949, 181,000. The decreases in total enrolment to the present estimated 130,000 are 42 per cent and 28 per cent respectively. The present total is still 20 per cent above the 108,000 of 1940 but that figure will be reached in another year if the freshman enrolment is no larger next year. If this size of entering class were to continue, the total enrolment would drop below 90,000.

Assuming that Selective Service were not withdrawing students from the engineering schools, the graduating classes in the next four years are estimated as follows:

1951	32,500
1952	21,900
1953	17,000
1954	12,400

Thus it is seen that if the draft were not calling engineering students and all who were academically successful were allowed to continue, after next June there would be an annual deficit of from 30 to 60 per cent based on 30,000 minimum need.

Selective Service announced on October 6 last, a plan being promulgated by their technical advisory committees and which the Director stated he was prepared to support, whereby those students who completed the freshman class in the upper half would be allowed to continue; those in the upper two-thirds of the sophomore class would be allowed to proceed; and those in the upper three-quarters of the junior class could continue. Assuming that the freshmen ranged from 16 to 19 years, the number to graduate from each 100 freshmen is estimated to be 34. Applying these rates to the present enrolments, it is found that the graduations in 1952 would be 18,000 and 1954 only 9,000.

Dean Hollister states it is his belief that in view of the fact that industry has absorbed nearly 50,000 graduates this year, the estimate of a combined annual need for both industry and the armed forces of 30,000 is very conservative. Therefore it appears to be in the national interest to assure the country of a continuing supply of at least 30,000 graduates. To achieve this objective it is first of all essential to develop a realistic draft policy. In view of the recently proposed regulations this matter is very urgent. Regulations that will conserve the present dwindling supply are necessary.

Canadian Figures

The Institute's annual compilation of enrolment figures for Canada is just now complete. It appears elsewhere in this issue of the *Journal*. Following somewhat the same form as used to present the American figures, the Canadian situation looks like this:

All Institutions:	*1940-41*	*1947*	*1948*	*1949*	*1950-51*
Freshmen Enrolment	1,379	3,675	2,316	2,034	1,794*
Total	4,079	14,149	13,063	10,715	8,329
Prospective Graduates	744	1,736	3,309	3,591	2,450†

* Including 93 veterans. † Including 1,318 veterans.

The reduction in numbers between 1949-50 and 1950-51 is due largely to the reduction in the enrolment of veterans, but it is believed there are other factors at work as well. The enrolment of freshmen compared to numbers of high school graduates for the same period should be examined. These figures are now being sought and will form the basis of further comment later.

As far as employment of graduates in Canada is concerned the situation is generally satisfactory. Through the Institute employment service and from visits to the universities, it appears that all graduates of this Spring's record class have found employment. The employment service continues to get enquiries for more engineers, both young and old, than can be supplied. If the present trend continues there will be a disturbing shortage by next year. Encouragement should be given to suitable high school seniors to enroll in engineering, so that economic progress may not be retarded for lack of adequate engineering services.

Recommended Reading List

Elsewhere in this issue of the *Journal* there is printed "A Reading List for Junior Engineers" which is one of the publications of the Engineers' Council for Professional Development. The work has been done by the Committee on Professional Training on which The Engineering Institute of Canada is represented by J. W. Brooks, of Kingston, Ont.

It is hardly necessary to explain or recommend a reading list. Everyone knows how essential it is that reading in many different fields must be continued throughout life. The books recommended in the list are divided into ten different classifications but none of them is in the nature of a textbook.

One member of the Institute after reading through the list said he would recommend that the words "for Junior Engineers" be struck out of the title. He thought the list was just as appropriate to senior engineers and that it is just as essential they should be guided by it as that junior engineers should be.

The list in pamphlet form is on sale by E.C.P.D. and may be purchased through the Engineering Institute. The prices are 10c for separate copies or 5c for fifty or more copies.—L. A. W.

Hamilton Engineers' Wives Group

Headquarters has been advised of the organizational meeting on November 14th of the Engineers' Wives Association of the Hamilton Branch. The meeting was held at the Cawesco Club in Hamilton and the principal speaker was Mrs. H. E. Treble of St. Catharines, formerly of Ottawa.

Mrs. Treble has been active in the formation of the Engineers' Wives Association in Ottawa and her advice was most useful to the ladies in Hamilton.

The provisional executive of the new association consists of:-

Honorary President: Mrs. L. C. Sentance.

President: Mrs. George L. Schneider.

Vice-President: Mrs. J. Arthur Reid.

Secretary: Mrs. Leslie C. Galloway.

Treasurer: Mrs. Fred J. Veale.

Membership Convener: Mrs. John A. Tyerman.

Programme and Social Convener: Mrs. John B. Carruthers.

Publicity Convener: Mrs. G. L. T. Vollmer.

The Institute congratulates the wives of the Hamilton engineers and wishes them every success in their new venture.

Winnipeg Engineers' Wives Birthday

The Fort Garry Hotel in Winnipeg was the setting for a dinner party held in late October to mark the 10th anniversary of the Engineers' Wives Association of Winnipeg.

Mrs. J. W. Baldock, president of the Association was in the chair. Mrs. E. P. Fetherstonhaugh, wife of the past-president and former dean of engineering at Manitoba, gave a resume of the work of the Association in its first ten years and explained a bursary that is being set up by the Association for engineering students at the University.

The speaker was Grant MacEwan, Dean of Agriculture and Home Economics at the University of Manitoba. T. E. Storey and J. C. Trueman conveyed greetings from the Manitoba Association of Professional Engineers and the Winnipeg Branch of the Institute.

REGISTRATION IN ENGINEERING AT CANADIAN UNIVERSITIES

University	Year	General Course	Aeronautical Engineering	Agricultural Engineering	Ceramic and Non-metallic Minerals	Chemical Engineering	Civil Engineering	Electrical Engineering	Engineering and Business Administration	Electro-Mechanics	Forest Engineering	Geology and Mineralogy Engineering	Mechanical Engineering	Metallurgical Engineering	Mining Engineering	Engineering Physics	Total
Dalhousie University.	1st	35 (3)															35 (3)
	2nd	29 (1)															29 (1)
	3rd	31 (6)															31 (6)
Total		95 (10)															95 (10)
Saint Mary's College, Halifax.	1st	36															36
	2nd	17															17
	3rd	14															14
	4th	6															6
Total		73															73
St. Francis Xavier.	1st	48															48
	2nd	63 (3)															63 (3)
	3rd	54 (4)															54 (4)
Total		165 (7)															165 (7)
N.S. Tech. College	4th					12 (3)	73 (15)	39 (8)					41 (12)	3	3 (2)		171 (40)
	5th					7 (5)	64 (35)	32 (16)					61 (30)	2 (1)	8 (4)		174 (91)
Total						19 (8)	137 (50)	71 (24)					102 (42)	5 (1)	11 (6)		345 (131)
Acadia University.	1st	19															19
	2nd	15															15
	3rd	23 (2)															23 (2)
Total		57 (2)															57 (2)
Mount Allison University	1st	24 (1)															24 (1)
	2nd	45 (4)															45 (4)
	3rd	18 (3)															18 (3)
Total		87 (8)															87 (8)
*University of New Brunswick	1st					3	23	17					4		1		48
	2nd					7	32 (4)	19 (1)					8		1		67 (5)
	3rd						21 (3)	14					5 (3)				40 (6)
	4th						36 (13)	27 (15)									63 (28)
Total						10	112 (20)	77 (16)					17 (3)		2		218 (39)
Laval University, Quebec.	1st	69															69
	2nd	75															75
	3rd					11	27	11				1	1	4	4		59
	4th					9	23 (1)	13				4 (2)		2	6		57 (3)
	5th					15 (4)		22 (3)				6 (1)		2	5		50 (8)
Total		144				35 (4)	50 (1)	46 (3)				11 (3)	1	8	15		310 (11)
Ecole Polytechnique	1st	118															118
	2nd	101 (1)															101 (1)
	3rd	80 (5)															80 (5)
	4th						50 (3)			23(2)		5 (1)		2			80 (6)
	5th						48 (7)			34(5)		9		3 (1)			94 (13)
Total		299 (6)					98 (10)			57(7)		14 (1)		5 (1)			473 (25)
McGill	1st	184 (1)															184 (1)
	2nd	206 (3)															206 (3)
	3rd					28 (2)	48 (3)	35 (4)					42 (4)	1	4	11 (3)	169 (16)
	4th					32 (6)	71 (14)	54 (19)					85 (27)	11 (3)	9 (6)	3 (1)	265 (76)
	5th					60 (39)	82 (46)	73 (46)					90 (58)	21 (17)	16 (9)	9 (2)	351 (217)
Total		390 (4)				120 (47)	201 (63)	162 (69)					217 (89)	33 (20)	29 (15)	23 (6)	1175 (313)
Ottawa University	1st	6				2	8	1				1	2		3	1	24
	2nd					3	5 (1)	6				1	4				19 (1)
Total		6				5	13 (1)	7				2	6		3	1	43 (1)
Carleton College	1st	25															25
	2nd	33 (1)															33 (1)
Total		58 (1)															58 (1)
Queen's University.	1st	200 (2)															200 (2)
	2nd	144 (17)															144 (17)
	3rd					29 (6)	30 (4)	31 (6)				10 (3)	34 (9)	9 (2)	12 (4)	17 (3)	172 (37)
	4th					33 (10)	55 (21)	47 (30)				13 (5)	56 (27)	14 (9)	11 (9)	13 (3)	242 (114)
Total		344 (19)				62 (16)	85 (25)	78 (36)				23 (8)	90 (36)	23 (11)	23 (13)	30 (6)	758 (170)
Toronto	1st		11		2	86 (2)	83 (5)	46 (3)	57 (2)			11 (1)	75 (5)	12	11	21	415 (18)
	2nd		10 (1)		2	69 (3)	68 (8)	70 (7)	42 (3)			13 (1)	66 (10)	5	7 (2)	26 (1)	378 (36)
	3rd		8 (3)		6(1)	80 (18)	105 (38)	85 (29)	57 (21)			8 (2)	108 (52)	17 (6)	13 (4)	34 (4)	521 (178)
	4th		31 (18)		10(5)	96 (52)	124 (75)	139 (105)	60 (32)			23 (10)	181 (128)	18 (15)	23 (16)	39 (21)	744 (477)
Total			60 (22)		20(6)	331 (75)	380 (126)	340 (144)	216 (58)			55 (14)	430 (195)	52 (21)	54 (22)	120 (26)	2058 (709)
Manitoba	1st	106 (7)															106 (7)
	2nd	104 (14)										8 (1)					112 (15)
	3rd						50 (15)	24 (9)					33 (8)				107 (32)
	4th						45 (25)	52 (38)					56 (34)				153 (97)
Total		210 (21)					95 (40)	76 (47)				8 (1)	89 (42)				478 (151)

NOTE—The figures shown in brackets indicate, in each case, the number of veterans included in the figure immediately preceding.
*University of New Brunswick, now in transition to a five-year engineering course, will graduate the present fourth year in 1952.

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	110	....	....	....	....	....	....	....	...	....	....	....	....	....	....	110
	2nd	33 (1)	....	2	1	8	30	11	....	...	....	10	13	....	....	13	121 (1)
	3rd	....	....	4(1)	3(2)	5	38 (6)	12 (3)	....	...	....	9 (1)	28 (5)	....	....	10 (1)	109 (19)
	4th	....	....	3(1)	5(2)	14 (1)	27 (13)	13 (4)	....	...	....	6	37 (13)	....	....	11 (3)	116 (37)
Total......	....	143 (1)	....	9(2)	9(4)	27 (1)	95 (19)	36 (7)	....	...	....	25 (1)	78 (18)	....	....	34 (4)	456 (57)
Alberta	1st	151 (3)	....	....	....	....	....	....	....	...	....	....	....	....	....	....	151 (3)
	2nd	....	....	....	....	29 (1)	50 (6)	10 (1)	....	...	....	....	....	....	11	....	100 (8)
	3rd	....	....	....	....	48 (9)	44 (10)	19 (2)	....	...	....	....	....	....	8 (4)	2 (1)	121 (26)
	4th	....	....	....	....	62 (33)	45 (22)	44 (35)	....	...	....	4	....	....	15 (12)	2	172 (102)
Total......	....	151 (3)	....	....	....	139 (43)	139 (38)	73 (38)	....	...	....	4	....	....	34 (16)	4 (1)	544 (139)
British Columbia	1st	171 (8)	....	....	....	....	....	....	....	...	11	....	....	....	....	....	182 (8)
	2nd	172 (15)	....	....	....	....	....	....	....	...	9	....	....	....	....	....	181 (15)
	3rd	....	....	1(1)	....	17 (1)	58 (17)	44 (15)	....	...	10 (3)	13 (8)	52 (15)	8 (1)	11 (4)	5 (1)	219 (66)
	4th	....	....	5(1)	....	34 (18)	83 (28)	66 (34)	....	...	22(12)	14 (11)	91 (39)	15 (5)	17 (11)	7 (3)	354 (162)
Total....	....	343 (23)	....	6(2)	....	51 (19)	141 (45)	110 (49)	....	...	52(15)	27 (19)	143 (54)	23 (6)	28 (15)	12 (4)	936 (251)
Grand Total	....	2565(105)	60 (22)	15(4)	29(10)	799 (213)	1546 (438)	1076 (433)	216 (58)	57(7)	52(15)	169 (47)	1173 (479)	149 (60)	199 (87)	224 (47)	8329(2025)
Prospective 1951 Graduates	....	....	31 (18)	8(2)	15(7)	321 (162)	609 (285)	515 (326)	60 (32)	34(5)	22(12)	75 (26)	572 (329)	75 (48)	95 (61)	81 (33)	2450(1318)

†Alberta includes Petroleum Engineering, 2nd Year 18 (1), 3rd Year 27 (7), 4th Year 26 (17).
NOTE—The figures shown in brackets indicate, in each case, the number of veterans included in the figure immediately preceding.

This year's tabulation of enrolment in Canadian engineering courses shows a further downward trend in new enrolment. In all schools except Dalhousie, the number of veteran students enrolled in first year has decreased sharply.

It is noteworthy also that non-veteran enrolment in first year has also decreased from 2,024 last year to 1,751. In view of the many statements that have been made in recent months about the expanding need for graduate engineers it is perhaps somewhat alarming that young men should be turning in decreasing numbers to this field. It is expected that more comprehensive reference will be made in an early issue of the *Journal* to the overall picture of the supply of engineers in the United States and Canada.

Again this year there is little apparent change in the relative popularity of the various engineering branches.

Fourth Wallberg Lecture

Dr. R. W. Diamond, vice-president and general manager of the Consolidated Mining & Smelting Company of Canada Ltd., will deliver the Fourth Wallberg Lecture on Wednesday, January 17, at 8.30 p.m., in Convocation Hall, University of Toronto. The title of the Lecture is "The Engineer and Industrial Management."

Elections and Transfers

At the meeting of Council held in Saskatoon on October 14th, 1950, the following elections and transfers were effected:

Members:

W. M. Armstrong, *Vancouver, B.C.*
M. D. Ayers, *Hamilton, Ont.*
W. H. Bateman, *London, Eng.*
V. G. M. Chatfield, *Montreal, Que.*
K. T. S. Chung, *Montreal, Que.*
M. C. Collins, *Corner Brook, N'fld.*
J. W. Eakins, *Montreal, Que.*
J. D. Heaman, *London, Ont.*
P. E. Goodwin, *Montreal, Que.*
W. E. Hickey, *Toronto, Ont.*
D. A. Hopper, *Montreal, Que.*
T. P. P. Hutchinson, *Sarnia, Ont.*
T. Ingledow, *Vancouver, B.C.*
J. B. Kinney, *Toronto, Ont.*
F. Krug, *Montreal, Que.*
J. E. Lenhoff, *Kapuskasing, Ont.*
A. S. Lowe, *London, Eng.*
H. M. Lumb, *Kingston, Ont.*
E. G. Macnutt, *Montreal, Que.*
G. F. Pearce, *Camp Borden, Ont.*
Z. K. Radecki, *Drummondville, Que.*
Z. J. Ramza, *Montreal, Que.*
Z. Rimsa, *Sault Ste. Marie, Ont.*
H. J. V. Tiedemann, *Montreal, Que.*
W. M. Wood, *Kitchener, Ont.*
L. W. Ziegler, *Milverton, Ont.*

Juniors:

D. J. Bird, *London, Ont.*
R. A. W. Bond, *Toronto, Ont.*
W. J. Bratina, *Bow Island, Alta.*
F. S. Brown, *London, Ont.*
R. Champagne, *Montreal, Que.*
H. G. Crawford, *London, Ont.*
F. H. Domina, *Winnipeg, Man.*
R. R. Galpin, *Sarnia, Ont.*
L. G. Hewiston, *Des Moines, Iowa.*
T. Kowalski, *Montreal, Que.*
N. D. Lea, *Montreal, Que.*
N. W. Life, *Wallaceburg, Ont.*
G. H. Mitchel, *Montreal, Que.*
J. R. Morris, *Montreal, Que.*
R. G. Newell, *London, Ont.*
J. P. Ofrenchuck, *Shawinigan Falls, Que.*
P. R. Terry, *Sydney, N.S.*
J. L. Woodward, *Toronto, Ont.*

Affiliates:

T. E. Boyce, *Toronto, Ont.*
A. A. Joedicke, *London, Ont.*

Transferred from the class of Junior to that of Member:

G. E. Dawson, *Toronto, Ont.*
S. S. Gilmour, *Prince Rupert, B.C.*
T. R. Hunt, *Barrancabermeja, S.A.*
F. S. Idenden, *Maracaibo, S.A.*
R. J. Jones, *Ottawa, Ont.*
S. S. Lefeaux, *Vancouver, B.C.*
J. S. MacMillan, *Ottawa, Ont.*
J. D. Rice, *Britannia Heights, Ont.*
H. A. Spencer, *San Leandro, Calif.*
R. E. Stopps, *Montreal, Que.*
P. D. Verschoyle, *Hatfield, Eng.*

Transferred from the class of Student to that of Junior:

A. G. Hyde, *Toronto, Ont.*
R. C. Thurber, *Vancouver, B.C.*

Students admitted:

J. J. Abel, *Toronto, Ont.*
R. A. Brocklebank, *Willowdale, Ont.*
W. R. Cooke, *Amherst, N.S.*
R. E. Finch, *Montreal, Que.*
H. E. Hendrickson, *Toronto, Ont.*
B. G. King, *Montreal, Que.*
M. Kudrenecky, *Kingston, Ont.*
N. N. MacLean, *Little Sands, P.E.I.*
W. A. McConchie, *Montreal, Que.*
G. A. Norman, *Atlanta, Ga.*
A. R. Paradis, *Shawinigan Falls, Que.*
C. W. Pidgeon, *Kingston, Ont.*
J. Sutherland, *Montreal, Que.*
G. S. Williams, *Montreal, Que.*

Opportunity for Young Canadians

Attention is called to recently established fellowships for study and training in the United Kingdom, to be known as the Athlone Fellowships, details of which are presented herewith. The fellowships become effective in 1951, and it should be noted that applications must be received by the Registrar of the Canadian University by the end of January.

Further details can be obtained from Institute Headquarters or from the office of the High Commissioner for the United Kingdom at Ottawa.

Pertinent details from the brochure issued by the High Commissioner's office are as follows:

Eligibility

(i) The candidate should be a Canadian citizen or a British subject normally resident in Canada holding a degree awarded by one of the universities mentioned above on the successful completion of a course of study in any branch of engineering.

(ii) The candidate should not normally have passed his 27th birthday by October 1st in the year of selection for a fellowship.

Value of the Fellowship

The amount will cover:

(i) Cost of travel from home to the United Kingdom and return, and within the United Kingdom as may be approved.

(ii) Cost of approved university or college tuition and other fees.

(iii) Maintenance allowance at the rate of £6.10.0 per week, payable quarterly in advance.

Basis of Selection

In selecting candidates regard will be had to their academic and technical competence, physical fitness and personal qualities.

Method of Selection

By application in the first place to the Registrar of the candidate's own university. When an applicant in industry is to be interviewed at a university other than that at which he graduated, the Registrar of the latter university will be asked to forward a full report to the Registrar of the university at which the applicant will be interviewed.

Pioneer Honoured at the Abbey

One of the pioneers in the generation of electricity was commemorated at a solemn ceremony in Westminster Abbey last Thursday, when the Dean of Westminster dedicated a memorial window to Sir Charles Parsons. Many electrical engineers today will probably remember the great scientist who gave us the steam turbine which led to the turbo-generator of present-day power stations, and turbines which drove our largest ships. Sir Charles died in 1931 at the age of 77. The window in the Abbey is only one outcome of the work of a special committee set up by the Royal Society to arrange an appropriate memorial. Another is the familiar annual Parsons Memorial Lecture, and a third was the contribution of £10,000 towards the Parsons Memorial Library at London House, Bloomsbury, opened by Her Majesty Queen Mary in 1937.

Sir Frank Smith, chairman of the committee, delivered the memorial oration at the ceremony and recounted the highlights of this outstanding career. He told how Sir Charles overcame difficulties which many thought insurmountable to build the first turbo-electric generator, and how a few years later four such generators were supplied to the Newcastle Electric Lighting Co. Sir Frank Smith added that the modern electric power industry might be said to have started with those four engines. He said, "It is to Parsons that credit is due for the gigantic turbo-generators in electric power stations of the world."

Among those present were Viscount Hall, First Lord of the Admiralty, representatives of the B.E.A., Corporation of Newcastle, Institutions of Civil, Mechanical and Electrical Engineers, C. A. Parsons Co. Ltd., Parsons Marine Steam Turbine Co. Ltd., and seven-year-old Andrew Wainwright, a great-great nephew of Sir Charles.

Reprinted from *"Electrical Times,"* London, England, 12 October, 1950.

Industrial Design Competition

The National Industrial Design Committee has announced a $10,000 competition to stimulate Canadian interest in industrial design. The committee which operates under the auspices of the National Gallery of Canada is contributing $5,000 and the Aluminum Company of Canada and Canadian Lumbermen's Association are each contributing $2,500 to the prize fund.

There will be three cash prizes in each of two divisions—one for design of consumer products made principally of aluminum and the other for designs mainly in wood. First prize in each division will be $2,500, second $1,500, and third $1,000.

The contest is open to any Canadian citizen with the exception of the committee members, employees of the Aluminum Company of Canada Ltd., and the Canadian Lumbermen's Association. The judges will be Ernest Cormier, M.E.I.C., architect and engineer, Montreal; L. V. Randall, industrial banker and professor of art, University of Montreal; J. K. E. Cox, chief of sales development engineering, Aluminum Co. of Canada, Toronto; W. J. Leclaire, M.E.I.C., secretary-manager of the Canadian Lumbermen's Association, Ottawa; S. Chermeyeff, director, Institute of Design, Chicago.

The closing date of the competition is March 15th, 1951, and any entry post-marked later than that date will not be accepted.

Complete rules of the competition and entry forms may be obtained from the National Industrial Design Committee, National Gallery, Ottawa.

Meeting of Council

Secretary's Notes

A regional meeting of Council was held in the Bessborough Hotel, Saskatoon, Sask., on Saturday, October 14, 1950, with the president in the chair. Representatives were present from nine different branches in addition to which there were several guests from Saskatoon.

Fund for Special Purposes

The president reviewed the history of the committee of which he was chairman which had been appointed in 1948 to make recommendations with regard to raising additional funds for the Institute. He explained the reasons for the need of additional funds and also methods by which it was expected they could be accumulated. He explained that the matter had been before Council at many meetings but that finally the committee was prepared to make a report on its findings and to make specific recommendations. The report was as follows:

"To the Members of Council:

Since the appointment of this committee in October, 1948 the matter has been discussed before almost every branch of the Institute and in particular with certain specific members who are in a position to offer advice and counsel. The outcome is that the committee finds:

1. That to fulfil its purposes by expanding its activities the Institute requires more funds than can be produced by the present scale of fees alone.
2. That because of the great number of young men now in the Institute every effort should be made to hold the annual fees at their present level.
3. That substantial sums should be accumulated now in order to continue a full programme of activities in times of depression.
4. That many members would welcome an opportunity to contribute money for such purposes.

Based on these findings the committee recommends as follows:

1. That the entire membership be given an opportunity to make a contribution annually along with the payment of their fees.
2. That organizations that employ substantial numbers of engineers be canvassed for special contributions.
3. That a "special names" group of individuals be selected and invited to make a substantial contribution annually for a fixed period such as five years.
4. That a study be made of the possibilities of acquiring funds through legacies and bequests.
5. That Life Members be organized in such a way that they could make an annual or a lump sum contribution, perhaps for a fixed purpose or group of purposes.

In carrying out these recommendations the committee recognizes the great amount of work involved and believes it would be difficult to accomplish all the objectives with voluntary workers only. Therefore, it is suggested that the collections be made a responsibility of Headquarters even if it requires the employment of additional staff.

The Committee now asks Council's approval of these recommendations and authorization to proceed with the work step by step."

In the discussion which followed many questions were asked. The opinion was expressed from several sources that if these matters were presented fully to the branches a splendid response would follow.

Mr. Heartz as chairman of the Finance Committee supported the proposals, pointing out that in the opinion of the Committee it was necessary to secure additional revenue in order to support the expanding activities of the organization. Finally the report was approved unanimously and authorization given for its implementation.

Engineers and the Manitoba Floods

The president and general secretary reported on conversations which they had on this subject when they were in Winnipeg. It was quite apparent that the contributions of the engineers were outstanding but the engineers themselves had requested that no special recognition be given inasmuch as in their opinion every citizen in Winnipeg deserved equal credit. However it was agreed finally that an attempt be made to have the story of the struggle against the Winnipeg floods recorded in the annals of the Institute.

Employment of Engineers from Outside of Canada

The general secretary reported on an informal appearance made by himself and Mr. Leo Nadeau of the Corpn. of Professional Engineers of Quebec before the Tariff Board in Ottawa. He explained that this was a preliminary hearing and the Board had asked that a formal presentation be made later on perhaps in January.

Civil Defence

After considerable discussion it was agreed that the Institute would not at the moment set up any committee to deal with this matter. It was thought that Headquarters should gather as much information as possible so that in the event of an emergency the required information would be close at hand. It was agreed that within a short time the general secretary should report again to Council as to the material which he had gathered.

Resolutions from the Students Conference

Seven resolutions were presented and discussed. Decisions were reached on each resolution and the secretary was instructed to communicate again with the delegates who had attended the conference. In the meantime it was agreed that the resolutions themselves and Council's decision with them should not be published until the students had an opportunity of replying to the comments which will be made by the general secretary under instruction from Council.

Conference of Secretaries

The general secretary reported that a conference had been held between the secretary of the Canadian Institute of Mining and Metallurgy, the Chemical Institute of Canada and The Engineering Institute of Canada. This was an all-day affair held in Montreal at which a great many subjects of common interest were discussed in considerable detail. After Mr. Wright's report on the many subjects discussed it was agreed that encouragement should be given to holding these conferences frequently as it was felt that in this way the three organizations could in many instances integrate their activities to their mutual advantage, and to the benefit of the profession.

Tariff of Fees

Following instructions given R. E. Heartz at the September meeting, he reported that as chairman of the Special Committee he had secured the consent of James A. McCrory of the Shawinigan Engineering Co., and R. F. Shaw of the Foundation Co. to serve on the committee. The committee is to examine the tariff of fees as prepared by the Association of Consulting Engineers of Canada to see if they are suitable for adoption by the Institute to supersede the tariff established many years ago by the Institute's committee.

Financial Statement

Mr. Heartz as chairman of the Finance Committee presented the financial statement up to the end of September. He pointed out that income had increased substantially but that expenses also had risen. He referred to the increase in cost of doing business which had added considerably to the cost of operating Headquarters.

Co-operative Agreement

The president reported that the officers of the Association of Professional Engineers of Manitoba and the Winnipeg branch of the Institute had drawn up a co-operative agreement which was now submitted to Council for approval. The general secretary reported that the matter had been presented to the Institute's Committee on Professional Interests and that a telegram had been received from J. B. Stirling, the chairman, expressing the Committee's approval on the agreement as drafted except for certain changes in the clause relating to the amount of money which was to be collected by the Association on behalf of the Institute.

After due consideration it was agreed unanimously that the proposed agreement be approved by Council and that Mr. Trueman be instructed to take this message back to the officers of the Association in Winnipeg.

Resolutions from the Commonwealth Conference

The president and general secretary outlined the resolutions which had been presented from the Commonwealth Conference of Engineering Institutions which had been held in South Africa in April of this year. The resolutions were outlined one by one and approved. The president explained that the resolutions themselves would not be published until they had been approved by all societies participating in the Conference. However it was arranged that the complete resolutions would be attached to the November meeting of Council as an appendix and subsequently would be printed in *The Engineering Journal*.

Resolutions from Branch Officers Conference

The general secretary reported that as the minutes of the conference had been received only a short time before his departure for this meeting it had not been possible to select the resolutions and put them in shape for presentation to this meeting. It was agreed therefore that the matter of dealing with the resolutions would be left for the next meeting of Council.

Qualifications for Affiliate

The general secretary reported that the Admissions Committee was asking for some interpretation of the by-law regarding the qualifications for an Affiliate member. To illustrate the point upon which they wished information, two applications were presented: one for a man who was president of a company; another who was vice-president and general manager of a company—both companies being employers of engineers.

After considerable discussion it was agreed with one councillor dissenting that persons of this classification could be accepted as affiliates inasmuch as they were not representing themselves as engineers and were not doing engineering work, but as employers of engineers, their pursuits and practical experience qualified them to co-operate with engineers in the advancement of professional knowledge.

A resolution was made and approved unanimously expressing Council's appreciation of the splendid hospitality of the Saskatchewan branch for the programme which they had arranged for the president and his party, and for the out-of-town councillors. Mr. Olson as vice-chairman of the branch expressed the pleasure it had given him and the officers of the branch to have these distinguished visitors in their midst for two days.

News of Other Societies

The annual meeting of the **Canadian Section** of the **American Water Works Association** for 1951 will be at the Royal Alexandra Hotel in Winnipeg, Man., from May 21 to 23.

The **Royal Architectural Institute of Canada** announces that the annual meeting in 1951 will be held at the Chateau Frontenac, Quebec City, March 1, 2, and 3.

Several prominent scientists will address the first regional conference of the Chemical Engineering Division of the **Chemical Institute of Canada,** to be held in Toronto, February 19 and 20, 1951.

Dr. T. H. Chilton, technical director of the development engineering division of E. I. duPont de Nemours Company is a well known authority on fluid flow, heat transfer and distillation. Professor W. H. McAdams of the Massachusetts Institute of Technology is the author of a book on "Heat Transmission" and has many other publications to his credit. Dr. R. L. Pigford is chairman of the department of chemical engineering at the University of Delaware.

Dr. J. A. Taylor of Wayne University, and Dr. W. H. Stark, general manager of the Vickers-Vulcan Processing Company, are also expected to present papers.

Other regional conferences of divisions of the **Chemical Institute of Canada** are scheduled as follows: the fifth annual regional conference of the protective coatings division, at the Royal York Hotel in Toronto, Friday, March 16, 1951; and the third annual regional conference of the division of analytical chemistry, at the Mount Royal Hotel, Montreal, February 15 and 16, 1951.

The Institute of the Aeronautical Sciences (2 East 64th Street, New York 21, N.Y.) announces the nineteenth annual meeting, to take place January 29, 30, 31 and February 1, 1951, at the Hotel Astor, New York City.

The 30th Annual Meeting of the **Highway Research Board** (2101 Constitution Ave., N.W., Washington 25, D.C.) of the National Research Council (U.S.A.) will be held in the building of the National Academy of Sciences in Washington, D.C., from January 9 to January 12, 1951.

Mr. Raymond J. Faust, chief of the water supply section of the division of engineering, Department of Health of Michigan, U.S.A., has been appointed assistant executive secretary of the **American Water Works Association** (500 Fifth Avenue, New York 18, N.Y.)

The **American Society of Photogrammetry** (Box 18, Benjamin Franklin Station, Washington 4, D.C.) announces the annual meeting of the Society at the Shoreham Hotel, Washington, D.C., January 10, 11, 12, 1951.

William T. Pryor of the U.S. Public Roads Administration will head a symposium on "Photogrammetry as Applied to Highway Engineering".

The Plant Maintenance Show and Conference on Plant Maintenance will take place January 15 to 18, 1951, in Cleveland, Ohio, at the Public Auditorium.

National and regional scientific organizations are co-operating in the sponsorship of the events. The conference is being sponsored jointly by the American Society of Mechanical Engineers and the Society for the Advancement of Management.

An International Welding Congress will meet in London and Oxford, England, from July 14 to 21, 1951. The congress will include the annual meeting of the **International Institute of Welding** and its various Commissions. It is being sponsored in England by the five British member societies, the Institute of Welding (2 Buckingham Palace Gardens, Buckingham Palace Road, London, S.W. 1), the British Welding Research Association, the British Acetylene Association, the Welding Sections of the British Electrical and Allied Manufacturers' Association, and the Sheet and Strip Metal Users' Technical Association.

The **Institution of Naval Architects** and **Institute of Marine Engineers,** in association with the Institution of Engineers and Shipbuilders in Scotland and the North East Coast Institution of Engineers and Shipbuilders, intend to hold an International Conference of Naval Architects and Marine Engineers during the Festival of Britain in 1951.

The dates for the International conference are: London, June 25 to 29, 1951; Glasgow, July 2 to 4, 1951; Newcastle, July 4 to 6, 1951.

The secretary of the International Conference is at 10 Upper Belgrave Street, London, S.W. 1.

Headquarters Records

Each time the *Journal* or other Institute mail is dispatched we are advised of undeliverable items due to incorrect addresses. Our records staff must follow up these changes and the regular service to members suffers thereby. *Please* advise headquarters when your address or occupation changes. The form below can be completed, clipped, and mailed to headquarters in a few moments.

Please Print

Name..

Surname Given names

Home Address.. ☐

Employer..

Employer's Address.. ☐

(Check address to be used for Institute mail.)

Product or Service..

Position or Title..

Degree, Year & College..

Advise Headquarters Promptly of Changes

Personals

Notes of the Personal Activities of Members of the Institute

William L. Batt, HON. M.E.I.C., is in London, England, where he heads the Marshall Plan Administration in Great Britain. He has resigned from the presidency of SKF Industries, Inc., Philadelphia.

Mr. Batt is a past-president of the American Society of Mechanical Engineers.

Major-General G. R. Turner, M.E.I.C., was elected national president of the Military Engineers' Association of Canada, at the annual meeting of the Association on October 19, 1950, at Chilliwack, B.C.

Maj.-Gen. Turner retired from the army in 1946, after a distinguished military career dating from his enlistment in the R.C.E. in August, 1914.

He received the rank of major-general in 1942 when he was appointed quartermaster-general of the newly-formed First Canadian Army. He returned to Canada in 1944, and after service with the Department of Veterans Affairs, was appointed inspector-general of the Army in Western Canada.

Maj.-Gen. Turner was president of the Ottawa Branch of the Military Engineers Association of Canada in 1948. He is a past councillor of the Engineering Institute.

Maj.-Gen. G. R. Turner, M.E.I.C.

Christopher E. Webb, M.E.I.C., is serving in Southern Asia on the Helmand River Delta Commission, an international technical commission which will study and render an advisory report to the governments of Iran and Afghanistan on problems of mutual interest connected with the Helmand River. The Commission, which was organized by agreement between the governments of Afghanistan and Iran with the good offices of the United States Department of State, consists of Senor Francisco Dominguez of Chile, Mr. Webb, and Mr. Robert L. Lowry of the United States. The panel members are all experts on river water problems and were selected from a panel of internationally prominent engineers.

Mr. Webb is district engineer at Vancouver for the Water Resources Division, Department of Resources and Development of Canada.

Arthur Duperron, M.E.I.C., was recently named chairman of the Montreal Transportation Commission.

The chairman has a deciding vote in the five-member commission which includes one engineer with the appointment of Mr. Duperron. Its membership is now complete.

The first task of the commission will be to decide in what manner to acquire the transportation system of the Montreal Tramways Company which the commission is to operate.

The new chairman is a graduate of the Ecole Polytechnique, Montreal, in civil engineering and is a doctor of science of the University of Montreal. Mr. Duperron was chief engineer of Montreal Tramways Company from 1927 to 1937. In 1942 he was appointed assistant general manager and in 1949 he became general manager of the Company.

A. Duperron, M.E.I.C.

Reginald Bowering, M.E.I.C., of Victoria, B.C., has been appointed a member of the United Nations health team which will help to rehabilitate war-ravaged areas in Korea.

Mr. Bowering, a sanitary engineer in the British Columbia Health Department is the only Canadian engineer selected to join the six teams of doctors and engineers being sent to Korea. He has been granted leave of absence.

Mr. Bowering received the degree of B.Sc. from the University of Manitoba in 1938 and graduated with a M.A.Sc. degree in public health training at the University of Toronto in 1939. He joined the British Columbia Health Department in 1940.

Since then he has been instrumental in stepping up the standards of public health sanitation through control of industrial camps, eating and drinking establishments and shellfish production and processing.

He has taken active interest in stream pollution control and is a member of the Pacific Northwest Pollution Control Council.

R. Bowering, M.E.I.C.

W. Boyd, M.E.I.C.

Winnett Boyd, M.E.I.C., will set up a consulting engineering practice in January, 1951, to work initially with the Canadian aero gas turbine industry and its suppliers, and to extend ultimately into other fields of mechanical engineering.

Mr. Boyd, as assistant chief engineer and chief designer of A. V. Roe Canada Ltd. since 1948, was responsible for much of Avro's technical advancement in the turbo-jet engine field. He has been associated with Avro since 1946 when, as chief designer of the gas turbine division, he was asked to continue his work on the "Chinook" engine, which he had initiated for Turbo Research Limited. He was head of the engine design section of Turbo Research Limited, when as a newly formed crown company, it took over in 1945 the turbo-jet engine work of the National Research Council.

Mr. Boyd, while at Avro, was also responsible for development of the "Orenda" engine, a larger and further improved version of the "Chinook". Avro have reported very encouraging results in extensive test bed and flight trials of this latter engine and it is expected that it will power the Avro "Canuck", the all-purpose fighter which the Company is to build for the R.C.A.F.

F. V. Seibert, M.E.I.C., of Winnipeg, industrial commissioner for the Canadian National Railways since 1930, and immediate past-president of the Canadian Institute of Mining and Metallurgy, has retired from the railway service.

An R.A.F. veteran of the First World War, Mr. Seibert went to Winnipeg in 1930, joining the C.N.R. as superintendent of the natural resources department.

Mr. Seibert was associated with mining and metallurgy for many years before joining C.N.R. He entered the Department of the Interior in 1922 to work on topographical surveys. After two years he went to the Natural Resources Intelligence Branch, being appointed in 1929 the supervisory mining engineer of the department. He had graduated from Toronto University in 1912.

J. A. Gordon, M.E.I.C., has been appointed manager of the apparatus division in Canadian General Electric Company's Halifax district. He is responsible for the sale and service of the company's heavy electrical products for utilities and industry throughout the Maritimes and Newfoundland.

Mr. Gordon graduated from Dalhousie University with the degree of B.Sc. in 1939 and from McGill with the degree of B.Eng. in 1941. His most recent appointment has been on the C.G.E. staff in Windsor, Ont., as apparatus engineer.

W. A. Williamson, M.E.I.C., has been appointed manager of Canadian General Electric for the Vancouver District. He becomes responsible for the sales and service organization in the company's offices and warehouses throughout British Columbia.

Mr. Williamson has held a number of important posts from coast to coast—his most recent appointment as manager of C.G.E.'s Saint John, N.B., office.

A native of Toronto, he graduated in

W. A. Williamson, M.E.I.C.

1934 from the University of Toronto as a B.A.Sc., electrical. After receiving the Company's 'Test' training at Peterborough, he spent a number of years at Trail, B.C. For some time he was a sales engineer at the Toronto Head Office, for heavy electrical equipment utilities. In 1946 he was transferred to

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

Saint John, becoming manager of the office in the following year.

James C. Neufeld, M.E.I.C., of Vancouver, B.C., regional services engineer in charge of design and construction of municipal

W. L. Mackenzie, M.E.I.C.

services for Central Mortgage and Housing Corporation in connection with various housing projects in British Columbia has been appointed city engineer of Lethbridge, Alberta, to succeed **Mr. James Haimes,** M.E.I.C., who is retiring at the end of 1950.

Mr. Neufeld is a graduate of the University of Manitoba having received the degree of B.Sc. in civil engineering in 1931. He is a registered professional engineer in the provinces of British Columbia and Manitoba, and a member of the American Concrete Institute.

Previous to joining Central Mortgage and Housing Corporation on Jan. 1, 1948, he was with the engineering department of the City of Winnipeg.

W. L. Mackenzie, M.E.I.C., has been appointed assistant director of the newly formed Special Projects Branch of the Department of Transport of Canada. The new Branch unites the General Engineering Design and Capital Construction services of the Department under Guy A. Lindsay, the director of the Branch.

Mr. Mackenzie graduated from McGill University in 1917 with a B.Sc. in engineering before proceeding overseas with the Canadian Engineers. After returning to Canada he was associated with private firms before joining the Department of Railways and Canals in 1921. He was associated with the construction of the Welland Ship Canal until 1928 when he proceeded to Churchill, Manitoba, where he was engaged as designing engineer for the government harbour construction. Since 1936, he has been stationed at Ottawa in the capacity of senior office engineer and later as senior bridge and structural engineer.

W. Roland Alexander, M.E.I.C., municipal engineer has announced his association with Margison, Babcock & Associates Ltd., Toronto, consulting engineering firm.

He graduated from University of Toronto, receiving the degree of B.A.Sc. in civil engineering in 1935.

Prior to joining Margison, Babcock & Associates Ltd., he was a municipal engineer for the Central Mortgage & Housing Corporation in Toronto. He was, for a time, township engineer for Nepean, Ont., after having been associated from 1942-1947 with the Naval

Service at Ottawa. He graduated in civil engineering in 1935 from University of Toronto.

T. A. J. Leach, M.E.I.C., of the Water Rights Branch of the Department of Lands and Forests of British Columbia, has been promoted to chief hydraulic engineer.

Mr. Leach graduated from the University of Saskatchewan in civil engineering in 1938, after which he worked with the Water Rights Branch of P.F. R.A. In 1940 he was junior engineer with Department of Transport (Civil Aviation Division) and from 1942 to 1945 he was a lieutenant in a R.C.E. Survey Company working on survey control through N.W. Europe, on location of radar stations, airport construction and on air photo interpretation. The following year he was a resident engineer with the Saskatchewan Department of Highways and Transportation. He joined the Water Rights Branch in 1947.

S. V. Grisdale, M.E.I.C., has been appointed manager of the Canadian General Electric office at Saint John, N.B. He becomes responsible for the sales and services of the broad range of the Company's products throughout New Brunswick.

Mr. Grisdale has, for a number of years, been responsible for apparatus sales in C.G.E.'s Halifax district, which includes all the Maritimes and Newfoundland.

He graduated in 1936 from McGill University with the degree of bachelor of engineering.

S. V. Grisdale, M.E.I.C.

J. L. Miller, M.E.I.C., **F. M. Cazalet,** M.E.I.C., and **Jack E. Macdonald,** M.E.I.C., figured recently in announcements of promotions in the engineering division of British Columbia Electric Railway Company.

Mr. J. L. Miller has been appointed supervisor of civil engineering. He graduated from the University of Saskatchewan receiving B.Sc. in civil engineering in 1941. He joined B.C. Electric as a structural design engineer in 1947.

Mr. F. M. Cazalet is supervisor of mechanical engineering. He graduated from the University of British Columbia in 1937 with the degree of B.A.Sc. in mechanical engineering. He joined B.C. Electric in 1937 and has worked on research and sales and in the planning division.

Jack E. Macdonald is superintendent of construction for B.C. Electric. He joined the Company in 1939. He is a graduate of the University of British Columbia, receiving the degree of B.A.Sc. in 1931. He is a veteran of R.C. A.F. in the Second World War.

A. D. Huether, M.E.I.C., is employed by Proctor, Redfern & Laughlin of Toronto, and will be working in Fort William, Ont., for the next year.

He was previously the assistant city engineer at Calgary.

E. A. Russell, M.E.I.C., who was works engineer for Consumers' Gas Company at Toronto, Ont., has joined the Ford Motor Company of Canada Limited at Windsor, Ontario.

John Alec Simms, M.E.I.C., is employed by Canadian Industries Limited at Shawinigan Falls, Que. He was formerly with Fraser Brace Engineering Company at Sorel, Que., supervising works for Quebec Iron and Titanium Corporation.

Mr. Simms graduated from Nova Scotia Technical College in 1945 receiving the degree of B.E. in civil engineering. He joined Fraser Brace Engineering Company in 1945 and has worked on projects of the Company in Quebec and Ontario; and on construction work for Aluminum Company of Canada and for the Longlac Pulp and Paper Company.

B. Amyot, JR.E.I.C., has joined the sales staff of Bepco Canada Limited.

He is a graduate of Laval University in electrical engineering, receiving a degree of B.A.Sc. in 1946.

Before joining Bepco Canada Ltd. he was a sales engineer for Ferranti Electric Ltd.

Bruneau Amyot, M.E.I.C.

M. Peter Murphy, JR.E.I.C., who is with the firm of Emile D. Lavergne, engineer-contractor of Shawinigan Falls, Que., has been appointed construction engineer for the firm.

Born in Shawinigan Falls, Mr. Murphy studied at St. Francis Xavier University, Antigonish, N.S., and at Nova Scotia Technical College, Halifax, graduating in 1947 in civil engineering. He is attached to the Royal Canadian Navy (Reserve) in which he holds a commission as sub-lieutenant (engineering).

Joining the Shawinigan Engineering Company upon graduation, Mr. Murphy worked on the extension development work carried-out by the firm at Shawinigan Chemicals Limited. He was subsequently transferred to the Trenche power development where he remained for three years. He was the field engineer in charge of the building of the new roads in that vicinity.

E. P. Guloien, JR.E.I.C., has been appointed engineering supervisor for Canadian Industries Limited at James Island, B.C. He was previously in the Alkali Works of C.I.L, at Shawinigan Falls, Que., an engineer on planning and scheduling.

Charles Walter Henry, JR.E.I.C., is working for Newfoundland Light & Power Company Limited in St. John's Newfoundland.

Mr. Henry graduated from the University of New Brunswick in electrical engineering in 1946. Since 1947 he has been assistant distribution superintendent for C. A. Energia Electrica de Venezuela, Maracaibo, Venezuela, S.A.

Robert Alexander Myers, S.E.I.C., who graduated from the University of Saskatchewan in mechanical engineering this year has accepted a position with Burgess Battery Company of Niagara Falls, Ontario.

Visitors to Headquarters

H. V. Chapman, S.E.I.C., Amherst, N.S., October 26, 1950.

Karel R. Rybka, M.E.I.C., Toronto, Ontario, October 30, 1950.

Verdon Smith, Bristol, England, Nov. 16, 1950.

Edgar A. Cross, M.E.I.C., Toronto, Ontario, Nov. 18, 1950.

J. F. Wickenden, M.E.I.C., Three Rivers, Que., Nov. 18, 1950.

A. F. Baird, M.E.I.C., Fredericton, N.B., Nov. 18, 1950.

F. W. Bradshaw, M.E.I.C., Grand'Mere, Que., Nov. 18, 1950.

P. E. Buss, M.E.I.C., Thorold, Ont., Nov. 18, 1950.

E. R. Eaton, M.E.I.C., Sudbury, Ont., Nov. 18, 1950.

D. G. Geiger, M.E.I.C., Toronto, Ont., Nov. 18, 1950.

Chester B. Hamilton, M.E.I.C., Toronto, Ont., Nov. 18, 1950.

J. F. MacLaren, M.E.I.C., Toronto, Ont., Nov. 18, 1950.

J. O. Martineau, M.E.I.C., Quebec, Que., Nov. 18, 1950.

D. Ross-Ross, M.E.I.C., Cornwall, Ont., Nov. 18, 1950.

A. A. Swinnerton, M.E.I.C., Ottawa, Ont., Nov. 18, 1950.

T. F. Rahilly, JR.E.I.C., Sault Ste. Marie, Ont., Nov. 20, 1950.

Obituaries

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

Robert Ernest Doherty, Hon.M.E.I.C.

One of the most distinguished members of the profession and an Honorary Member of The Engineering Institute died suddenly at Scotia, N.Y., on October 19th. Dr. Robert E. Doherty who up to three months prior to his death had been president of the Carnegie Institute of Technology at Pittsburgh, was one of the best known and most respected engineers in North America. Strangely enough the news of his death came dramatically to a great group of his friends in the course of the annual meeting, in Cleveland, of an organization in which he had given outstanding leadership—the Engineers Council for Professional Development.

Robert E. Doherty's influence on professional education began over a quarter of a century ago at the General Electric Company with his organization of the "Advanced Course in Engineering". His conception of its purpose, to teach young engineers to understand the fundamental principle underlying engineering and to use them with well-ordered professional method in the solution of practical engineering problems, was developed as a result of his own experience as engineer and consulting engineer, and especially from his association with Charles P. Steinmetz. Two things had particularly impressed him: the sterility of the ideas which he and other engineering graduates had acquired in their education and in contrast the creative power of the ideas of Steinmetz and of his way of using them in dealing with new and difficult situations. The Advanced Course was designed to correct the one and, as far as possible, to bring the power of the other to its students.

Mr. Doherty had joined the General Electric Company following his graduation from the University of Illinois in 1909. His engineering career began like that of other graduates with the testing department, but he rapidly distinguished himself as Design Engineer from 1910 to 1923, and as Consulting Engineer from 1923-31. His high standing as an engineering scientist is attested by the numerous technical papers of this period in which, in addition to many other significant contributions to engineering, he established the constant flux leakage theorem and laid the foundations of modern synchronous machine theory.

In 1931 he was appointed Professor of Electrical Engineering at Yale University and, the following year, Dean of the newly organized Yale School of Engineering. In the years at Yale he extended his conception of professional education to include preparation for good citizenship as well as preparation for professional leadership.

In 1936 he became President of Carnegie Institute of Technology, where, under his leadership, professional education has developed significantly in both conception and execution. There his vision of professional education crystallized into what is becoming known as the Carnegie Plan which he and his team of co-workers, the Carnegie faculty, have laboured hard to achieve. Much progress has been made, but it will be many years before the full force of his ideas will be felt through the generation of teachers and of professional men educated under the influence of his thinking.

The story of Dr. Doherty's life will be an inspiration to young engineers. In it one sees the fully developed man who not only renders distinguished service in his professional field, but who recognizes his responsibilities in many fields. He had high ideals and great talents — a splendid combination, of great value to all who knew him or knew of him. In the pursuit of those things which he thought worthwhile he never spared himself, but counted only the needs of the cause, and his ability to render assistance to it. He had within him a fire which drove him on, to do all things which needed doing—perhaps to his own undoing. He was only 65 at the time of his death.

Dr. R. E. Doherty, Hon.M.E.I.C.

So that younger men who were not privileged to come within the circle of influence of this great man, may profit from his example, a chronological outline of his career follows:

Dr. Doherty, third president of the Carnegie Institute of Technology, was born January 22, 1885, in Clay City, Illinois. He completed his secondary education at the Academy of the University of Illinois. Before entering the university, from which he received a bachelor of science degree in 1909, he worked two years as a telegraph operator for the Baltimore and Ohio Railroad. This and earlier experience with electricity steered him to electrical engineering.

In 1921, he received his master of science degree from Union College. He holds also an honorary master of arts degree from Yale University (1931), and the honorary doctor of laws degree from Tufts College (1936) and the University of Pittsburgh (1936). Waynesburg College awarded him an honorary doctor of science degree in 1948.

From 1909 to 1931, Dr. Doherty worked for the General Electric Company, where he served for six years as assistant to the great Dr. Charles P. Steinmetz.

In 1931, Dr. Doherty left General Electric to join the Yale University faculty as professor and chairman of the department of electrical engineering. Two years later he was made dean of the Yale School of Engineering. He became president of Carnegie Institute of Technology in 1936.

An authority on electrical machinery and a pioneer in engineering education, President Doherty has received the Lamme awards given for achievements in each of these fields. In 1937, the American Institute of Electrical Engineers gave him its Lamme Medal for his work on electrical machinery and his "encouragement of young men to aspire to excellence in this field"; and in 1946, the American Society for Engineering Education presented him with its similarly named award "for noteworthy achievements in engineering education".

A prolific writer, Dr. Doherty has written extensively in the two fields in which he is most interested—electrical engineering and engineering education—for many scientific journals. In 1936, he wrote, with E. G. Keller, a textbook on "Mathematics of Modern Engineering".

Keenly interested in civic activities, Dr. Doherty served as mayor of Scotia, New York, in 1922, and as a member of that city's board of education from 1925-29.

Dr. Doherty organized the Allegheny Conference on Community Development in 1943, serving as chairman of the Conference from 1943 to 1946. He was member of the Pittsburgh Housing Authority. In 1943 the Pittsburgh Junior Chamber of Commerce selected him "Man of the Year".

Dr. Doherty has always played an active role in the educational programmes of professional societies. He was chairman for three years and a member for six of the Engineers Council for Professional Development. In 1932, he was chairman of the educational committee of the American Institute of Electrical Engineers. He has served on the Committee on Aims and Scope of Engineering Education and on the Committee on Engineering Education After the War. Other educational activities include the presidency of the Society for the Promotion of Engineering Education (now the American Society for Engineering Education) in 1943-44, as well as membership on numerous other boards and committees.

During the recent national emergency, Dr. Doherty was a member of the National Advisory Committee for Aeronautics (1941) and chairman of the Production Planning Board of the Office of Production Management (also 1941).

He was an Honorary Member of the Engineering Institute of Canada, a fellow of the American Institute of Electrical Engineers and of the American Society of Mechanical Engineers.

An accomplished painter, Dr. Doherty won first prize in the Associated Artists Annual Exhibition in 1944.

He was indeed the well rounded man —the perfect example of the engineer and the man at their superb best.

L. AUSTIN WRIGHT

Lt.-Col. Harry E. Bates, M.E.I.C., resident engineer for the Montreal engineering firm of Dr. P. L. Pratley, M.E.I.C., died in Halifax, on November 3, 1950.

H. E. Bates was born at Penacook, N.H., in 1884, moving with his family to Nova Scotia about 1900. He was educated at the Universities of Acadia, Mount Allison and McGill, graduating in civil engineering at McGill in 1908.

He was on the staff of the Quebec Bridge Board from 1909 to 1915, serving successively as a draftsman, assistant resident engineer, shop engineer and inspector of steel.

In 1916 he joined the 66th Field Battery, Royal Canadian Artillery, and served as an officer in that unit until the close of the First World War. In 1937 he organized and trained the 81st Battery in Shawinigan Falls, Que. After the outbreak of war he was in charge of training the 2nd Survey Regiment, Royal Canadian Artillery, in Montreal for about a year. Early in 1942 he was transferred to Camp Petawawa as chief instructor of gunnery with rank of lieutenant-colonel.

After service in the first war he was associated with the Laurentide Paper Company of Grand'Mere, Que., from 1919-28, and with the Consolidated Paper Corporation, Shawinigan Falls, Que., from 1928-49.

Lt. Col. Bates has since been associated with Dr. P. L. Pratley of Montreal, consulting engineer, having been placed in charge of the preliminary work on the proposed Strait of Canso bridge. Shortly before his death he went to Halifax to act in a similar capacity in connection with the Halifax-Dartmouth bridge.

He joined the Institute as a Student in 1907 transferring to Associate Member in 1913 and to Member in 1929. He was also a member of the Association of Professional Engineers of Nova Scotia. He was a past-president of the Shawinigan Falls Branch of the Canadian Legion.

A. H. Munson, M.E.I.C., the director of industrial relations for Dominion Bridge Co. Ltd., at Lachine, Que., died on November 3, 1950, after a short illness.

Mr. Munson was born at Hamilton, Ont., in 1886, and studied engineering at the University of Toronto.

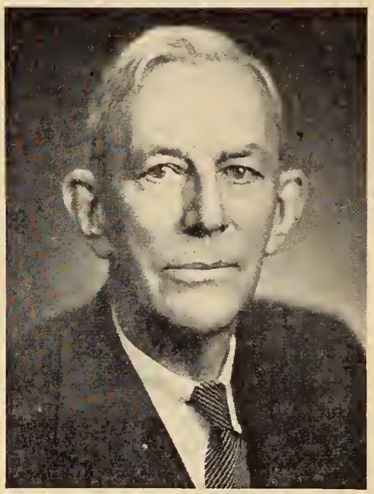
He did some engineering work in Ontario on hydro-plant construction and on bridge construction, before joining Canadian Pacific Railway Company in Montreal in 1912 as a bridge inspector. He returned to Hamilton in 1920 where he was engaged in an executive capacity with Frost Steel and Wire Corporation. He joined Dominion Bridge Company in 1930, and he served with the company until the time of his death.

Mr. Munson joined the Engineering Institute in 1911 as a Student. He transferred to Associate Member in 1916 and to Member in 1940. He held membership also in the American Management Association, and served on the Advisory Committee of the Quebec Industrial Relations Institute, and on the Industrial Relations Committee of the Canadian Manufacturers Association. In 1947 he was chosen Canadian Employers' representative to the International Labour Office, second session of the Iron and Steel Committee, held in Stockholm, Sweden.

J. W. Roland, M.E.I.C., of Montreal, died on November 6, 1950.

Mr. Roland was born at Aylesford, N.S., in 1888. He studied at Acadia University where he received an engineering degree in 1901, after which he went on to the Massachusetts Institute of Technology, graduating in 1904.

He was construction superintendent



J. W. Roland, M.E.I.C.

for six years on the Panama Canal before returning to his native province to take the post of engineering professor at Nova Scotia Technical College. Later he was chief engineer for the Ocean Terminal at Halifax, and also worked with the Department of Highways of Nova Scotia.

He joined the consulting engineering firm of Monsarrat and Pratley and served as resident engineer on construction of the Jacques Cartier bridge in Montreal and the Lions Gate bridge in Vancouver.

He worked for a time with Stadler, Hurter & Company, of Montreal and with the Aluminum Company. He joined the consulting engineering firm of C. J. Jeffreys of Montreal, and was chief civil engineer at the time of his death.

He joined the Engineering Institute as a Member in 1918 and attained life Membership in 1949. He held membership, also in the Associations of Professional Engineers of Quebec, Nova Scotia and British Columbia, and in the American Society of Civil Engineers. He was a life member of the International Association of Navigation Congresses, a member of the Geographical Society, and a past-president of the Rotary Club of Halifax.

H. H. Snyder, M.E.I.C., of Sarnia, Ont., who was with Hydro-Electric Power Commission of Ontario, died recently in a motor accident.

Mr. Snyder was born at Needham, Mass., in 1899 and his home during his youth was at North Bay, Ont. He graduated in mechanical and civil engineering from Queen's University in 1925 and 1926. Before going to university, Mr. Snyder worked for the Ontario Hydro at Cameron's Falls on the Nipigon River. During school vacations he was in charge of survey parties for the H.E.P.C. and it was a natural sequence that he continue with the Hydro on the development of the Nipigon River until 1928, when he went to the Saguenay River as a chief field engineer for the Alcoa Power Company on the Chute-a-Caron development.

In 1929 Mr. Snyder moved to Montreal where he was employed by the A. F. Buyers Construction Company and he later worked for the Canadian Welding Works Limited, Montreal. In 1932 he joined the Shell Oil Company of Canada Ltd., Montreal, when that Company erected a modern refinery at Montreal. He was appointed chief engineer of the refinery in 1940.

During the recent war he was responsible for the construction of the refinery expansion and at the end of the war he decided to retire from active engineering work. He left Shell Company in 1946, and entered on a fruit farming enterprise in the Niagara Peninsula.

In 1949 Mr. Snyder returned to engineering, being appointed project manager of the H.E.P.C. first major frequency conversion at Sarnia. The work was almost complete in Sarnia at the time of his death.

Mr. Snyder joined the Institute in 1924 as a Student, transferring to Associate Member in 1927 and to Member in 1940.

D. A. Chisholm, M.E.I.C., of Antigonish, N.S., died on October 19, 1950.

Mr. Chisholm was born at Eureka, Pictou County, N.S., in 1906. He attended St. Francis Xavier College, Antigonish, N.S., and Nova Scotia Technical College, graduating as a civil engineer in 1932. After graduation he worked for a year on school construction and on proposed improvements to the hydro electric plant of the Town of Mulgrave, N.S., and for a time he was at Schumacher, Ont., with the McIntyre Porcupine Mines. He became associated with the Department of Highways and Public Works of Nova Scotia in 1934, and was appointed a resident engineer in the Department in 1935. He was with the engineering branch of the Department of Naval Services from 1940 to 1944 when he returned to the Department of Highways and Public Works. He entered into a general contracting partnership in 1946 with R. K. MacDonald at Antigonish.

He joined the Institute as a Student in 1930, transferring to Junior in 1934, to Associate Member in 1938, and to Member in 1940. He was also a member of the Association of Professional Engineers of Nova Scotia.

H. McL. Chalmers, JR.E.I.C., civil engineer for Dominion Water & Power Bureau, died accidentally on October 5, at Menihek Rapides, Labrador.

Mr. Chalmers was born at Bathurst, New Brunswick, in 1923. He studied at Queen's University, graduating, in 1946 with the degree of B.Sc. in mechanical engineering.

He worked first for Dominion Engineering Company at Bathurst, N.B. He joined the Dominion Water and Power Bureau, of the Dominion Department of Mines and Resources in 1947, working at Montreal as a civil engineer.

He joined the Institute as a Student in 1946, transferring to Junior in 1948.

Paul Louis Derome, S.E.I.C., who graduated in mining engineering this year from Ecole Polytechnique, Montreal, died accidentally on October 5, 1950, at Menihek Rapides, Labrador. Mr. Derome was born at St. John's, Iberville, Que., in 1924.

He was employed by the Iron Ore Company of Canada, and was engaged on a works project when the accident occurred.

He joined the Institute in 1947 as a Student and was very active in the Junior Section of the Montreal Branch. He was the students' junior representative in 1947-48, and the senior representative in 1948.

News of the Branches

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

Cape Breton

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

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

On November 6th, Col. L. F. Grant, field secretary of the Institute was the guest of the executive and past-presidents of the Cape Breton Branch, at a luncheon held at the Isle Royale Hotel.

The office of field secretary was created to maintain better contact between Headquarters and the Branches, because due to the expansion of the Institute, it has been impossible for the general secretary to do all the necessary travelling. Col. Grant stated that his trip through the Maritimes and Newfoundland was mainly designed to make contact with those members who were too far away from a Branch to attend regular meetings. In that connection, Branch Chairman Cliff Murray welcomed Ed. Brown, one of the out of town members.

A vote of thanks to Col. Grant was proposed by Cliff Murray, and seconded by Gordon Naish. The field secretary left for Newfoundland on the evening boat from North Sydney.

Central British Columbia

M. L. Zirul, M.E.I.C.,
Secretary-Treasurer

A dinner meeting for engineers and their wives and friends was arranged in honour of the visit of the President of the E.I.C., J. A. Vance and Mrs. Vance.

Forty-one persons, including fifteen ladies, attended dinner at the Central Hotel, Kamloops, on October 18. Vice-chairman F. McCallum was in the chair.

Mr. H. N. MacPherson, regional vice-president, who attended the regional Council meeting in Saskatoon on October 14th, was present, accompanying Mr. and Mrs. Vance on the remainder of the tour west.

Mr. W. Ramsay, past chairman read Grace for the dinner.

The president of the Institute was introduced by the chairman. President Vance told of his recent visit to the Maritime Branches and to the new Province of Newfoundland. He told of the tremendous development taking place in Newfoundland and in the cities of the Maritimes in general and of the need for engineers in these places.

He went on to review the status of the engineer and of the engineering societies in world society. He pointed out the scope for development in Canada and the need for young engineers to aid this development. Canada, he assured the meeting, could afford opportunity to all the engineers graduated from her universities for some time to come, without exporting any to the United States or other countries. The number of students and juniors in the Institute this year is greater than at any time and Mr. Vance stressed the importance of giving these young engineers proper guidance and training.

Mr. M. L. Wade very appropriately expressed the appreciation of the meeting for the president's excellent address.

Regional Vice-President H. N. MacPherson, addressing the meeting, spoke of the probability that the 1952 E.I.C. Convention would be held in Vancouver.

Coloured films on the Okanagan Valley and the Cariboo were shown by Mr. W. Goodland of the National Film Board.

The meeting adjourned at 10.15 p.m. and the Presidential Party left for Vancouver by C.N.R., at 11.05 p.m.

Cornwall

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

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

An appreciative audience of 35 heard Mr. R. C. Adams, Cornwall Works superintendent, addressing the Cornwall Branch in Courtauld's Assembly Room on November 7. Mr. Adams first outlined procedure behind the scenes in the City Council's general affairs, describing many points that the general public is not usually aware of. With the aid of maps he then described Cornwall's water and sewage system, pointing out that water rates in the city were considerably lower than in surrounding districts because water power from the St. Lawrence is used to drive the water pumps. Several questions from the audience were answered during this part of the address.

Mr. Adams next showed blueprints of a proposed overpass, crossing the C.N.R. on the north side of the city, and described problems that had arisen in this regard. This led to a lengthy question and discussion period, because of high local interest in the project. L. P. Stidwill introduced the speaker and R. H. Wallace expressed the appreciation of the group.

During the evening several guests were introduced. Two members were appointed to serve on the nominating committee with W. P. Nesbitt. At a brief executive meeting preliminary plans were laid for the annual dinner meeting in December and for the President's visit in January: Vice-chairman H. W. Nickerson was in charge of the evening's activities.

Edmonton

T. E. Bate, M.E.I.C.,
Secretary-Treasurer

E. K. Cumming, M.E.I.C.,
Branch News Editor

On September 28th, 1950, approximately 115 members of the Edmonton Branch of the Engineering Institute of Canada were guests of the Imperial Oil Company on a tour of their recently completed Natural Gas Conservation Plant at Devon, Alberta.

The purpose of this plant is to utilize all products produced from the wells in the Leduc field. To appreciate the place of this plant it is necessary to follow the oil received at the well head to the battery where the oil and gas produced by the well are passed through separators. The oil is then piped to the refinery and the gas obtained is piped to the Conservation Plant for processing. The products obtained at the plant are butane, propane, natural gasoline and residue gas.

At the present time there is no market for the butane produced. The propane, however, is being distributed for use as a domestic fuel in rural areas in the province and as far south as the State of Washington. In addition to this market propane is now being used by the Edmonton Transit System as a fuel for their motor coaches and has been found to provide very low cost operation. The natural gasoline obtained is used for blending with the gasoline produced at Imperial's Edmonton Refinery.

The residue gas remaining after the separation process is piped to and distributed in the City of Edmonton by Northwestern Utilities Limited. This company is presently receiving 6,000,000 cu. ft. of gas per day and will take the total plant output of 12,000,000 cu. ft. per day when installation of all distributing equipment is completed. This amount of gas will provide approximately ten per cent of the city's peak load.

The details of the plant and equipment are beyond the scope of this report. It is, however, an example of excellent engineering and construction which can only be fully appreciated when seen.

Following the tour a dinner meeting was held at Devon's Club Pagoda at which Mr. Terry Smith, chemical engineer at the plant, was guest speaker. Mr. Smith explained the purpose and details of operation of the plant providing the information necessary to understand what had been seen during the tour.

Congratulations for a highly interesting and successful meeting should go to the chairman—E. H. Wright, to E. L. Smith, and N. J. Allison of the programme committee and especially to Mr. Terry Smith and other members of the staff of Imperial Oil.

Hamilton

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

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

Toronto's Rapid Transit Subway System was the topic of an address by W. H. Paterson, m.e.i.c., chief engineer, Toronto Transportation Commission. He was assisted by Mr. Baker, assistant secretary of T.T.C., in presenting slides to illustrate his lecture to the Hamilton Branch of the Institute on October 26, 1950.

Mr. Paterson stated that the Subway Plan was decided on in 1942 when Toronto was faced with the problem of replacing worn-out tracks and equipment on heavily travelled Yonge Street. It would have cost $12,000,000 "to perpetuate the street cars on a street where they could not operate efficiently because of traffic congestion". The 4½-mile subway would carry all passengers from present Yonge and Bay Street routes in 10-car trains at a rate of 40,000 per hour, which is twice the number of passengers carried at present. One of the outstanding features of the system was the off street alignment of the subway which permitted unusual transfer arrangements to cross town surface lines.

Mr. L. C. Sentance, chairman of the Hamilton Branch, called the meeting to order and after a few remarks asked Mr. W. L. Hutchison, m.e.i.c., to introduce the speaker.

A very interesting and informative question period was enjoyed by the members and their guests, the registered professional engineers from the Hamilton District who received special invitations to attend all meetings of the Hamilton Branch E.I.C. Members and guests filled the Science Theater to its capacity of 160.

The chairman called on Mr. A. R. Hannaford, Hamilton's building commissioner to thank the speaker.

Mr. Sentance announced the next meeting for Nov. 16, 1950, which would take the form of a symposium on "Iron ore Resources" in Labrador, Ontario and Mesabi".

The Chairman announced the "Engineers Ball" to be held at the Brant Inn, Burlington, Ontario, December 7th.

Mr. Sentance invited all to doughnuts and coffee, and declared the meeting adjourned.

This year the Executive of the Hamilton Branch has tackled the problem of activities with unusual thought and energy. The October meeting was the largest held in Hamilton for many years, and filled the McMaster Science Theatre to overflowing. Local professional engineers were invited as guests.

On Dec. 7th the Branch held an "Engineer's Ball" for the first time and it is hoped to make this a regular feature of the Hamilton year. The dance was held at the Brant Inn, Burlington. Guests of honour were the President of the Engineering Institute and Mrs. Vance, Mr. E. V. Buchanan, president and Col. T. M. Medland of the Association of Professional Engineers of Ontario. Patrons were H. A. Cooch, H. G. Hilton, W. J. W. Reid, N. Eager, F. W. Paulin and H. G. Bertram. A working committee headed by J. B. Carruthers and G. L. Schneider, co-chairmen, has made all necessary arrangements for an event of unusual interest to all engineers in the Hamilton District.

Kingston

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

S. H. Rochester, m.e.i.c., *Branch News Editor*

The Kingston Branch of the Institute held a smoker in the R.C.E.M.E. School, Barriefield, on October 31st, 1950, at the kind invitation of the officer commanding, Lieut.-Colonel Dunlop, m.e.i.c., r.c.e.m.e.

The meeting was opened by the chairman, Mr. C. T. Andrews, who called on Mr. Irving Orloff, chairman of the local branch Public Relations Committee, to speak upon the objectives and activities in this direction.

Major A. L. McLean, m.e.i.c., r.c.e.m.e., vice-president of the local branch, outlined a programme of events for the coming season and introduced Mr. E. J. Blandford, publication manager of The Engineering Institute of Canada, who spoke on **Public Relations in the Engineering Profession.**

Mr. Blandford, stressing the importance of cultivating the proper attitude toward the general public, said the attention of engineers to public relations can do much to further the standing of the profession.

The speaker considers that engineers are too retiring and do not sufficiently publicize the results of their work. Very few people, for example, are aware that the Rt. Hon. C. D. Howe is a professional engineer. Mr. Blandford went on to explain that the public usually associated the term "engineer" with a mechanic or locomotive driver, whereas in fact, the engineer is responsible for the planning and management of our largest industrial undertakings.

Mr. Blandford described the function of publicity in bringing news of the profession to the people, and how newspapers can assist in this field. Technical magazines such as the Engineering Journal provide a medium for the exchange of information and news among members of the profession, and the interested public.

Finally, Mr. Blandford pointed out that no matter how efficient or competent a person may be, he must practise sound public relations if he is to be appreciated.

Following a lively question period, the speaker was thanked by Mr. M. G. Saunders, after which the meeting adjourned for refreshments. Films illustrating water purification and sewage disposal were shown.

Lethbridge

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

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

A dinner meeting of the Lethbridge Branch was held in honour of President and Mrs. J. A. Vance on the occasion

Dinner meeting on the occasion of the President's visit to Lethbridge.

The Brown Musical Trio entertained with dinner music during the President's visit to Lethbridge. This group has been participating in branch meetings at Lethbridge for over 25 years.

of their visit to Lethbridge on November 1, 1950. Ninety-two members and guests, and their wives attended, to make this meeting the largest ever held by the branch.

Mr. Vance speaking at the dinner meeting commenced by paying tribute to the Lethbridge city engineers for the job they have done in planning and designing the city layout. He also expressed his pleasure at seeing the great water conservation projects now in construction at the St. Mary Irrigation Development.

Mr. Vance spoke of the work of the Institute, remarking on the effort being made to acquaint young engineers with the opportunities available for them in Canada. He also urged engineers to improve their influence and representation in national affairs. He related impressions and experiences from his visits across the country, and also spoke of his recent visit to South Africa and various countries in Europe. He had been particularly impressed with the work of British engineers in the development of jet aircraft.

Mr. Vance was introduced by P. M. Sauder and Mr. A. L. H. Somerville moved a vote of thanks to the speaker, which was heartily endorsed by all present.

Earlier, guests enjoyed a singsong led by R. S. Lawrence, and vocal selections by Miss Laverne Cunning and Mr. George Brown. Brown's Musical trio entertained with dinner music.

M. S. Mitchell, the branch chairman, also introduced the officers of the newly formed ladies' auxiliary: the president, Mrs. W. L. Foss; secretary-treasurer, Mrs. A. G. Donaldson; directors, Mrs. C. S. Clendening, Mrs. A. W. Rider, and Mrs. M. S. Mitchell.

Montreal

R. B. Wotherspoon, M.E.I.C.,
Secretary-Treasurer

Notice

In accordance with the by-laws, the Nominating Committee has made the following nominations to fill the vacancies created on the Branch Executive Committee for 1951:

Chairman, E. R. Smallhorn, general manager, Aerocrete Construction Co.; Vice-Chairman, F. L. Lawton, chief engineer, Power Dept., Aluminium Laboratories Ltd.; Committeeman, J. A. Ouimet, chief engineer and co-ordinator of television, C.B.C.; W. E. Patterson, manager of engineering and development, Merck & Co. Ltd.; R. F. Shaw, vice-president, Foundation Company of Canada, Limited.

No further nominations having been made, the above-named candidates are hereby declared elected by acclamation and they will take office at the Annual Meeting of the Montreal Branch to be held at 2050 Mansfield St., Montreal, at 8.15 p.m., Thursday, January 25, 1951.

Continuing to hold office as members of the Executive are: P. G. A. Brault, designer, Dominion Bridge Company Ltd.; A. B. Dove, works supt., Dominion Works, The Steel Company of Canada; and G. E. Shaw, engineer of bridges, Canadian Pacific Railway.

Annual Dance

The Annual Dance of the Montreal Branch will be held at the Windsor Hotel on Friday, February 2nd, 1951. Tickets will be available some weeks in advance, but members should plan now to attend.

Technical Divisions

By the time this item appears in print about three and a half months will have passed since Members and Juniors of the Branch received letters announcing plans for increasing the technical activities of the Branch.

Of about 2,200 questionnaires sent out with these letters, 514 were returned. The Executive had hoped for a much larger return. As only 9 replies indicated disapproval, and nearly half not only approved but expressed a willingness to work on committees, the Executive decided that the proposed plans should be put into effect. The written comments of the Members were most encouraging. The following summary of the replies may be of interest.

1. Do you favour the proposals in general? Yes—490; Doubtful—15; No—9; Total—514.
2. Will the proposals increase your interest? Yes—440; Doubtful—24; No—50; Total—514.
3. Interest expressed in specialized divisions of: Civil engineering—352; Mechanical engineering—345; Chemical engineering—107; Electrical engineering—236; Industrial engineering and management—196; Mining engineering—10; Metallurgical engineering—15; Transportation—77.
4. Available for committee work: Yes—194; Perhaps—40; No—280; Total—514.

It has been decided that the technical programme could be best started under the existing section chairmen who form the Programme Committee. Each section chairman is enlarging his Committee to at least 5 members, chosen from those willing to serve on the various divisions indicated in the questionnaire. These committees will organize their own programmes with "local participation" as their keynote, thus providing local members with opportunities to deliver papers or to take part in discussions relating to their own fields of specialization.

It is hoped that the first results of the hard work being done by the Programme Committee will be available to the Branch Membership early in the New Year. The success of these plans and the ultimate introduction of semi-autonomous technical divisions is dependent on the members' interest.

Peterborough

G. W. Herzog, Jr.E.I.C.,
Secretary-Treasurer

M. V. Powell, M.E.I.C.,
Branch News Editor

On Monday, October 23rd, the opening meeting of the Peterborough Branch for the 1950 fall season was addressed by Mr. W. B. Wilson of the Industrial Power Division of the General Electric Company in Schenectady, N.Y. Mr. Wilson, very ably and fully covered the subject **Gas Turbines in Industry.**

After a brief review of the history of gas turbines and turbosuperchargers, Mr. Wilson described the simple, open-cycle combustion gas turbine. This is a self-contained prime mover suitable for driving electric generators, pumps, compressors, grinders and other kinds of machinery. It consists of one or more compressors, combustion chambers and one or more "flow type" gas turbines. Atmospheric air is compressed in the compressor, passes into the combustion chamber where it mixes with the fuel. An excess of air is supplied to maintain gas temperature within proper limits. As the fuel burns, the gases are expanded through the gas turbine which is mounted on the same shaft as the compressor and are then exhausted to the atmosphere. The initial temperatures range from 1300 to 1500 F. and the pressures are approximately 85 per cent, about two-thirds of the turbine output is required by the compressor and the remainder is available for useful work. An efficiency of 15 per cent is usual with this type unless the heat in the exhaust gases can be utilized in which case as high as 70 per cent overall efficiency is possible. This first type is manufactured by the General Electric Company in units of 3500 kw. capacity.

In the second type of gas turbine produced by this Company an efficiency of approximately 22 per cent is obtained due to the use of a regenerator which transfers some of the heat from the exhaust gas to the air between the compressor and the combustion chambers. The third type shows an efficiency of approximately 26 per cent by the addition of intercoolers between the L.P. and H.P. compressors and other refinements. If use of the exhaust gas heat can also be made, these latter types will give an overall efficiency up to 70 per cent or even more.

In the first simple type, any considerable drop in speed will interfere with the compressor operation and decrease or stop the flow of air. To overcome this difficulty in the latter types, the H.P. turbine is used to drive the compressors and the L.P. turbine in the same casing but on a separate shaft drives the load. This allows greater speed variation of the shaft driving the load and increased efficiency during idling. Actual speeds are fairly high being 5000 rpm. or more and so reduction gears are necessary.

The usual fuels are gas and bunker "C" oil. The latter is the last residue from the oil refineries and commonly contains harmful ingredients. However, it can now be bought to a proper specification and this trouble will disappear. Coal cannot at present be used as successfully as a fuel but research is being conducted to perfect some method of using it.

The cost of a gas turbine plant is approximately three-quarters of that of a comparable steam turbine plant and it would require less floor space, less piping and very much less cooling water. The fuel cost is about the same but maintenance cost is lower. The gas turbine controls are relatively simple, starting time is short and automatic controls are satisfactory.

The meeting was well attended and the audience showed great interest in the subject. Mr. Roy Bogle moved a vote of thanks. At the opening of the meeting, the Chairman, Mr. J. M. King called on Mr. Gordon Davis to introduce a number of members who were new to this Branch.

Saguenay

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

On Friday afternoon, October 27th, 1950, about 50 members of the Saguenay Branch made a field trip to the Riverbend Mill of Price Brothers & Company, Limited. The officials of Price Brothers had made good preparations to receive the group. One of their staff gave a description of the process before the visitors entered the mill and this helped considerably in the subsequent thorough trip through the mill.

The party adjourned to the Union Hotel in St. Joseph d'Alma for refreshments and dinner and it was joined there by a few members who had not been able to take part in the field trip.

In the evening, a meeting was held in the Riverbend School at which guest speaker Mr. Adam Cunningham, chief engineer of Price Brothers, was introduced by Branch Chairman J. F. Braun. Mr. Cunningham gave some very interesting historical data on the manufacture of paper, showing how the old hand methods had been adapted to our present machine methods and describing the difficulties which have been met and overcome, and some difficulties which remain, in making paper. Mr. Cunningham was thanked by Mr. B. E. Bauman who also mentioned the appreciation of the members for the consideration shown them by Price Brothers.

A film was shown which illustrates the manufacture of paper, by the Powell River Company, as carried out from the logging operations to the finished product. This was followed by a film showing the manufacture of felt at the Ayers' Plant in Lachute.

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A meeting of the Saguenay Branch was held in the assembly room of the Saguenay Inn on November 14th, a smoker, attended by 47.

The chairman of entertainment committee, Jules Mercier, had worked out a good programme for a "get acquainted" meeting. Lapel name badges of local design and manufacture were used to eliminate need of introductions. Some light films featuring group singing were shown. Jimmie Wright at the piano supplied the accompaniment for the large group who sang.

Sarnia

J. W. Graeb, M.E.I.C.,
Secretary-Treasurer

F. Belshaw, Jr.E.I.C.,
Branch News Editor

On Monday evening, November 20, 1950, the Sarnia Branch dinner meeting, attended by fifty Branch members and thirty members of the Sarnia Institute of Power Engineers, featured an address by W. A. Osbourne, vice-president and general manager of Babcock-Wilcox and Goldie-McCulloch Limited of Galt, Ontario. He discussed **Trends in Boiler Design** and appropriately, he was introduced by J. Guthrie, who is a member of the Sarnia Branches of both the Engineering Institute and the Institute of Power Engineers.

The opening remarks dealt briefly with the history of steam power from the time of Watt and Newcomen. The maximum steam pressure in Watt's time was 7 p.s.i.g., while today boilers are being built which approach the critical pressure of 3200 p.s.i.g. In 1867 the first watertube boiler had a capacity of 1500 pounds per hour of steam at 50 p.s.i.g., while today boilers are being built with capacities of more than one million pounds per hour at pressures exceeding 2500 p.s.i.g.

Mr. Osbourne next pointed out the seven requirements of a modern boiler, which he illustrated by means of slides. It must be able to withstand the elevated pressures which are encountered in modern installations; must provide steam at the maximum temperature which known metals will withstand; must have high combustion efficiency (effected by economizers, air preheaters, and reheaters); must supply a means of eliminating waste products produced in its furnace; must novide steam of maximum purity (obtained by steam cyclones, baffles, etc.); must be easily controllable over its total range; must have maximum reliability and availability.

At the conclusion of Mr. Osbourne's address a film entitled "Steam for Power" was shown to the meeting. This sound movie emphasized the speakers' remarks and described further the progress made in the design of modern steam generators. For instance, in 1900, 6 pounds of coal were required to generate one kilowatt hour of power, while today one kilowatt hour requires only 0.85 pounds of coal.

Thanks to the speaker were astutely delivered by Mr. J. Burns, vice-president and president-elect of the Institute of Power Engineers.

Dr. B. B. Hillary, M.E.I.C., chairman of the Sarnia Branch, in his opening remarks welcomed the members of the Institute of Power Engineers; and Mr. W. McPhee, president of the Institute of Power Engineers, expressed the thanks of his organization to the Engineering Institute of Canada.

Vancouver

Alan Fletcher, Jr.E.I.C.,
Secretary-Treasurer

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

The November meeting of the Vancouver Branch was held at the Medical Dental Auditorium on Wednesday the 8th. Chairman Syd Hogg introduced Mr. J. C. Garnett, the speaker for the evening. Mr. Garnett is a member of the Institution of Civil Engineers of Great Britain and of the Institution of Mechanical Engineers of Great Britain. During the war he was a lieutenant-colonel in the Royal Engineers and British War Office. At present he is with the Hayes Manufacturing Company.

The topic of Mr. Garnett's address was **Management and the Engineer.** He made it quite clear that he had no magic formulae by which an engineer could quickly become a top flight executive. The theme of his talk was that engineers are educated and trained in their everyday work to use the methods and procedures of top management. Engineers generally must consider and appreciate the problems of costs of production, possible profits, saleability and other non-technical but all-important phases of production if they want recognition as management potential. Mr. Garnett explained how the controls used by management in industry were mostly instituted by engineers; it was his feeling that engineers should be more aggressive in the operation of those controls through seeking top management positions.

After an active discussion period Colonel Sherman thanked Mr. Garnett for his able address and good advice to all ambitious engineers.

Victoria

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

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

More Water for Victoria was the subject of an interesting address given by Mr. Ralph Davis before the Victoria Branch at the Prince Robert House on October 20, 1950.

Mr. Davis, who is chief commissioner of the Greater Victoria Water District outlined the organization and history of the district from its formation in 1922 up to the present time.

The powers and functions of the Corporation are exercised and discharged by an Administration Board consisting of representatives appointed annually by the various councils of the municipalities included in the District. These

Municipalities include Esquimalt, Oak Bay, Saanich and the City of Victoria. The undertakings of the Corporation are under the management of a Commissioner, appointed by the Board and subject to its authority.

The Corporation is charged with the responsibility of furnishing an adequate supply of water in bulk to the several Municipalities within the District, to satisfy the respective needs for water for all purposes at a fair and equitable rate as may be determined by the Board from time to time. The rate for water is the same to each member of the District. The distribution and sale of water to the consumers in each Member Municipality are the responsibility of the Municipality, and the rates charged to the various classes of consumers are set by the Municipality.

For the purposes of its undertakings the Board has power to incur debts and pledge the assets and the credit of the Corporation by borrowing money by means of the issue and sale of debentures or other securities of the Corporation.

The revenues of the District are raised from the sale of water. The rate is set each year so that the estimated income for that year, as nearly as possible, equals the requirements of the Corporation for interest, debt, retirement on the securities issued, the cost of administration, maintenance and operation of the supply systems and for necessary reserves. The rate set by the Administration Board for the year 1950 is eight cents per thousand Imperial gallons.

Mr. Davis pointed out that the present water supply is drawn from the Sooke and Goldstream watersheds located roughly 20 miles to the north-west of the City of Victoria. The Sooke watershed can provide a total of 16 million gallons a day during the driest year. With the Goldstream supply to augment this a total average flow of just over 25 million gallons per day is available.

Water is conveyed from Sooke Lake by 27½ miles of 42-inch concrete pipe to the Humpback Reservoir. The original capacity of this pipe line was 18 million gallons a day but due to joint losses this has been reduced to 12 million gallons a day. This summer, the laying of 6,100 feet of 36 in. steel pipe will complete the connection between Japan Gulch, which contains the Goldstream water and the Humpback Reservoir.

Following construction of the new main, the Water Board must consider two other major improvements, namely, a 5½-mile tunnel from Sooke Lake east to the Goldstream supply and replacement of the remainder of the Goldstream main in a larger size. Construction of the tunnel will be delayed as long as possible but the chief factors that will determine the starting date are the yield of the Goldstream watershed, the capacity of the concrete flow line from Sooke Lake, and the population growth of the area served with water. From present indications, the tunnel will be required before 1960.

The average daily consumption of water has increased from ten million gallons in 1941 to fourteen million gallons in 1947. The average per capita consumption is about 140 gallons per day, based on an estimated population served of 105,000. On the day of heaviest consumption (21 million gallons) the per capita consumption was 204 gallons. Total volume of water drawn from the reservoir is now over 5 billion gallons per year.

In conclusion the speaker pointed out that the new main to the City will increase the potential supply to 46 million gallons a day, or more than double the present capacity. The full benefit of the main will be felt in 1952, provided there are no serious interruptions to the construction programme.

A long and lively question period followed, indicating the interest of the members in this subject.

The speaker was thanked for his well illustrated and instructive address by Mr. Musgrave, municipal engineer for Oak Bay.

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The Victoria Branch was visited by President James A. Vance and Mrs. Vance on October 25, they were accompanied by the regional vice-president, H. N. MacPherson and Mrs. MacPherson.

In the afternoon an informal discussion was held by the Executive, at which the Institute policies were discussed by the president and Mr. MacPherson.

In the evening, a banquet was held at Lougheed's Banquet Club with Branch Chairman H. F. Bourne presiding.

In introducing the president as the speaker for the evening, Dr. Gray, the Branch Councillor, pointed out Mr. Vance's remarkable and varied career as an engineer and a contractor and in the many other public offices he has held. His interest in Canada and things Canadian were also noted by Dr. Gray.

Mr. Vance outlined some of the opportunities available to the young engineer in Canada, as he has observed them in his travels. He mentioned the discoveries of natural gas, uranium, titanium, and new deposits of iron ore, remarking that there is still a large hinterland to explore and discover.

While many young engineering graduates have secured employment with large industries both in the past and at present, many of the smaller businesses would benefit also from engineering guidance. Self-employment possibilities for the engineer are becoming more attractive as well. From the standpoint of our national economy, it is important that small businesses be developed—why not let the engineer do it?"

Mr. A. L. Carruthers thanked the speaker for his thought provoking address and especially for his efforts in the growth of the Engineering Institute.

Before adjourning the meeting, Chairman H. F. Bourne wished the visitors a happy trip home.

Reading List for Junior Engineers

Revised under Direction of the Committee on Professional Training, Engineers' Council for Professional Development, 29 West 39th Street, New York 18, N.Y. 1950

Introduction

(Preface to 1936 list)

"Two of the most important attributes the successful engineer must possess are first, the ability to deal with men and affairs and second, the ability to read and absorb the written experience of others. These abilities are seldom found fully developed in any man. Generally, they must be developed by the individual himself and usually after formal education is completed.

"The Reading List given here, based upon recommendations by a number of eminent men, many of them distinguished engineers, is presented especially for the junior engineer who is desirous of broadening himself and developing a full professional life. We hope the titles are suggestive and will attract the reader and lead him to explore further. It is expected that they will provide a basis on which the nontechnical culture of the engineer can be continued.

"A few words of advice may be in order. Over a period of about four years a minimum of twenty-five of these books might be selected and read, with the limiting recommendation that the selection made will include at least one book in each classification. Read a few books well and make their thoughts your own, rather than skim many and absorb nothing. Develop reading habits outside of your technical specialty—it will profit you much in enjoyment and mental stimulation. Since 'reading maketh a full man and writing an accurate one,' practice the reduction of your thinking into written words so that you may perfect yourself in accuracy of expression."

List Revised

Each book in this revised reading list has been read or reviewed by one or more members of the committee. It meets the standards set for the inclusion of a book in this tabulation.

The committee, in its work, has striven to eliminate textbooks, encyclopedic works, and volumes difficult to obtain. A supplement to this list has been prepared, giving more titles, books which have been considered somewhat less effective than those in this printed list. The supplemental mimeographed list is available on request.

COMMITTEE ON REVISION

Edward Wesp, Jr., *Chairman*
Elwyn H. King, ASCE
Roger I. Wilkinson, AIEE
J. W. Brooks, EIC
C. G. Brennecke, AICHE
H. L. Solberg, NCSBEE

Natural Science

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Hecht, Selig. Explaining the Atom. Viking.

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Korzybski, Alfred. Science and Sanity. International, 1948.

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10c each; 50 or more copies, 5c each.

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

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

CIVIL

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

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

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

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

ELECTRICAL

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

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

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

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

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

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

MECHANICAL

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

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

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

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

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

MISCELLANEOUS

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

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

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

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

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

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

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

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

YOUNG ENGINEER required for the production department of a printing firm in Montreal. Good opportunity for advancement offered. Apply to File No. 1653-V.

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

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

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

HYDRAULIC AND STRUCTURAL DESIGN ENGINEERS required in Ottawa. Work assignments may have to do with the development of major waterworks. Salary up to $7500.00 depending on qualifications. For further details, write to The Civil Service Commission, Ottawa and request information circular, 50-616. Apply to File No. 1660-V.

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

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. 1662-V.

APPLICATIONS are invited by the department of works for the City of Halifax, N.S., for a graduate engineer. Employment to begin January 1st, 1951. Preference will be given to an applicant with experience in municipal work, particularly sewer design and construction. Salary range $2400.00 to $4800.00. Applications received until noon, December 9th, 1950, by F. C. Woods, acting commissioner of works. Apply to File No. 1665-V.

INDUSTRIAL ENGINEER required by industrial firm located in Toronto. Applicant should have at least 2 years experience in timestudy, particularly standard data development, budgetary control, methods improvement, job evaluation. Preferably under 35 years, with some experience in the metal industry. Salary according to qualifications. Apply to File No. 1666-V.

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

The Public Service of Canada

REQUIRES

HYDRAULIC AND STRUCTURAL DESIGN ENGINEERS AT OTTAWA

Salary—up to $7500, depending on qualifications.

Work assignments may have to do with the development of major waterways.

For further information, write to the Civil Service Commission, Ottawa, and request information circular, 50-616.

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

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

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

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

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

CHEMICAL

CHEMICAL ENGINEER required in Ethiopia to help in installing facilities for dehydration of alcohol and applicant must be an expert with full technical knowledge of the latest methods of dehydrating alcohol. Apply to File No. 1571-V.

CHEMICAL ENGINEER required in Ontario to act as plant supervisor. Applicant should have four to eight years experience in chemical plant operations or allied industry. Age 30 to 40 years. Duties to consist of supervision of operations in coal tar distilling and extraction of coal tar chemicals. Salary open. Apply to File No. 1572-V.

CHEMICAL ENGINEER, recent graduate required in Montreal to act as production engineer in the production planning of chemical plant operations. Apply to File No. 1572-V.

TWO CHEMICAL ENGINEERS, recent graduates to act as development engineers, required in Province of Quebec. Duties to consist of technical problems in chemical plant operations. Apply to File No. 1572-V.

CHEMICAL ENGINEER required in Province of Quebec to act as plant chemist. Age 27 to 35 years. Duties to consist of supervision of the control laboratory and in chemical plant operations. Apply to File No. 1572-V.

CHEMICAL ENGINEER required in Province of Quebec, to act as production supervisor, with approximately 10 years experience in chemical plant production. Duties to consist of production supervision in a chemical plant. Apply to File No. 1572-V.

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

CHEMICAL ENGINEER recent graduate for paper mill located in Province of Quebec. Permanent position. Apply to File No. 1606-V.

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

CIVIL

CIVIL ENGINEER required by firm of inspection engineers in Montreal for land surveying and instrument work on airports and general building constructions. Apply to File No. 1565-V.

YOUNG CIVIL ENGINEER required by large organization in Montreal with some experience in reinforced concrete design. Apply to File No. 1576-V.

YOUNG CIVIL ENGINEER required by construction company in Montreal. Duties include contact work and buying. Apply to File No. 1597-V.

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

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

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

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

ELECTRICAL

FOUR JUNIOR ELECTRICAL ENGINEERS with radar experience required by large firm in Montreal. Apply to File No. 1556-V.

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

GRADUATE ELECTRICAL ENGINEER required in the Province of Quebec as sales engineer for established wire and cable company. Experience in power field desirable. Salary open. Apply to File No. 1570-V.

ELECTRICAL ENGINEERS with experience in electronics and radar for positions in Ottawa. Salaries open. Apply to File No. 1588-V.

ELECTRICAL DESIGN ENGINEER required by manufacturer of industrial equipment, in Toronto. Applicant should have about five years experience. Apply to File No. 1590-V.

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

ELECTRICAL ENGINEER required by large firm in Montreal. Applicant should have experience in the writing of specifications for, the selection and installation of motors, controls and other items of electrical equipment required for cranes and hoisting machinery. Salary open. Apply to File No. 1600-V.

ELECTRICAL ENGINEERING GRADUATES to be trained as field engineers in applied illumination by a firm located in Ontario. Excellent opportunity offered for mature-minded graduates who are seeking a lifetime career. Several openings for young men as trainees or more mature former graduates who would be accorded an opportunity commensurate with their experience. Apply to File No. 1601-V.

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

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

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

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

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

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

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

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

INSTRUMENT ENGINEER

(Electrical or Mechanical Preferred)

REQUIRED FOR LARGE OIL REFINERY IN MONTREAL EAST

Applicant should have not less than three years experience as instrument engineer, or not less than five years general electrical engineering experience. Would be expected to take charge of instrument department under general supervision of Power Engineer. Salary open. Applications will be treated confidentially and should include full particulars as to qualifications, together with recent photograph. Apply to File No. 1684-V.

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

MECHANICAL

GRADUATE MECHANICAL ENGINEER required by a Montreal firm to do time study and/or methods work. Applicant should have one to two years experience in methods or general products problems and be preferably bilingual. Salary open. Apply to File No. 1561-V.

JUNIOR MECHANICAL ENGINEERS required by automotive industry in Ontario interested in administrative training, prior to tentative selection for overseas service in subsidiaries. Also openings in general engineering department. Apply to File No. 1567-V.

MECHANICAL DESIGN ENGINEERS required by West Coast pulp and paper mill. Previous pulp and paper experience desirable but not necessary and consideration will be given to all applicants with industrial experience. Salaries from $3,600.00 upwards commensurate with experience. These are permanent appointments in a well established mill. Apply to File No. 1582-V.

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

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

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

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

MECHANICAL ENGINEER required by large firm in Montreal for Mackenzie, British Guiana. Applicant should have 4 or 5 years Kiln operation and general mill experience along mechanical lines with a knowledge of the principles of combustion. Duties include mechanical maintenance, operation of crushers, conveying systems, vibrating screens and mechanical and electrical drivers etc. Apply to File No. 1611-V.

MECHANICAL ENGINEER required for long term design project requiring highest skill, preferably with experience in design of typewriters, accounting machines, cash registers or similar apparatus. Location Montreal. Excellent salary for right man. Apply to File No. 1614-V.

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

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

TWO MECHANICAL ENGINEERS required in Ontario. Applicants should have some farm background and be familiar with the operation of farm machinery. Apply to File No. 1624-V.

MECHANICAL OR ELECTRICAL ENGINEER

For supply inspection department of large organization

A Professional Engineer

with at least 12 to 15 years' extensive practical shop and office experience in the manufacture of heavy mechanical and electrical machinery and equipment.

LOCATION TORONTO

Reply stating age, education and details of work actually carried out in previous positions, to File No. 1678-V.

YOUNG MECHANICAL ENGINEER required in Montreal with some field experience. Duties include the installation of pipe lines in connection with various construction projects. Will also consider recent graduate for training period. Apply to File No. 1628-V.

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

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

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

MINING

MINING ENGINEER with 5 years experience in underground hard rock mining required by large industrial firm in Montreal, for subsidiary in Newfoundland. Duties to include underground mining, mapping, draughting and some surveying both underground and surface. Apply to File No. 1298-V.

MISCELLANEOUS

ENGINEER, required versed in the mining and milling of iron ore (magnetite). The ore is presently in an open pit, grinding to about 200 mesh and electrical separation as concentrates for the manufacture of sponge iron. Location Ontario with excellent working conditions. Age about 35 years. Apply to File No. 1557-V.

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

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

CITY ENGINEER required in Western Canada. Work includes the operation of the pumping and filteration plant, sewage disposal plant, incinerator and cleansing branch, asphalt plant, and the construction by the department of street paving, concrete curbs and sidewalks, and sewer and water mains and the building inspection department. Preference will be given to applicants possessing a wide engineering experience especially in municipal engineering. Applicants should state age, qualifications, salary required and previous experience with details of duties involved and accompanied by copies of testimonials. Apply to File No. 1562-V.

ENGINEERS required by large automotive industry in Ontario, for their production engineering department. Experience on methods, process, layouts, specifications and installation is desirable. Apply to File No. 1567-V.

PROCESS ENGINEERS, draughtsmen and tool and die designers required by automotive industry in Ontario. Applicants should have preferably experience in the automotive industry with a knowledge of heavy layout. Apply to File No. 1567-V.

ENGINEERS required by automotive industry in Ontario for their time standards and methods department. Senior personnel must be competent in methods and must have experience in developing standard data on machine tool and other operations. Junior personnel will undergo training period on monthly induction programmes. Apply to File No. 1567-V.

PRODUCTION SUPERVISOR to train for the position of works manager of small operation in Western Canada. Some experience in manufacturing required. Applicant should have a preference for administration of a small operation rather than technical. Age 30 to 40 years. Apply to File No. 1572-V.

PLANT ENGINEER required in Ontario, with a minimum of five years' experience in chemical plant or paper mill maintenance and engineering supervision. Age 30 to 40 years. Duties to consist of supervision of maintenance and plant engineering. Salary open. Apply to File No. 1572-V.

DESIGN ENGINEERS required by large industrial organization in Montreal. Must have some experience in hydraulic and reinforced concrete design. Apply to File No. 1577-V.

FRENCH FIRM well known in Canada for its first class cemented carbide products: diamental and diaferid dies and tools, wants commission representative. Specialties, tips for tools, tipped tools, wire and tube drawing dies, wearing parts etc. Write to Agence Havas Dijon (France) No. 40326. Apply to File No. 1578-V.

PATENT LAWYER required by automotive industry in Ontario, with engineering background, for trade mark and patent work. Apply to File No. 1583-V.

TOOL ENGINEER required by large automotive plant. Mechanical preferred. Senior position as supervisor in tool engineering department. Age 30 to 45 years. Apply to File No. 1533-V.

ENGINEERS AND DRAUGHTSMEN required by automotive industry in Ontario. Openings in field staff, foundry design, mechanical design, piping design, electrical design, construction design. Junior and Senior personnel required. Salaries open. Apply to File No. 1583-V.

CITY ENGINEER required by city located near Montreal. Applicant must be bilingual. Position will offer opportunity for promotion to city manager. Apply stating age, qualifications and salary expected to File No. 1585-V.

TECHNICAL DIRECTOR wanted for paper company producing from 100% rag to 100% sulfite papers. Applicant should be a graduate chemist or chemical engineer and must be bilingual. Surroundings are ideal and living conditions very good. Mills located near Montreal in the Laurentian Mountains. Apply to File No. 1586-V.

SALES ENGINEER required in Montreal for the sale of scaffolding material. Payment on commission basis only. Permanent position or part time employment offered. Must be bilingual. Apply to File No. 1591-V.

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

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

YOUNG ENGINEER required by firm located in Ontario to act as Internal Auditor. Duties include 6 months in the year visiting plants in Ontario and Quebec. Work would bring applicant into contact with all sales and manufacturing supervisions as well as office supervisors. Apply to File No. 1608-V.

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

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

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

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

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

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

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

TWO ENGINEERS OR DRAUGHTSMEN required by well established firm located 100 miles east of Toronto. One junior man required with about 1 or 2 years experience in making shop details, the other applicant should have 5 to 10 years experience in the design and detail of machinery and steel work required for the handling of material in bulk form. Apply to File No. 1626-V.

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

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

Situations Wanted

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

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

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

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

INDUSTRIAL CHEMICAL ENGINEER, M.E.I.C., B.Eng. (McGill 1936), M.B.A. (Harvard 1938), P.Eng. (Ontario). Veteran R.C.A. Married. One child. Age 36. Seeking employment in Nova Scotia only. Presently employed as general manager and sole executive of small business comprising seventy employees. Other experience includes teaching of industrial management and cost accounting in University. Would prefer similar employment or in larger organi-

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Senior Petroleum Engineer

Independent Canadian Oil Company, with headquarters in Calgary, has opening for Senior Petroleum Engineer particularly experienced in Reservoir Engineering and Production Practices.

No one with less than 7 years' experience in the industry need apply. Give synopsis of education, training and experience. Supply recent photo if possible.

All replies will be held in strict confidence. Apply to File No. 1675-V.

zation as production manager, labour director, or comptroller. Present income based on profit and willing to work on same basis. Willing to purchase or invest in small business. Willing to accept temporary employment and to travel to Nova Scotia at own expense for interview. Apply to File No. 2584-W.

GRADUATE MECHANICAL ENGINEER (Jr. E.I.C., P.Eng. Quebec) desires part time employment with consultant or others in mechanical or structural fields. Interested in designing, checking, estimating or draughting. Available evenings and week-ends in Montreal, district. Apply to File No. 2909-W.

MECHANICAL ENGINEER, P.Eng., McGill 1944. 8 years industrial experience, shop fabrication experience, wage incentive installation, timestudy, production and cost control, plant supervision, excellent experience in welding field, methods, cost estimating, design. Sound business background and organizing ability in volume production and job contract. Desire industrial, sales, or plant engineering. Available four weeks. Apply to File No. 2920-W.

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

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

MECHANICAL ENGINEER, Sask. 1944, P.Eng. Age 29, married, desires position with responsibility and opportunity for advancement. Experience includes four years supervising maintenance and construction in the pulp and paper industry, one year in the Engineering Department of a large textile mill and two years as a supervisor for a contracting firm in the oil fields and oil refineries. Have speaking knowledge of French. Apply to File No. 3313-W.

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

EXPERIENCED CHEMICAL ENGINEER from Sweden specializing in manufacturing of Macrocellular Building material such as blocks, slabs, girders, insulating boards etc. wishes to make contacts with manufacturers or research institutions who are interested to exploit and/or research the raw materials such as ashes from power station, oil shale, washery slagg etc. using lime as basic component. Apply to File No. 3343-W.

MECHANICAL ENGINEER, S.E.I.C., at present employed in Montreal would like part time employment evenings and week-ends. Designing, draughting, estimating etc. Apply to File No. 3344-W.

ELECTRICAL ENGINEER, S.E.I.C., B.E. N.S.T.C. 1950. Age 32, married. Pre-graduation experience: Four years power house installation, operation and maintenance (Diesel driven generators). Supervised installation and maintenance of refrigeration equipment in modern cold storage plants. Two summers general field engineering work with a large construction company. One year as Assistant Utilities Superintendent (Water, Power, Sewage and Refrigeration) in connection with airport maintenance. Available immediately. Apply to File No. 3346-W.

ELECTRICAL ENGINEER, S.E.I.C. University of New Brunswick 1949. Completed Canadian General Electric test course in spring of 1950. Married. Age 23. Interested in design or production engineering, preferably around Toronto. Apply to File No. 3347-W.

ELECTRICAL HEATER SPECIALIST, graduate engineer, formerly employed by United States Company, designing and supervising the manufacture of electrical heaters, desires position with electrical concern doing similar work. Apply to File No. 3348-W.

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

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

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

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

MECHANICAL ENGINEER, M.E.I.C., M.I. AE. SC. B.Eng. McGill 1940. Age 31. Presently employed good executive position in aircraft industry. Desire to broaden experience in production and business administration in other industries. R.C.A.F. for 5 years as engineer officer and 5 years in technical and administrative work on maintenance of aircraft with varied experience in design work, engineering supervision, direct supervision of labour force, budgetting, cost control, personnel and union relations. Extensive study since leaving university including establishment of own business as a sideline has given good background. Interested in permanent position with future and can offer proven organizing and administrative ability with willingness to learn. Apply to File No. 3366-W.

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

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

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

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

ELECTRICAL & MECHANICAL ENGINEER, B.Sc., M.I. Mech. E., M.I.E.E., A.M.I.C.E., seeks employment in Canada as from May next. Aged 47, married, three children. Experience includes oilfield electrification, consulting engineering, govt. inspection, operation and management of hydro-electric undertakings, valuation Recently in India visiting all hydro-electric schemes on behalf of major oil company. Present annual salary equivalent to $9000.00 basic $1200.00 with allowances. Available near Halifax early May. Apply to File No. 3378-W.

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

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

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

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

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

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

RESIDENT ENGINEER WANTED

For construction of proposed Granville Bridge in Vancouver, B.C. Duration of work approximately 2 years, starting about March 1st, 1951. Applications should be made by letter giving full details of experience, professional qualifications, age, etc., and salary expected. Apply to File No. 1685-V.

LIBRARY NOTES

Additions to the Institute Library

Reviews — Book Notes — Abstracts

SELECTED ADDITIONS TO THE LIBRARY

TECHNICAL BOOKS, ETC.

Bliss Power Press Handbook:
Toledo, E. W. Bliss Company, 1950. 717 pp., illus. $7.50.

Capacitors for Industry:
W. C. Bloomquist. New York, Wiley, 1950. 246 pp., illus. $4.50.

Chemistry of Industrial Toxicology:
Elkins, H. B. New York, Wiley, 1950. 406 pp., illus. $5.50.

Contemporary Structure in Architecture:
Leonard Michaels. New York, Reinhold, 1950. 229 pp., illus. $10.00.

Decay of Timber and its Prevention:
K. St. G. Cartwright. New York, Chemical Publishing Co., 1950. 294 pp., illus. $7.50.

Electrical Engineers' Handbook, v. 2, Electric Communication and Electronics, 4th ed.:
Harold Pender, Ed. New York, Wiley, 1950. Paged in sections, illus. $11.05.

Electricity in the Home and on the Farm:
Wright, F. B. New York, Wiley, 1950. 380 pp., illus. $3.96.

Elementary Theory and Design of Flexural Members:
Jamison Vawter. New York, Wiley, 1950. 215 pp., illus. $4.00.

Engineering Economy:
Thuesen, H. G. New York, Prentice-Hall, 1950. 501 pp., illus.

Equivalent Valves:
Gordon Hawes, M.I.T. Ed. San Francisco, Hooper Publishing Company, 1950. Loose-leaf format, thumb indexed, $15.00. Annual set of new sheets, $10.00.

Examination of Water and Water Supplies, 6th ed.:
Thresh, Beale and Suckling, Ed. E. W. Taylor. London, Churchill, 1949. 819 pp., illus. 70/–.

Floating Equipment:
Milne, Gilmore and German, Naval Architects, Publishers. Montreal, 1950. 216 pp., illus.

Foundations of Aero-dynamics:
A. M. Kuethe. New York, Wiley, 1950. 374 pp., illus. $7.48.

Foundations of Structures:
C. W. Dunham. Toronto, McGraw-Hill, 1950. (Civil Engineering Series), 679 pp., illus. $9.10.

Gas Producers and Blast Furnaces:
Wilhelm Gumz. New York, Wiley, 1950. 316 pp., illus. $7.00.

Industrial Accident Prevention: A Scientific Approach:
H. W. Heinrich. Toronto, McGraw-Hill, 1950. 470 pp., illus. $6.05.

Industrial High Frequency Electric Power:
E. May. New York, Wiley, 1950. 355 pp., illus. $5.00.

Installations Electriques à Haute et Basse Tension, v. 2.:
A. Mauduit. Paris, Dunod, 1950. 1302 pp., illus. 4850 fr.

Irrigation Principles and Practice, 2nd ed.:
O. W. Israelson. New York, Wiley, 1950. 405 pp., illus. $6.00.

Manual of Plastics and Resins in Encyclopedia Form:
W. Schack, Ed. New York, Chemical Publishing Company, 1950. 547 pp., illus. $10.00.

Mechanical World Monographs:
Practical Management and Works Relations, by A. C. Whitehead. Manchester, Emmot, 1949. Monograph 54. 3/6.

Motor Ship Reference Book, 19th ed.:
Compiled by the Staff of The Motorship. London, Temple Press, 1950. 187 pp., illus.

Private Companies Special Tax on Undistributed Income:
CCH Canadian Limited. Toronto and Montreal. $2.00.

Refrigeration Engineering, 2nd ed.:
H. J. Macintire. New York, Wiley, 1950. 610 pp., illus. $6.50.

State-City Relationships in Highway Affairs:
Hebden, Norman and Smith, W. S. New Haven, Yale University Press, 1950. 230 pp. $4.00.

Structural Plastics:
H. C. Engel. Toronto, McGraw-Hill, 1950. 301 pp., illus. $5.85.

Structural Theory:
Hale Sutherland. New York, Wiley, 1950. 394 pp., illus. $5.00.

Subsurface Geologic Methods — A Symposium:
Colorado School of Mines, Department of Publications. Colorado, the School, 1950. 1166 pp., illus. $8.50.

Survey of Modern Electronics:
P. G. Andres. New York, Wiley, 1950. 522 pp., illus. $5.75.

Theory of Flow and Fracture of Solids, v. 1, 2nd ed.:
A. L. Nadai. Toronto, McGraw-Hill, 1950. 572 pp., illus. $13.00.

Theory of the Interior Ballistics of Guns:
J. Corner. New York, Wiley, 1950. 443 pp., illus. $8.00.

Traffic Engineering Handbook, 2nd ed.:
H. K. Evans, Ed. New Haven, Institute of Traffic Engineers, 1950. 514 pp., illus. $6.00.

Works Management and Organisation:
P. S. Houghton, London, Spon, 1950. 269 pp., illus. 25/–.

TECHNICAL BULLETINS, PAMPHLETS, ETC.

American Waterworks Association:
Specifications. New York, The Association, 1950. 15c.

American Wheelabrator and Equipment Corporation:
Wheelabrating Eliminates Acid Pickling. Available on request.
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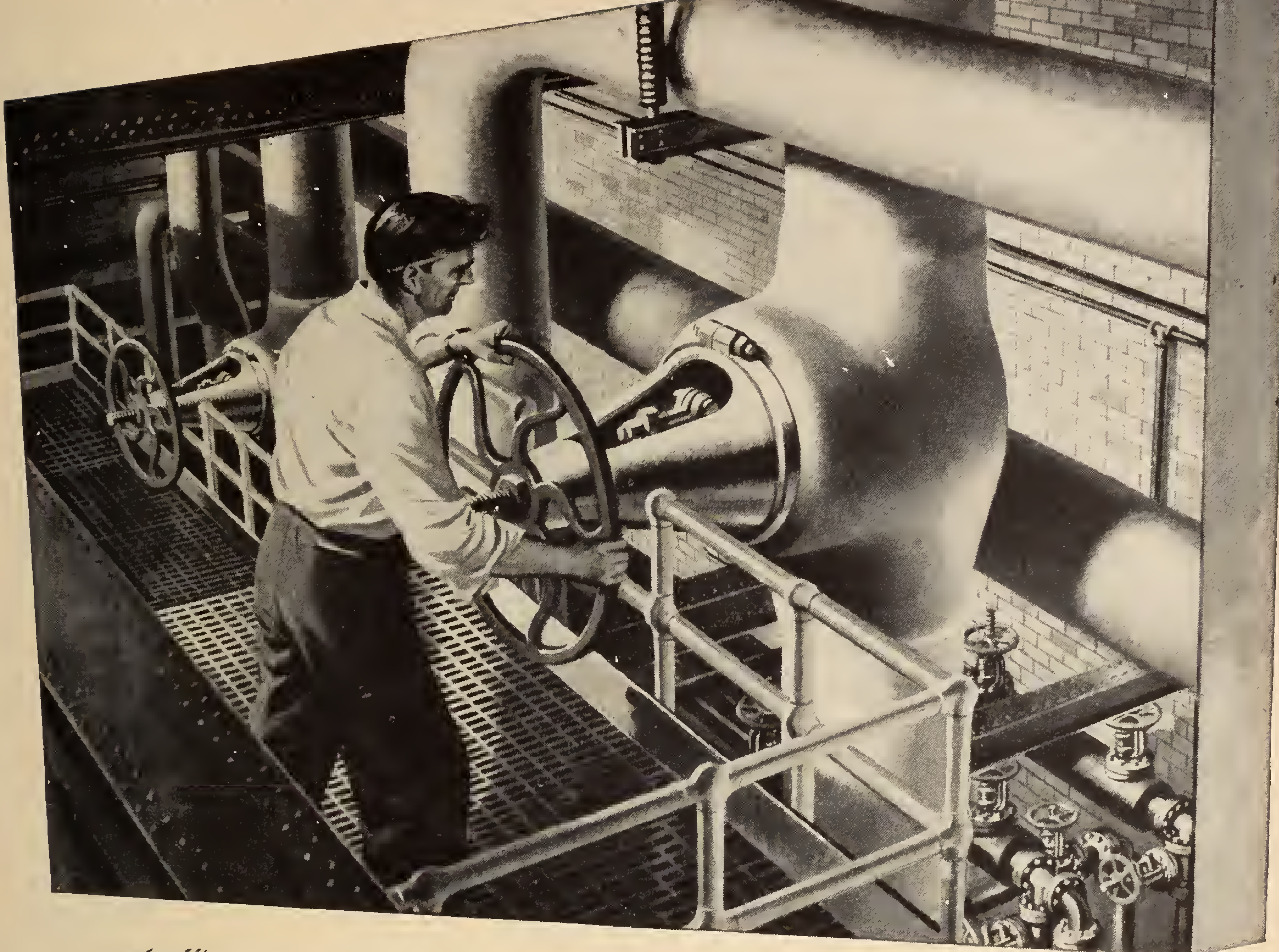

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Bibliographies and Literary Searches

Short subject bibliographies are compiled on request.

Extensive searches will be made at a charge of $3.00 per hour to members, and $5.00 per hour to non-members.

Please give as much detail as possible when requesting information of either type.

Borrowing and Purchasing

Books, periodicals, photostats, translation, etc. may be borrowed for two weeks at a time. **A fine of 25c. per day will be charged for each day borrowed items are retained beyond this period.**

A library deposit of $5.00 at par in Montreal is required before items may be borrowed. Books, periodicals, etc. may be ordered by members through the library. All carrying charges are payable by the individual concerned. Except in the case of library deposits, please make **no payments in advance.**

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

Bouwcentrum:
International Architectural Documentation. (Sheets of description and photographs of famous modern buildings, 24 sheets issued to date). Rotterdam, Bouwcentrum, 1950.

British Society for Research in Agricultural Engineering:
Fruit Sizing and Machinery Grading.

British Welding Research Association:
Ref. T25. Photographic Aspects of the Radiography of Welded High Pressure Vessels, by L. Mullins. 2/–.
Recommendations for the Standardisation of the radiographic examination of Welded Joints in Mild Steel Pressure Vessels. 1/6.
Welding Research, V. 4, No. 4:
The Welding of Thick Aluminium Alloy Plates by the Argon Arc Process.
Some Extracted Notes on Hastelloy Fabrication and Welding.

Canada. Dominion Coal Board:
The Briquetting of Alberta Coals, by W. A. Lang.
Current Statistics on Coal in Canada, by C. L. O'Brian.

Canada. National Research Council:
Building Code Bulletin No. 1.

Canada. Resources and Development, Department of
List of Publications.
Program of Work of the Forest Products Division.

Institution of Structural Engineers:
Civil Engineering Code of Practice No. 2. Earth retaining structures.

Troup Publications:
Operation and Maintenance of Hand-Fired Cast-Iron Central Heating Boilers, by David Kut. London, Industrial Heating Engineer. 2/6.

Princeton University. Industrial Relations Section:
Layoff Policies and Practices. $2.00.
Personnel Administration and Labor Relations in Department Stores. Paper, $2.50. Cl. $3.00.

Quebec. Corporation of Professional Engineers:
List of Members.

Institution of Structural Engineers:
Report on the Structural Use of Aluminium Alloys in Buildings.

Steel Founders' Society of America:
Steel Castings Reports, Nos. 1-4.

Surface Combustion Corporation:
Bulletin SC-45 — Dry Cyaniding in Surface Continuous and Batch Type Furnaces.

Wagner, H. L.:
Stress Analysis of Structures by Joint Rotation and Deflections. H.E.P.C. Publication.

YEARBOOKS, ETC.

Highway Engineers Pocket Book:
F. G. Royal-Dawson. London, Spon, 1950. 113 p., illus. 12/6.

National University of Ireland:
Calendar, 1949. 860 pp.

New York City. Board of Water Supply:
Annual Report, 1948. 155 pp., illus.

Packaging Annual Catalogue:
1950 Packaging Annual Catalogue of Great Britain. London, Tudor Press, 1950. 203 pp.

Yearbook of the Heating and Ventilating Industry:
London, Technical Journals, Ltd. 1950. 362 pp.

BOOK NOTES

Prepared by the Library of The Engineering Institute of Canada

A SYMPOSIUM ON ELECTRONICS AND RESEARCH IN INDUSTRY, 1948:

A. G. Peacock, Ed. London, Chapman and Hall, 1949. 199 pp., cl. 16/–.

Consisting of eleven papers read before the first symposium on electronics in scientific research and industry in 1948, this volume scarcely needs an introduction to the technical reader for value of content. But, the extraordinary range of application of electronic equipment both in scientific research, and in production and inspection processes of modern industry is exemplified in the diversity of subject matter covered by the lectures. Chart, diagram and photograph illustrations are excellent and numerous throughout the text. Bibliographical references are included with eight of the papers, and all include the question and answer discussion at the conclusion of each lecture, both of which enhance the interest and value of the book.

CHEMICAL THERMODYNAMICS:

F. D. Rossini. New York, Wiley, 1950. 514 pp., illus., cloth, $6.00.

Assuming some knowledge on the part of the reader of physical chemistry, and some calculus, the author of Chemical thermodynamics introduces the basic concepts of the subject in a simple, straightforward manner. The practical application of the laws and principles of thermodynamics to actual physical and chemical systems are emphasized. Both problems and references are included for review and study with each chapter. An appendix at the end of the book includes various conversion factor tables, symbols, and abbreviations, and "publications of the author and collaborators". There is both an author and a subject index.

ELEMENTS OF OIL RESERVOIR ENGINEERING:

Pirson, S.J. Toronto, McGraw-Hill, 1950. 441 pp., illus., cl. $8.45.

Based on a series of lectures on oils reservoir engineering at Pennsylvania State College, this book develops the concepts of three basic production processes, namely, water, segregation, and depletion drives, which may operate singly, or in combination.

The concept of the driving index, which is a constant check on production efficiency, to gauge the degree of effectiveness for each mechanism in a combination drive field, is introduced, and electric log interpretation is fully covered.

"Selected References" arranged under date of publication, are included with each chapter. Abbreviations and symbols are appended, and there is an author and subject index.

HOW TO SUBDIVIDE: A HANDBOOK ON THE LAYOUT OF HOUSING DEVELOPMENTS:

H. Spence-Sales. Ottawa, Community Planning of Canada, 1950. 36 pp., paper, $1.50.

Illustrated on every alternate page with aerial photographs, maps and plans, HOW TO SUBDIVIDE discusses typical communities in Ontario and Quebec provinces, and also ideal non-existant areas. The information is treated from four different aspects, namely: effects of pattern of land enclosure on subdivision; factors bearing on the selection of a site; sequence of steps on the preparation of layout; and financial aspects of land subdivision. It should prove a valuable handbook to all those in any way connected with the planning and development of a new subdivision.

PETROLEUM PRODUCTION ENGINEERING: PETROLEUM PRODUCTION ECONOMICS: 1st ed:

Uren, L. C. Toronto, McGraw-Hill, 1950. 639 pp., illus. cloth, $9.10.

Emphasizing the economic aspects of the petroleum industry, this Petroleum production economics is the third part of this author's trilogy on this subject, and supplements the two earlier volumes, dealing largely with technologic material. It presents the application of the principle divisions of economics and business administration to the specific problems of the petroleum and natural gas industries, in order to give the students of petroleum engineering a perspective of the economic side of his subject and its application to his particular engineering field.

Each chapter carries a "selected bibliography", and the book is both author and subject indexed.

PHILIP'S TECHNICAL LIBRARY: Series of books on electronic valves in 4 volumes. Eindhoven (Netherlands) Philips' Gloeilampenfabrieken, 1949.

V. 1, Fundamentals of Radio Valve Technique, deals with the physical principles, the latest construction, and the properties of radio receiving and amplifying valves, and the mathematics of the value characteristics. *539 pp., illus., cloth, $5.00.*

V. 2, Data and Circuits of Receiving and amplifying valves, includes valves placed on the market between the years 1933 and 1939. *409 pp., illus., cloth, $2.75.*

V. 3, (1st Supp.) Data and Circuits of Modern Receiving and Amplifying valves, covers the same field as Volume 2, but, for the years 1940 and 1941. *213 pp., illus., cloth, $2.00.*

The foregoing are all illustrated with tables, characteristics, and circuit diagrams.

V. 4, Application of the Electronic Valve in Radio Receivers and amplifiers, book four of the series, is written for engineers and technicians engaged in the development of receivers and amplifiers, the material being presented in the following five parts:

1. R.F. and I.F. amplification.
2. Frequency changing.
3. Determination of the padding curve.
4. Interference and distortion due to bend in characteristics of the receiving valves.
5. Detection.

467 pp., illus., $5.00.

The completed work will be in seven books, of eight volumes, there being two parts to Book 3, and are now in the process of being published. Prices quoted are in U.S. funds.

RURAL ELECTRIFICATION ENGINEERING:

U. F. Earp. Toronto, McGraw-Hill, 1950. 313 pp., illus., cloth, $4.25.

Designed for college level, this volume will prove useful for training agricultural engineers for administrative positions in the rural electrification field. Basically fundamental in its treatment of this one aspect of electrical engineering, the book now brings together between two covers material heretofore available only from a number of different sources of more general electrical engineering.

Three of the chapters in the book are followed by a number of review problems, and the last chapter covers organization and administration.

Footnote bibliography is scattered here and there throughout the book, and it is indexed.

T.V. INSTALLATION TECHNIQUES:

S. L. Marshall. New York, Rider, 1950. 330 pp., illus., cloth, $3.60.

Have you ever had a TV set installed? Have you ever installed one yourself? The first instance presents a considerable expense item: the second, considerable difficulty and risk. TV installation technique is a "how to do it" book, and it discusses all the mechanical details of the subject you need to know, from the topmost element of the antenna, to the ground connection on the receiver terminal board. Questions, and chapter summaries add to the quick reference value of the book. An appendix, including line loads, anchor specifications, coaxial tables, etc., and an author and title index, all combine to make this a handy and valuable manual.

THE EVOLUTION OF SCIENTIFIC THOUGHT FROM NEWTON TO EINSTEIN: 2nd ed.: rev. and enl.

A. d'Abro. New York, Dover, 1950. 481 pp., illus., cloth, $4.35 (*Can.*)

Covering scientific theories of the past three centuries, this volume includes the essential features of Newton's great discoveries, and the apparent inevitableness of absolute space and time in classical science. From Riemann's problem of space, to Einstein's theory of relativity, the author gives an accurate presentation of facts in as non-technical language as possible.

Since the 1927 edition, the chapter on the finiteness of the universe has been entirely re-written, and is supplemented by a brief discussion of the Expanding Universe of the Abbé Lemaître.

THE HUMAN USE OF HUMAN BEINGS: CYBERNETICS AND SOCIETY:

Norbert Wiener. Boston, Houghton Mifflin, 1950. 241 pp., cl., $3.00.

Following up his previous more technical book on cybernetics, Mr. Wiener, in this volume, avoids mathematical symbolism and ideas as treated in his first title, Cybernetics, and here emphasizes rather the social consequences of communication as related to the machine and the living organism. This emphasis takes the form of a plea, or a warning against man's exploitation of the power of the machine against his fellow man. The thesis of this book, says the author, is that "society can only be understood through a study of the messages and the communication facilities which belong to it, and that, in the future, development of these messages between man and machines, between machines and man, and between machine and machine, are destined to play an ever increasing part." This is an intriguing subject, still in its infancy, and one which many of you will find profitable, interesting, and thought-provoking.

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 CEMENT, prepared by A.S.T.M. Committee C-1 on Cement, Specifications, Chemical Analysis, Physical Tests, May, 1950.

American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 219 pp., illus., diagrs., tables, 9 x 6 in., paper, $2.00.

This publication presents in convenient form 28 A.S.T.M. standard and tentative specifications, methods of chemical analysis, and methods of physical testing pertaining to cement. Portland, air-entraining, blast-furnace slag, natural and masonry cements are covered. Additional material, appearing in appendices, includes information on analytical balances and weights, a manual of cement testing, and a list of selected references on portland cement.

ELEMENTS OF INTERNAL COMBUSTION TURBINE THEORY:

By H. T. Adams. Toronto, Macmillan Co. of Canada, 1949. 178 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, $3.00.

Intended both for advanced students and engineers, this book presents the theory and some of the methods used in the design of the internal combustion turbine. A background of the calculus and some knowledge of aerodynamics is assumed, but some fundamental material is given in the first chapter. Stress calculations, critical speeds, and heat exchange are among the special topics dealt with.

HEAT INSULATION:

By G. B. Wilkes. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1950. 224 pp., illus., cloth, $5.20.

This book is designed to bring together in one volume for the engineer, architect and student some of the miscellaneous information on heat insulation which has previously been scattered through a variety of sources. In addition to the material on the fundamental formulas, types, purposes and economics of insulation and insulating materials, there are special chapters on reflective insulation, methods of determining heat transfer coefficients, and factors affecting the coefficient of thermal conductivity. There is a bibliography.

RESPONSE OF PHYSICAL SYSTEMS:

By. J. D. Trimmer. John Wiley & Sons, New York, Chapman & Hall, Ltd., London, 1950. 268 pp., diagrs., charts, tables, 8¾ x 5½ in., cloth, $6.50.

This book on instrumentation and the measurement process demonstrates the application of mathematical techniques to physical systems. Closely linked with cybernetics, it includes not only such physical systems as instruments, regulators and servos, but also some reference to biological and sociological entities as well. The intent is to provide a broad general study of system response to input forces, covering feedback and other control methods. A full working knowledge of calculus is essential, and a concurrent study of differential equations is recommended.

SOLIDIFICATION OF CASTINGS, a Review of the Literature. (Monograph and Report Series No. 7):

By R. W. Ruddle. Institute of Metals, 4 Grosvenor Gardens, London, S.W. 1, 1950. 116 pp., charts, tables, 8¾ x 5½ in., linen, $2.00.

Originally published as confidential reports of the British Non-Ferrous Metals Research Association, the book reviews the literature on the production of sound castings. Part I deals with studies on methods of gating and feeding in which no attempt is made to measure or analyze the actual progress of freezing in the casting. Part II reviews the more fundamental work which includes the measurement of rates of heat abstraction and rates of solidification. The work described in Part II and conclusions drawn therefrom are briefly summarized in Part III.

UNIT OPERATIONS:

By G. G. Brown and Associates. John Wiley & Sons, New York; Chapman & Hall, Ltd., London, 1950. 611 pp., illus., diagrs., charts, tables, 11¼ x 8½ in., cloth, $7.50.

Stressing the similarity of basic principles as applied in various industries, this treatise by twelve authorities in the field presents a comprehensive treatment of modern process operations. The unit operations are classified according to their function and the phase or phases treated: i.e., Part I is devoted to operations involving solids; Part II to fluids; Part III to the transfer of material from one phase to another separation by mass transfer; and Part IV to heat transfer, evaporation, and other similar operations, including a thorough coverage of energy and mass transfer rates.

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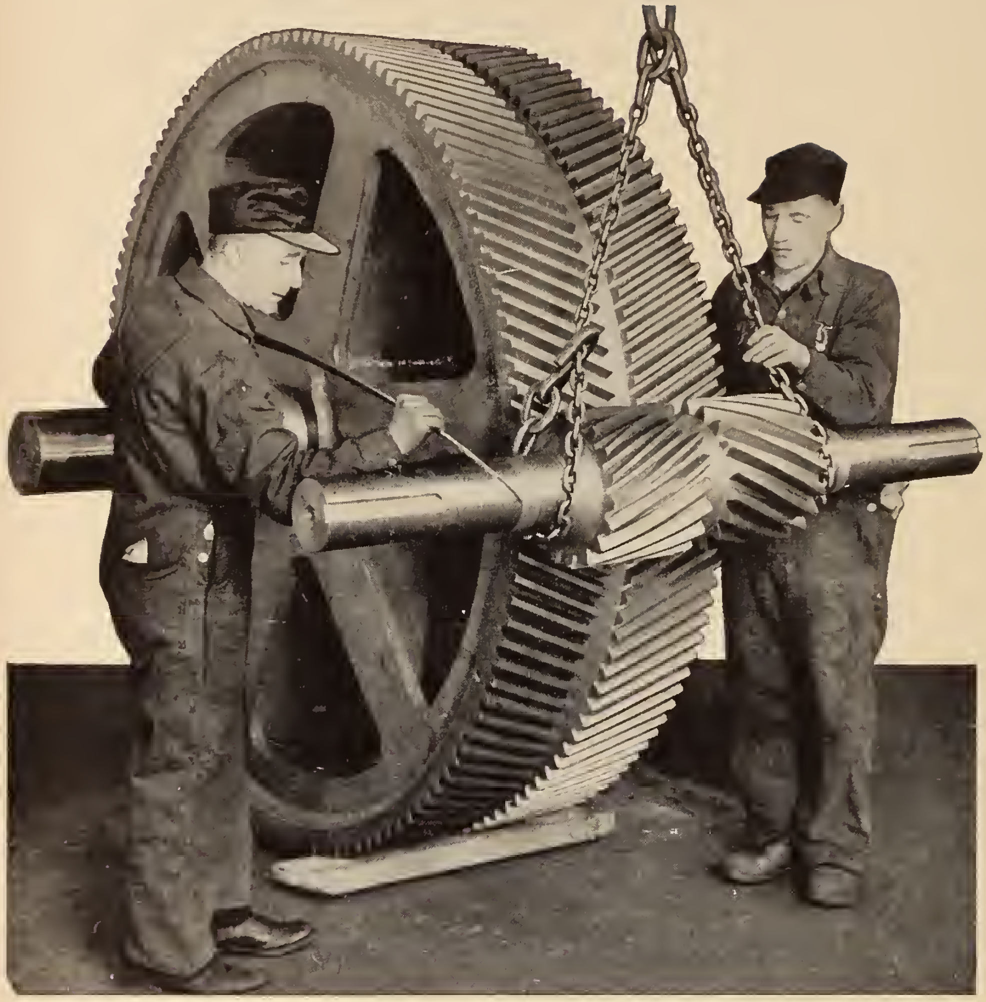

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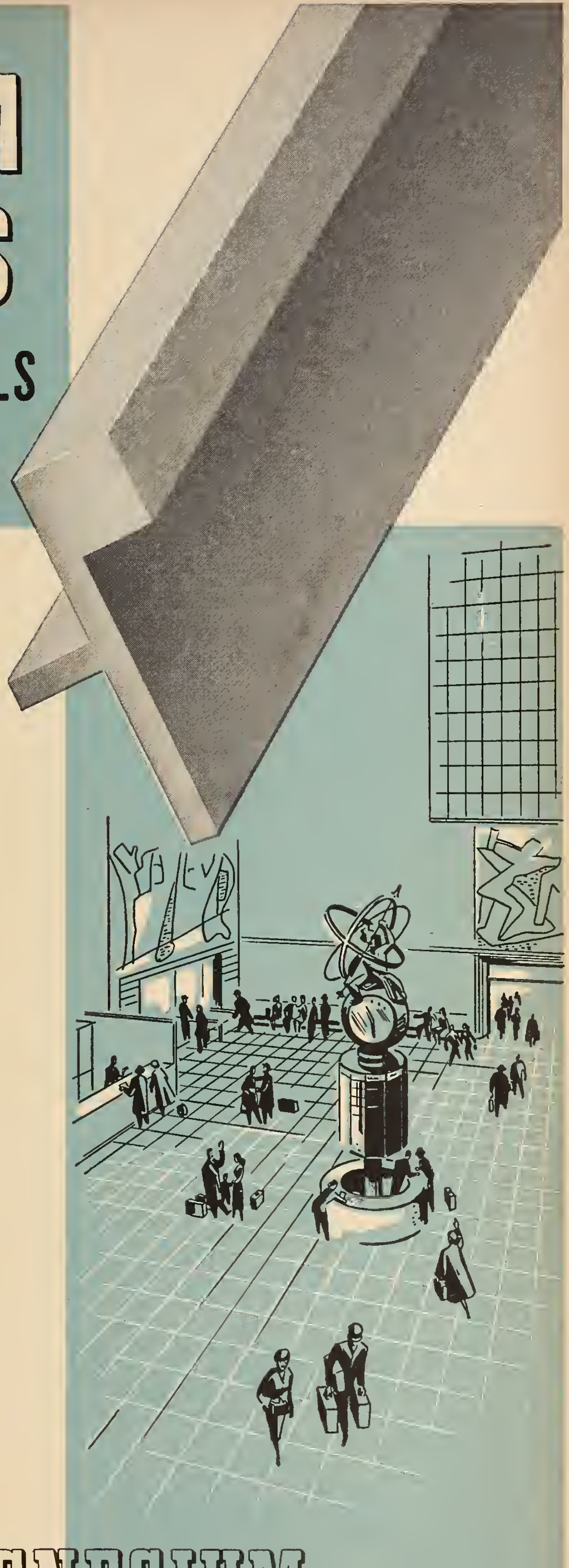

This terrazzo strip shape costs less in magnesium than in any other light metal

Previously using other materials, Canadian terrazzo suppliers turned to magnesium extrusions for their terrazzo strip used in the construction of terrazzo floors. Extruded magnesium strip not only saved them money but was unbelievably easy to handle, initial die cost was low and delivery almost immediate.

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DOMINION MAGNESIUM LIMITED

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Business & Industrial Briefs

A Digest of Information received by The Editor

Appointments and Transfers

Columbia Cellulose Co. — Columbia Cellulose Company Ltd., Canadian subsidiary of Celanese Corporation of America, has appointed Bulkley, Dunton Pulp Company Inc., selling agent for the market pulp of its plant near Prince Rupert, British Columbia. The plant will come into production early next year.

D. S. Horsley

D. S. Horsley.—D. S. Horsley has been appointed branch manager of the Saskatoon office of the Canadian Westinghouse Company. Mr. Horseley has been with the Company since 1929. He first served in Winnipeg and in February, 1948 was transferred to Saskatoon.

Fred T. Smye.—Fred T. Smye has been made a member of the Board of Directors and executive vice-president of A. V. Roe (Canada) Limited. He was formerly assistant general manager.

Mr. Smye was the first employee of Avro Canada and, in fact, was engaged by Sir Roy Dobson before Avro Canada was officially formed.

Link-Belt Office.—The Montreal sales office and warehouse of Link-Belt Limited, is now located at 945 Beaumont Avenue, Montreal. The parts stocked at Montreal include roller chain drives, steel pulleys, bearings, collars, malleable and steel chains, cast tooth sprockets, silent chain drives, V-belts, elevator buckets, enclosed gear drives, and numerous other parts and accessories.

The new office and warehouse will continue to be directed by A. W. Williams.

Leslie Jackson

Bepco Appointment. — Leslie Jackson was appointed recently to the sales staff of Bepco (Canada) Ltd. Mr. Jackson will make his headquarters at the Toronto office of the company.

Stelco Appointments.—The Steel Company of Canada Ltd., has made the following appointments. E. F. Grigsby is now sales manager, bars, plates, sheets—eastern division in Montreal. W. H. Whyte is now the assistant to the sales manager, tin plate division, Hamilton. D. A. Taberner has been appointed assistant to the sales manager, bar division, Hamilton.

F. H. Richards.—F. H. Richards has been appointed representative for the Province of Quebec for Scientific Exports (Great Britain) Ltd. His address is 5520 Victoria Avenue, Suite 16, Montreal. The organization he represents has headquarters at 20 Carlton Street, Toronto, and is the Canadian distributor of Baird and Tatlock (London) Ltd., W. Edwards and Co. (London) Ltd., Hilger and Watts Ltd., Hilger Division and Watts Division, Hopkin and Williams Ltd. and W. Watson and Sons Ltd.

Before coming to Canada, Mr. Richards was the sole representative of this group in Prague.

D. B. Allison.—D. B. Allison has been appointed to the staff of the fractional horsepower motor section of Canadian General Electric's supply department, Toronto. He is to be responsible for the general application and sale of special types of small motors.

A. H. Sievert

A. H. Sievert.—A. H. Sievert has been appointed manager of the electronic tube sales division of the Canadian Westinghouse Company. He has been with Westinghouse for 15 years and served in the lamp and tube engineering divisions before transferring to sales in 1947.

Companies You Depend on
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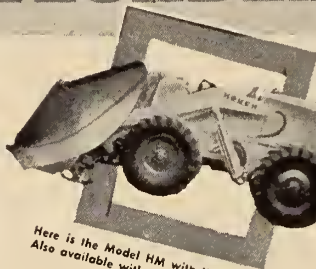
In the Winter -- a drift-busting brute for the Snow Belt . . it's a Model HM "PAYLOADER" equipped with "V" or Reversible Blade Plow.

In the Spring, Summer and Fall — with regular bucket it's an all-around excavating, earthmoving, loading and bulk materials handling tool.

The Model HM as a snow plow has the power, traction and speed ranges to crawl through heavy drifts or swoosh through lighter snows at speeds up to 16 mph. Four, big, pneumatic-tired wheels *with power on all four* provide the push that puts snow in its place — off the highway. Powerful hydraulic control exerts up to 3 tons of lifting capacity for "break-out" or tremendous down-pressure to dig in fast. Power-boosted rear wheel steering is easy and responsive . . four speeds in reverse as well as forward assure slow or fast action in either direction. All-weather cab is optional.

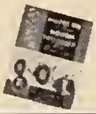
For summer or snow, for all-season *go* the HM "PAYLOADER" is a year-round tax saver Get the full facts from your Hough "PAYLOADER" Distributor



Here is the Model HM with "V" Snow Plow. Also available with Reversible Blade Plow.

Equipped with regular bucket, the Model HM is a fast snow loader. Interchange of bucket and plow is quickly accomplished.

CATALOGS on the big 1½ yard Model HM or the four smaller sizes of "PAYLOADERS" are available, without obligation.



Distributors for Province of Quebec

Chas. Cusson Limited

Quebec - MONTREAL - Val d'Or

Sciex Appointment. — W. Edwards & Co. (London) Ltd. of Worsley Bridge Road, Lower, Sydenham, London, S.E. 26 have decided to centralize their entire Canadian organization as of December 31st, 1950, when their Canadian business will be directed by Sciex (Canadian Division) Odeon Building, 20 Carlton Street, Toronto 2. When the centralization becomes effective Edwards & Co. will no longer be represented in Ontario by Physical Enterprises Ltd.

Dow Chemical Changes. — L. D. Smithers has been appointed executive vice-president of Dow Chemical of Canada Limited. His office address will be 204 Richmond Street West, Toronto 1. Mr. Smithers was appointed a vice-president in April of this year and a director about twelve months ago. He has been with Dow Chemical Company since 1936 and has been associated with the Canadian development since 1946.

Mr. Smithers' first act, under his new title, was to appoint Paul D. Scott his successor as works manager, and John L. Smart, assistant works manager.

J. F. Gilbert has been appointed plant superintendent in charge of the chlorine-caustic- and brine-treating production units; D. N. Staples is plant superintendent of the glycol and solvents plants and D. S. McArthur is now assistant plant superintendent at glycol and solvents.

Walter Silverson.—Bepco Canada Limited has appointed Walter Silverson manager of their Harland Drive Department. He succeeds R. J. Spencer Phillips.

Mr. Silverson has been with Bepco since 1937. Until 1945, he was in the engineering department and in that year was transferred to the Harland Drive Department.

Mr. Spencer Phillips, who has reached retirement age, has requested that he be relieved of the responsibilities of the management of the Harland Drive Department, but he will continue full-time employment with the Company. His services will be available in an advisory capacity and for special work.

Dominion Rubber Purchasing.—W. J. Paterson has been appointed director of purchases of Dominion Rubber Company. He succeeds H. R. Nixon who has retired from the position for reasons of ill health. Mr. Nixon will remain as a consultant to the purchasing department.

Before joining Dominion Rubber in 1946, and during the war years, Mr. Paterson was associated with the controller of supplies at Ottawa, later becoming assistant to the rubber controller and deputy rubber administrator, Wartime Prices and Trade Board.

J. J. Dawson.—John J. Dawson has been appointed manager of Canadian Westinghouse lamp sales. He succeeds W. J. (Bill) Orr who now becomes special representative of the lamp sales division.

J. J. Dawson

Geo. D. Tilley.—George D. Tilley has been named sales manager, mechanical rubber goods, Quebec division of Dominion Rubber Company. He succeeds A. C. McGiverin, who, in addition to being Quebec division sales manager for mechanical rubber goods, was also director of government sales for all company products. Mr. McGiverin will continue with the Company as director of government sales.

Chipman H. Drury. — Chipman H. Drury is vice-president in charge of production of Canadian Car and Foundry Co. Ltd. He held various positions in the Company's Montreal plant previous to his present appointment.

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.

Levelling Instruments.—Pan-American Trading Company Limited, 1465 Yonge Street, Toronto 12, offer well-prepared pamphlets describing Breithaupt instruments. These publications have been prepared especially for the Canadian engineer. They fully describe the operation, construction and special features of the instruments.

●

Sciex Booklet.—Sciex (Canadian Division) 20 Carlton Street, Toronto 2, Ont., offer a publication "Sciex in Canada". The publication was prepared originally for distribution at the Canadian Trade Fair. It contains descriptions of the scientific equipment, surgical instruments, and laboratory chemicals manufactured by the companies represented in Canada by Sciex. It is a 28 page two colour booklet of a pleasing and highly informative nature.

●

Jerguson Valves. — Peacock Brothers Limited, P.O. Box 6070, Montreal, who are Canadian representatives of the Jerguson Gauge and Valve Co., offer information sheets on their principal's products. To be placed on the mailing list for Jerguson pamphlets and data sheets apply on your official letterhead.

Jerguson manufactures valves for instrument piping and general use which reduce threaded connections from ten to three. These valves, which combine unions, nipples, reducers, elbows, tees, valve, and drain valve into one space saving unit, are offered in nine styles which include valves with or without union outlet as well as offset and jacketed valves. Special features, which are available on all or many of the nine valve styles, include: A safety shut-off, a double-seating stem for repacking under pressure; choice of regular or quick-closing stem and lever; regrindable and renewable seats; pressure bleeder valve and test gauge connection; outside screw and yoke when desired; throttling stem when desired.

●

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Distance from tip to ground allows ample clearance for loading highest trucks. Bucket under finger-tip control at all times.

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CHAS. CUSSON LIMITED

Quebec City MONTREAL Val d'Or

B.C. Wood Booklet.—British Columbia's Coast Woods Trade Extension Bureau, 837 West Hastings Street, Vancouver, B.C., offers a three-colour 12-page brochure "British Columbia's Timber Harvest". The booklet illustrates the nature and scope of the lumber industry in British Columbia which is, more than any other single economic factor, responsible for British Columbia's high level of employment. The text is of a non-technical nature and the publication of a very pleasing appearance.

●

"Dexion" News.—Dexion Limited, 189 Regent Street, London, W.1, England, publish a house magazine "Dexion News".

This booklet, which is published at regular intervals, describes the application of Dexion products in various countries and industries. Dexion products are easily-assembled prefabricated units for such uses as storage racks, scaffolding, ladders, catwalks, hoardings etc. The Company also publishes a very comprehensive catalogue.

●

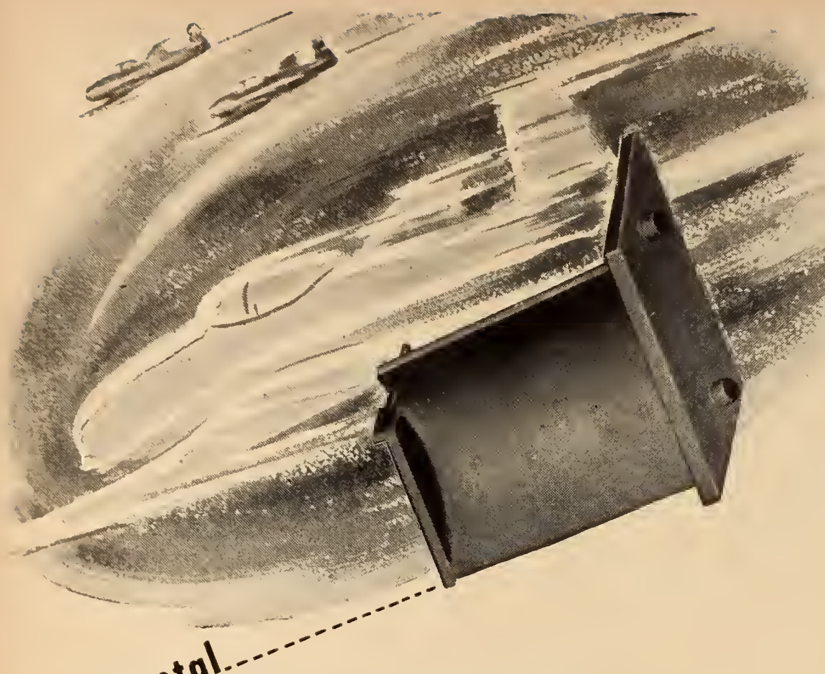
Diesel-Electric Locomotives.—No. 5 of Volume 17, of the Dominion Engineer contains a reprint of the article "Application of Diesel Electric Locomotives," by P. L. Mathewson, M.E.I.C., Transportation Engineer, Canadian National Railways, which appeared in a recent issue of the *Journal*. To be placed on the mailing list of the "Dominion Engineer" apply to Dominion Engineering Co. Ltd., P.O. Box 220, Montreal, Que.

●

Gear Data.—Hamilton Gear and Machine Co. Ltd., 950-990 Dupont Street, Toronto, 4, have added to their series of technical data sheets "Welded Steel Spur Gears". For copies of this bulletin, and of those previously published, apply to the manufacturer.

●

British Instruments. — The Scientific Instrument Manufacturers' Association, 20 Queen Anne Street, London, W.1. England, have published an excellent brochure of instruments and accessories for radio-isotope applications. These instruments and accessories have been produced by the association in collaboration with the Atomic Energy Research Establishment at Harwell and the manufacturers of this type of equipment in Great Britain.



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The brochure gives up-to-date information on the equipment available in the United Kingdom. Copies may be obtained by applying to A. G. Peacock at the address given above. Application should be on official letterhead.

●

Bristol Instruments.—A new bulletin describing a new line of Series 500 Strip-Chart Dynamaster Electronic Instruments has just been published by the Bristol Company of Canada Ltd., 71-79 Duchess Street, Toronto.

The bulletin gives information on the new instruments for recording and indicating such variables as temperature, resistance, conductivity, strain, position, inductance, pressure, and force. In addition to the recording models, air- and electric - operated automatic control models are also described. The bulletin is well illustrated with photos of various models, reproductions of chart records, and schematic drawings. Photographs of recent installations of the instruments are also included. Ask for bulletin No. W1821.

●

Saran-Lined Pipe.—Dow Chemical of Canada Limited, 204 Richmond Street West, Toronto 1, Ont., offer a new catalogue on Saran-lined steel pipe, fittings and valves. Photographs, cross-section, and dimensional drawings are also included. Copies may be obtained from the company.

●

Arc Welding.—A new 9th Edition of the "Procedure Handbook of Arc Welding Design and Practice", published by the Lincoln Electric Company, contains up-to-date information on recent important welding developments. New design data has been included and the latest procedures for welding of all metals and alloys commonly welded with manual open arc and hidden arc welding as well as automatic and semi-automatic hidden arc welding are described.

This handbook contains over 1200 pages and over 1300 illustrations in photographs and drawings. It is bound in semi-flexible, gold-embossed simulated leather and measures 6 in. by 9 in. The price is $2.65.

●

Revised Regulator Prices. — Minneapolis-Honeywell Regulator Co. Ltd., Vanderhoof Ave., Leaside, Toronto 17, Ontario, has issued a complete set of revised prices on both new and reconditioned controls. This list replaces the listing published in catalogue No. 9. Copies of the new price list and of the catalogue may be obtained by applying to the manufacturer at the address given above.

●

Corrosion Resistance.—Corrosion resistance superior to conventional zinc coatings is claimed for Zincilate, an anti-corrosion coating described in an 8-page illustrated technical bulletin just published by Industrial Metal Protectives, Inc., 401 Homestead Avenue, Dayton 8, Ohio.

The bulletin presents case histories and typical applications showing the resistance to severe abrasive and corrosive conditions. It also contains complete specifications for the two Zincilate formulations and data on surface preparation and methods of application.

●

Refractories. — Technical bulletin No. P-33 (October 13, 1950) — Monsanto Chemical Company, phosphates division, St. Louis 4, Missouri, is titled "Aluminum Phosphates for Refractories".

The Company offers commercial quantities of aluminum phosphate bonding agents for refractories, high temperature cements, and refractory paints. These products, ranging in ratio of aluminum to phosphoric acid from 1.0 to 1.67 and in physical form from dry solids to water solutions of high concentrations, are designated by the trade name Alkophos. They are said to afford good green strength, making it possible to fire moulded shapes in place to yield high-temperature non-slagging refractories. The bulletin gives typical analyses and it also carries an article by Dr. H. H. Greger, "New Bonds for Refractories". Copies may be obtained on application to Monsanto (Canada) Ltd., 425 St. Patrick Street, Montreal.

●

Dwelling Construction.—The Associate Committee on the National Building Code of the National Research Council has approved the final draft of a "Code for Dwelling Construction". This code deals with buildings housing one or two families. It is now being printed and it is expected copies will be available for distribution before the end of the year. For copies please apply to the division of Building Research, National Research Council, Ottawa.

●

TIME and COSTS were SAVED with CALCIUM CHLORIDE in ready-mix, on SIMPSON'S new MAIL ORDER BUILDING

Consulting Engineers: Margison and Babcock, Toronto.
Contractor: Foundation Company of Ontario Limited, Toronto, Ontario.
Superintendent: L. A. LaVoie.
Architects: Designed by the Architectural Department of the Robert Simpson Company Limited under the direction of Robert Carley.

Simpson's Mail Order building in Toronto provides another typical example of how concrete curing with Calcium Chloride saves time and speeds up work.

For this project, concrete was ready-mixed (supplied by Canada Building Materials Limited) and Calcium was used 1 pound to the bag of cement. The job took 18,000 yards of ready-mix.

You, too, can shorten normal building schedules, save time and costs, if you use Calcium Chloride for curing. The reasons are simple.

1. **Concrete sets faster, with high early strength.**
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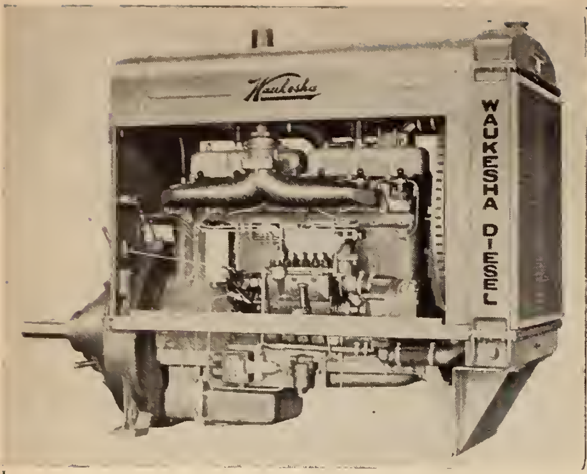

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It's a fine tribute to a fine engine that more than half of all the engines installed in construction equipment, building Canada's first subway, are **Waukesha.**

Leading manufacturers of shovels, cranes, compressors, etc., depend on rugged, dependable, precision-built **Waukesha Engines** to help make their equipment the finest in the world.

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Worm Gear Reducers.—The Cleveland Worm and Gear Company, 3249 East Eightieth Street, Cleveland 4, Ohio, which is represented in Canada by Messrs. Peacock Brothers Ltd., Ville LaSalle, Montreal, offers bulletin No. 130 in which is described Cleveland Types AT and RT Worm Gear Speed Reducers.

These speed reducers are an improvement on older models and they have the following important new characteristics:

1. Face type oil seals are used in place of older style packing glad on type AT units. The new seal is far more efficient and requires no maintenance.
2. New higher horsepower rating tables. Many major improvements have been made in the design and manufacture of worm gearing since the old ratings were originally published in 1934.

Bulletin No. 130 contains 36 pages of well-produced factual material. All Canadian inquiries should be directed to Messrs. Peacock Brothers Ltd., at the address given above.

●

Solderless Terminals.—Aircraft Marine Products Inc., 1523 N. Fourth Street, Harrisburg, Pa., specialize in the production of solderless terminals which are manufactured to suit various wire sizes. They have produced an 86 page catalogue. It is highly informative and extremely well produced. By means of carefully prepared indices the information required by the user may be obtained with minimum effort and all information is presented in a most concise manner. The publication should be of interest to engineers in the electrical industries or responsible for the wiring and maintenance of electrical equipment. This catalogue is an expensive production and it is particularly requested that accurate mailing instructions be given when copies are requested.

●

British Boilers.—Davey, Paxman and Co. Ltd., Standard Ironworks Colchester, Essex, England, are a very well known firm of British Manufacturers of boilers and other boiler room equipment. They have just published an elaborate 28 page bulletin, printed in multiple colours, in which are described some of the boilers manufactured by this company. Copies of this bulletin, and of other Davey Paxman publications may be obtained by writing to the Company at Colchester.

●

Link-Belt Power Unit.—Link-Belt Limited, Eastern Avenue at Leslie and Keating Streets, Toronto 8, announce the development of a new packaged power unit, named "The Link-Belt Motogear." The unit consists of an enclosed helical gear drive with separate standard motor, flexibly coupled and mounted on one welded steel base plate. The motor gears are available in a variety of sizes, in double or triple reductions and in a wide range of ratios and horsepower. Complete information on gearmotors, motorgears and separate helical gear drives, 1 to 75 H.P., is given in a new 16-page Link-Belt Book No. 2247.

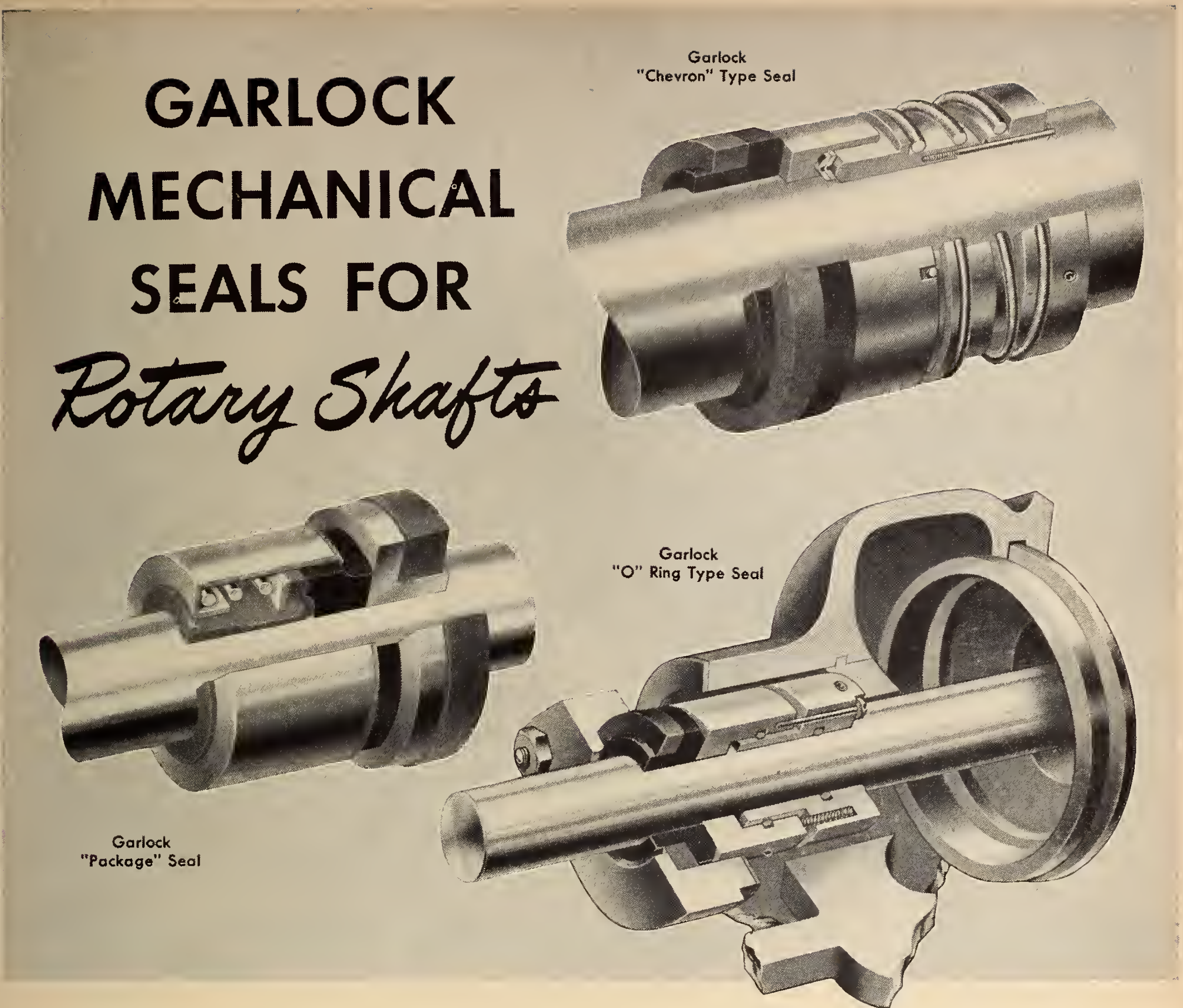
●

Wood Bureau Books.—The B.C. Coast Woods Trade Extension Bureau, 857 West Hastings Street, Vancouver, B.C., has available a number of well prepared bulletins describing the uses and application of wood in construction jobs. A recent addition to this series is a bulletin entitled "Windows of Wood for Schools". Copies of this bulletin and of others issued by the Bureau are available on request.

●

Spray Valve.—The Farval Corporation, 3251 East 80th Street, Cleveland 4, Ohio, have introduced a new spray valve by means of which either grease or oil can be sprayed onto open gearing, slide surfaces, or any other area where it is desirable to apply a measured amount of lubricant at regular intervals. This equipment is described in a new bulletin No. 60 which may be obtained by an application to either the U.S. company or to the Canadian representative Peacock Brothers Ltd., Ville LaSalle, Montreal.

●



Where leakless operation of rotary shafts on pumps or other equipment is required, GARLOCK MECHANICAL SEALS will do the job.

There is no wear on the shaft when a Garlock seal is used. Sealing is effected by leakless and positive contact between carefully lapped metal-to-carbon or metal-to-metal mating surfaces. One of these elements rotates with the shaft and the other is stationary. The stationary element does not contact the shaft.

These precision-built seals are made in several standard designs and in a wide range of highest grade materials. The selection of design and materials depends upon the service in which the seal is to be used. If none of our standard designs appears entirely suitable for any specific application, a modification of a standard design or a specially designed seal will be engineered and built for that job.

Thousands of GARLOCK MECHANICAL SEALS have proved their effectiveness, durability and economy on shafts operating at high and low speeds and pressures. Users of Garlock seals are enjoying many months—or years—of trouble-free operation on equipment handling various liquids such as, for example, water, gasoline, beer, acids and paint.

If you need Mechanical Seals for any kind of a rotary shaft application, let Garlock's experienced engineering staff work with you. Write for our Mechanical Seal booklet.

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GARLOCK

Pressure Boosters. — Miller Motor Company, 4027 N. Kedzie Avenue, Chicago 18, Illinois have published a new 12-page bulletin in which is described the low cost fluid pressure boosters they manufacture.

In this publication instructions are given on when to use the boosters in place of air cylinders, when to use them in place of hydraulic pumps, how they operate to produce practically any desired hydraulic output pressures up to 10,000 p.s.i. from ordinary plant air or hydraulic pressure, how to select the proper size, model and type of booster best suited for a particular application. Ask for bulletin No. B-200.

●

Tricone Mill.—Hardinge Company Inc., York, Pennsylvania, has just published a new catalogue — No. AH-414 in which is described the recently developed Tricone Mill. The catalogue contains 12 pages. It describes the operating principle of the mill, and presents a discussion on ball segregation, design features, performance data etc. The street address is 240 Arch Street, York, Pa.

●

Plasticizer Booklet.—The properties and uses of typical polyvinyl chloride film and sheeting formulations are described in a bulletin available from Monsanto (Canada) Limited. Pointing out that plasticizers are as important to the quality of the finished product as the resin itself, the bulletin contains detailed information on various types of plasticizers and their functions. The composition and relative values of seven stabilizer systems are also included. Although nine of the plasticizers suggested are manufactured by Monsanto, the bulletin recommends other plasticizers and stabilizers as well. For copies apply to Monsanto (Canada) Ltd., 425 St. Patrick St., Montreal.

●

Tight Brick Walls.—Causes of leaky brickwork and how they can be attacked with the help of Omicron Mortarproofing are discussed in a 16-page illustrated booklet "Omicron Mortarproofing For Tight Brick Walls" just published by the Master Builders Co., 7016 Euclid Avenue, Cleveland 3, Ohio.

Featured in the booklet are tests by leading laboratories which show how "O.M."— cement dispersing, water reducing mortar admixture—improves the properties of all mortars whether job-mixed cement-lime, masonry cement, or prepared mortar mixes. Copies may be obtained on application to the publisher.

●

Discharge Centrifuge.—The Sharples Corporation, 23rd and Westmoreland Streets, Philadelphia 40, Pa., offer their "Bulletin No. 1243" in which is described DV — 2 Controlled Solids Discharge Centrifuge. This equipment employs the stratification principle of high separating efficiency combined with high capacity, and develops a centrifugal force equal to 6,200 times the force of gravity. Unique in the DV-2 centrifuge are ten externally controlled solids discharge valves located radially around the inside of the bowl which are operated by the admission of water (or other operating liquor) through a separate channel of the centrifuge. This Company also offers bulletin No. 50-Do which deals with "insulating oil regeneration". This bulletin will be of particular interest to engineers who are responsible for the efficient operation and maintenance of transformers.

●

Materials Handling.—Rapistan material flow equipment is described and illustrated in a new 24-page, 2-colour catalogue now available from The Rapids-Standard Company Inc. of Grand Rapids, Michigan. The catalogue is fully indexed and contains application tips, construction features, and specification charts, useful for reference in solving material handling problems. Gravity conveyors, powered conveyors, and hand and platform trucks are treated in separate sections for convenient selection.

●

Aluminum Containers.—Volume 9 of the Alcan Ingot contains an article in which are described some shipping containers of aluminum which were manufactured by Ross Engineering Limited of Montreal. The containers stand 6 ft. high and are 6 ft. 9 in. square. They weigh about 750 pounds each and have a capacity of 275 cu. feet. They can carry four tons of cargo. For copies of this issue of the Ingot and for further data pertaining to the containers please write to: The Editor, The Ingot, Aluminum Company of Canada Ltd., 1700 Sun Life Building, Montreal, Que.

●

There's an Increasing Demand Among Canadian Engineers for

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Some of our recent Canadian Contracts:—

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Arena, Montmagny, P.Q.
Monkland High School, Montreal
Station, Farnham, P.Q. and Angus Shops extension C.P.R.
St. Joseph Hospital extension, Sudbury, Ont.
Canadian International Paper Co., Hawkesbury, Ont.
Catholic Seminary, Amos, P.Q.
Post Office, St. Jerome, P.Q.
Biscuit Factory, David & Frere, Montreal
Dominion Textiles - Burlington Mills, Sherbrooke, P.Q.
Steinberg Groceteries, Cote des Neiges Road & Ontario St., Montreal
Samuel Casavant School, St. Hyacinthe, P.Q.
Hydro-Quebec Konowaki Suspension Towers, Ville La Salle, P.Q.
United Stores, Ontario & Bourbonniere Sts., Montreal
Arena, Val d'Or, P.Q.
Hydro-Quebec Service Centre, Jorry Street, Montreal.
Rosedale School, Montreal
La Salle Hotel, Montreal

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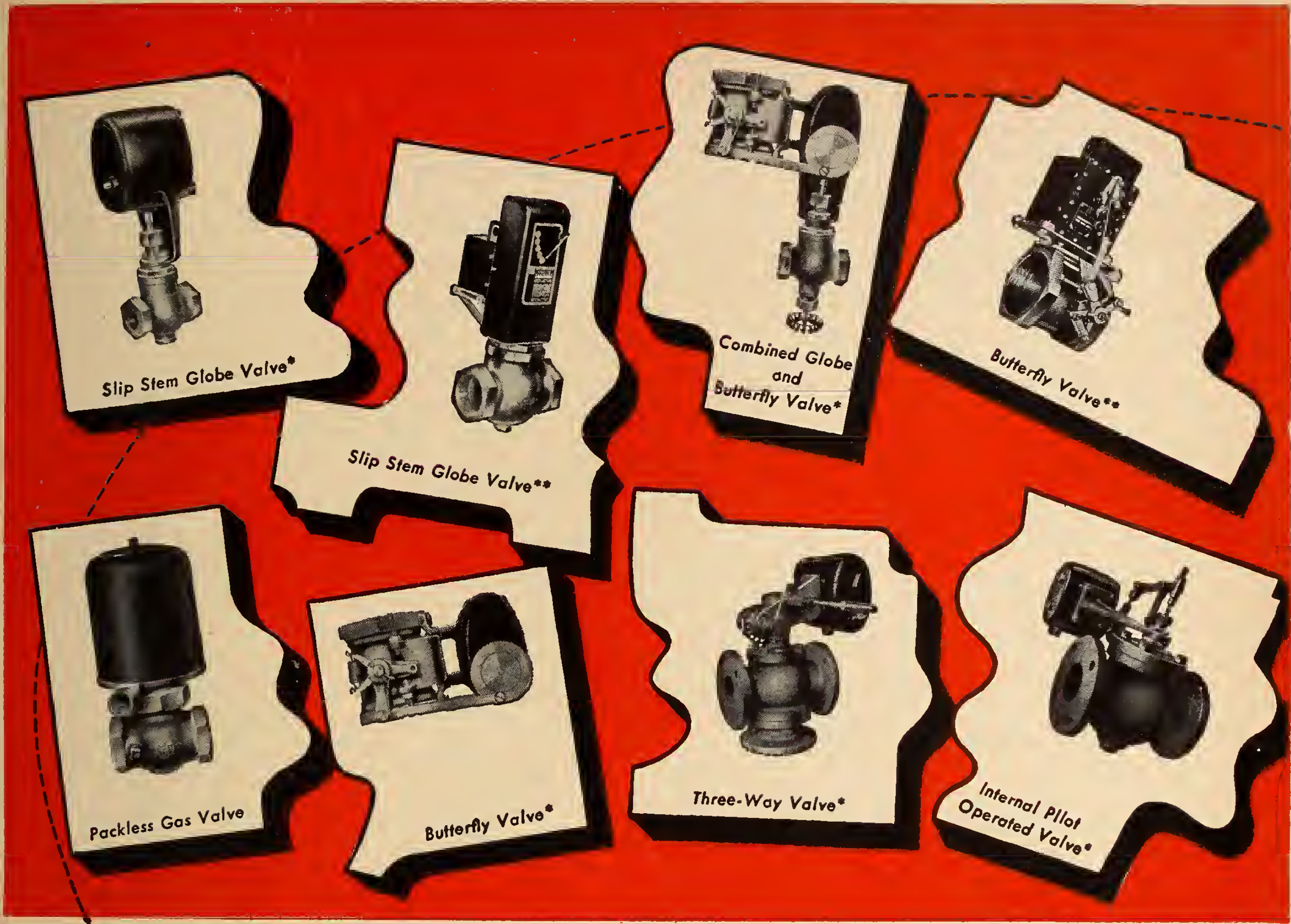

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VITAL to optimum operation of any control system is the selection of the proper valve for each application. What is gained through the superiority of the process equipment and its control may be lost through poor selection or sizing of the valves.

Proper valve selection often is difficult. The type of inner valve, motor timing, torque rating, material and size . . . all must be chosen to fit the process conditions. Particular care should be given to valve sizing . . . for a valve can perform best only when it is properly sized.

Your local Honeywell engineer is qualified to render expert advice, will gladly help you select the correct valve for each specific application. The completely integrated line of Honeywell motorized control valves, a few of which are illustrated, enables him to make unbiased recommendations.

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MINNEAPOLIS
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VALVE PRODUCTS

New Equipment and Developments

Boiler Water Treatment. — A new product known as "Concentrol" which, it is claimed, eliminates foaming and boiling water carry over due to high alkalinity, dissolved solids, suspended solids or any combination of them, has been announced by The Bird-Archer Company, Limited, 503 McGill Building, Montreal.

•

Commonwealth Electric Purchased.—Commonwealth Electric Corp. Ltd., Welland, Ontario, has been purchased by the Reliance Electric and Engineering Co., of Cleveland, Ohio. Commonwealth motors of the squirrel cage, wound rotor, and synchronous types, motor-generator sets, and transformers for power and distribution service are now supplemented in the Canadian market with a variety of Reliance products. These include VS Drives, specially engineered drives, heavy duty Type "T" direct current motors, gear motors, and power drive auxiliaries including electronic and magnetic controls and regulators.

Founded in 1905 to manufacture a special type of direct current adjustable speed motor providing much wider operating-speed ranges than any motor then commercially available, Reliance has since become the third largest producer in the United States of electrical equipment within its field.

•

Ferranti Price Stabilization.—To protect purchasers against rising cost, Ferranti Electric Limited will quote firm prices on distribution transformers, where shipment is made within six months from the date of acceptance of order. Up-to-the-minute lists of Ferranti transformers in stock at the Toronto factory, and in warehouses in Montreal and Winnipeg, may be obtained by applying to the Company — Ferranti Electric Limited, Mount Dennis, Toronto 15.

•

Mine Trammer.—A new 1½-ton battery-powered trammer for use in mine haulage work is available from the transportation division of Canadian General Electric Company. The Trammer is designed for use in mines where clearances are restricted.

Available in any track gauge between 18 and 24 inches, the new unit is 71½ inches long over bumpers, 35 9/16 inches wide and weighs 3000 pounds with its battery. With a standard battery the trammer is 38½ inches high; with a high-type battery — 44⅛ inches high. Individual drive from the motor to each of two axles provides maximum tractive effort.

Rated drawbar pull of the trammer is 400 pounds, but a maximum drawbar pull on level tangent track of 750 pounds is available. Maximum speed of the locomotive alone is seven miles per hour. Its speed at rated drawbar pull is three miles per hour. Tractive effort is furnished by a totally-enclosed four-pole d-c motor designed especially for battery-powered operation. Further information on this locomotive may be obtained from your nearest C.G.E. office.

•

U.K. Steel Export.—According to a news release by the United Kingdom government, 48 per cent of Britain's export trade is now represented by iron and steel exports, direct and indirect. During the first half of 1950 direct exports of iron and steel rose by 25 per cent compared with the same period of 1949 — from a monthly rate of 200,000 tons to 250,000. This included the doubling of shipments to Canada.

•

New Chlorine Plant. — It has been announced by Monsanto Chemical Company, St. Louis 4, Missouri, that the first sizeable chlorine plant in the United States or Canada to use De Nora mercury-type cells with a rated capacity of 30,000 amperes will be erected by Marathon Paper Mills of Canada, Ltd. This undertaking is a result of a contract signed by Marathon, the Leonard Construction Company of Chicago, and Monsanto Chemical Company.

The plant will be built to produce 25 tons of chlorine per day. It has been designed by Monsanto and the products will be rayon-grade caustic soda, chlorine, electrolytic sodium sulphide, sodium hypochlorite, and synthetic hydrochloric acid.

•

Soldering Tools.—Upton, Bradeen and James Ltd., of Toronto are Canadian representatives of the Luma Electric Equipment Co., Toledo 1, Ohio, who offer, through their Canadian representative, the Luma resistance type soldering tool. It is claimed that it will do any type of soldering job, from fine precision work to heavy industrial operations. Six ranges of power units are offered; 3 single and 3 multi-stage. The 3 single stage tools have a range from 270 to 1225 watts. The 3 multi-stage from 1575 to 2500 watts.

Electrodes equipped with 5-foot extra flexible cables, range in sizes from .050-in. to ½-in. diameter. The 3/32-in. electrodes, in both single and double types, are especially adapted to light terminal work, such as the manufacturing of jewelry, motor armatures, fuses, radios, microphones, harnessed assemblies, etc. Weight is 8½ ounces including cable. Complete information on this line of soldering equipment may be obtained from the Canadian company.

•

New Quebec Hydro Development.—A substantial addition to the power resources of the Province of Quebec was announced by officials of the Aluminum Company of Canada Ltd., on October 31st. Work will start immediately on the construction of a 200,000 horsepower generating station at Chute du Diable on the Peribonka River. The development will be known as the Peribonka No. 1 Power Development.

The dam and power house represent a major construction job for which over 450,000 cubic yards of rock must be excavated. About 275,000 cubic yards of concrete will be required to complete the project. The work at the site will be carried out by the long-established Quebec contracting company, Fraser-

Brace Engineering Company, Ltd. The consulting engineers are the Shawinigan Engineering Company. Ltd., of Montreal.

●

Engineer's Instruments. — Pan-American Trading Company Limited, 1465 Yonge Street, Toronto 12, are Canadian distributors for F. W. Breithaupt & Son, Kassel, Western Germany. The Breithaupt company has been manufacturing high precision surveying instruments since 1762, and they are in use in all parts of the world. Breithaupt instruments are of the highest quality and they have won the top prizes at international exhibitions.

Pan-American Trading is introducing to the Canadian Market Breithaupt instruments of modern design and with special features designed to meet Canadian conditions. They are equipped with erecting eyepieces, four-screw sockets, double verniers and brass centres. The tripods are made of selected white ash, and a solid oak carrying case is supplied as part of the standard equipment.

The Canadian agents will be pleased to supply literature and to arrange demonstrations.

●

Vermiculite Discovered.—On November 15th the Hon. James J. McCann, Minister of Mines and Technical Surveys, Ottawa, announced the discovery of vermiculite over a large area at Stanleyville near Perth, Ontario. The existence of the mineral was brought to light in the course of field investigations by C. G. Bruce of the industrial minerals division acting on information supplied by Arthur W. Powers of Stanleyville.

Vermiculite has not hitherto been available in economic quantity from any deposit in Canada and imports have been made from South Africa and the United States. Preliminary expansion tests made in the laboratories of the industrial minerals division on the vermiculite from the deposit at Stanleyville indicate that a product of high quality can be made from it. Further work is planned.

●

Gardner-Denver Plant. — To provide increased service for its expanding Canadian business, Gardner-Denver Company, manufacturer of rock drills, air compressors, pumps and equipment for mining, contracting, oil field, and industrial purposes, is establishing a Canadian plant. The new plant will be located at Brantford, Ontario, and will be operated by Gardner-Denver Company (Canada) Limited.

●

Canadian Argon Plant.—The Canadian Liquid Air Company, Ltd., has announced the opening of a plant for producing argon gas. It is the only plant of this kind in Canada. In the past argon has been imported from the United States.

Designed to meet the growing demand of industry for this inert gas, the plant will produce high quality "Welding Grade" and "Lamp Grade" argon.

"Customers are now assured of a guaranteed supply of argon," said a Canadian Liquid Air Company official, "and, because the gas is now produced in Canada, costs will not be affected by customs and import-export regulations or dollar exchange rates."

●

Paint "Sandwich". — A three-decker paint "sandwich" developed by the

for the 1951

CANADIAN INTERNATIONAL

TRADE FAIR

Before you put the final okay on your firm's budget for 1951, be sure it includes funds for exhibiting at or attending the 1951 Trade Fair.

You'll find things there to interest you from around the world . . . and from just around the corner. It's an opportunity to see . . . compare . . . and buy the best the world has to offer.

No matter what business you're in, it will pay you to participate in the 1951 Trade Fair. Ask your trade association, or write for an informative illustrated booklet to The Administrator, Canadian International Trade Fair, Toronto.

There's something for **YOU** at the

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Tapered Spher-O-Honed Roller Bearings

Take the thrust component of the load on
—spherical roll-heads, micro honed
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You can install Bower Bearings with permanent fit — no necessity of a "running-in" or wearing-in period, or any "final" adjustment.

Silently, enduringly, they carry the toughest, heaviest loads of industry and transportation.

Largest Stock in Eastern Canada.

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VANCOUVER NEW GLASGOW

Westinghouse Electric Corporation will withstand conditions ranging from sub-zero cold to desert heat and including continuous salt spray attack.

J. G. Ford, manufacturing engineer for the Westinghouse transformer division described the "sandwich" as an entirely new painting system that "should help to reduce the nation's (U.S.) $3,000,000,000 annual cost of corrosion." It was developed specifically for use on small distribution transformers.

"Even under the most severe climatic conditions," Mr. Ford said. "The new system will more than double the life of the finish on distribution transformers. Test samples of the new paint, exposed continuously for 18 months on the seacoasts of Florida and California, showed absolutely no signs of corrosion."

Complete information on this paint "sandwich" can be obtained by applying to Canadian Westinghouse Co. Ltd., Hamilton, Ontario.

●

Bit Extractor. — Canadian General Electric Co. Ltd., has announced a new magnetic bit extractor designed to assist in the removal of broken rods and bits.

Equipped with a powerful Alnico magnet the extractor is low in cost. Three sizes are available, 1, 1¼ and 1¾ inches. The largest size has a holding power of appoximately 65 pounds on flat, thick steel. Apply to any C.G.E. office for futher information.

●

Canadian-U.S. Priorities.—On November 8 the Right Hon. C. D. Howe, Minister of Trade and Commerce, announced that an agreement had been reached with the United States Government under which each country extends to the other equal priority assistance to that accorded its own defence contracts to ensure the supply of essential materials and components for the military production programmes.

A memorandum of instruction regarding defence requirements and priorities has been issued to Canadian industry. Additional copies may be obtained by applying to the Department of Trade and Commerce, Ottawa.

In announcing the agreement Mr. Howe stated that it did not indicate the institution of a formal priorities system in Canada.

●

Standard Tube Expansion.—A British Company, Tube Investments, is investing nearly $3,000,000 in the Standard Tube Company of Woodstock, Ontario.

Ivan A. R. Stedeford chairman of Tube Investments has stated that negotiations have been completed for a "substantial interest" in the Canadian company, including provision of a specialized plant.

Standard Tube manufactures electrically welded precision steel tubes and has a number of distribution depots throughout Canada.

●

Steel Restrictions.—The use of steel for amusement construction will be banned, effective January 1st, 1951.

The new order has been found necessary because of the greatly increasing demand for steel for defence construction. Curtailment of the use of steel for non-essential work has been called for under the Canada-U.S. joint programme of economic defence planning. The cutting off of new building of theatres, bowling alleys, and similar non-essentials also is viewed as an anti-inflationary move.

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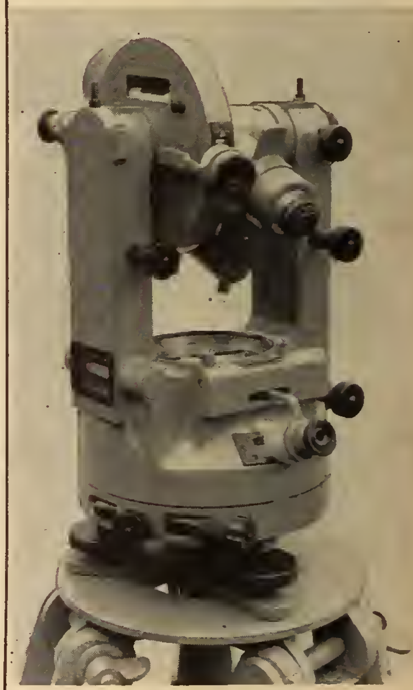

World-famous surveying instruments manufactured by F. W. Breithaupt & Son, Kassel, Western Germany, are now offered for the first time in Canada. There are models suitable for every purpose. Modern equipment includes erecting eyepieces, 4-screw sockets, powerful telescopes, double verniers, and solid tripods and carrying cases.

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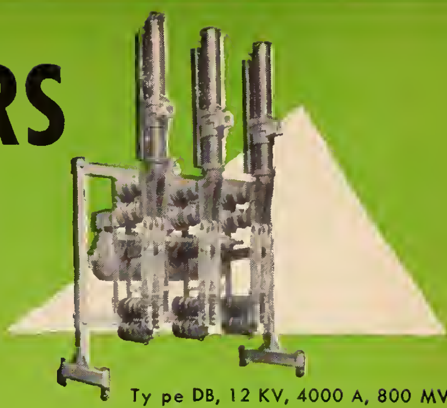
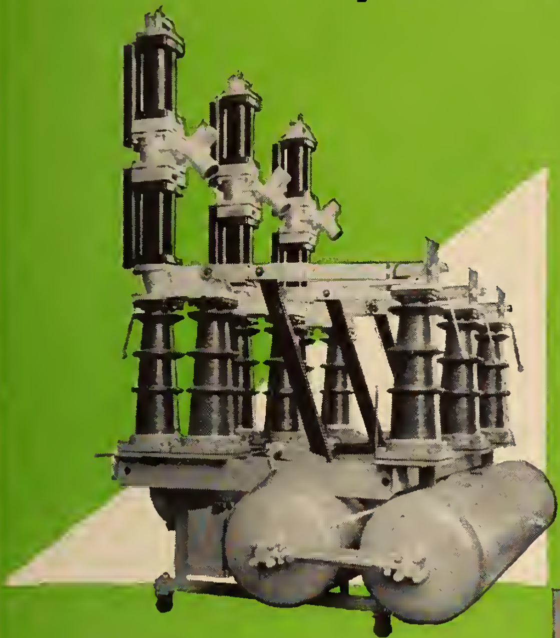
for Mighty Power Systems

Now! A Complete Range of Air Blast Breakers by Brown, Boveri:



Ty pe DB, 12 KV, 4000 A, 800 MVA.



Type DB, 69 KV, 1000 A, 1200 MVA.

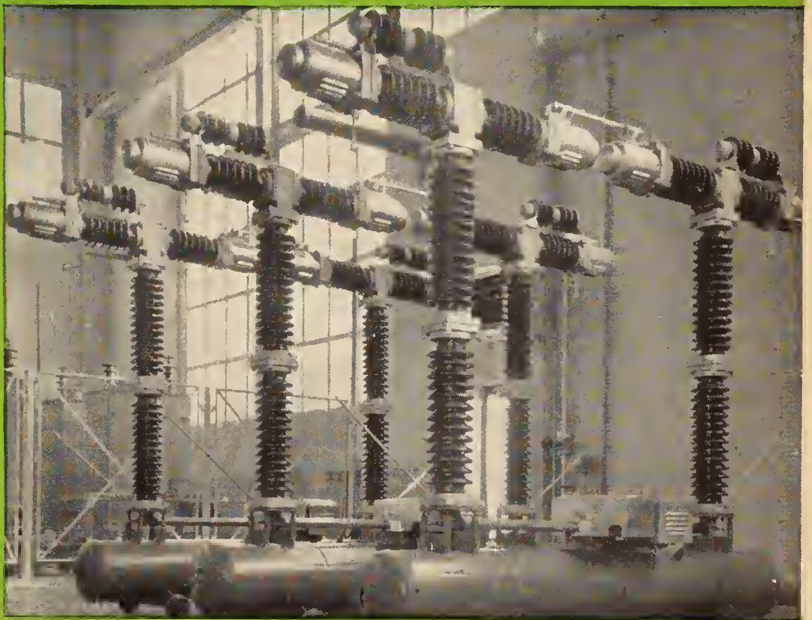
After 12 years of exhaustive tests and experience in the field, Brown Boveri now offers a complete range of standardized designs capable of fulfilling every service requirement in the largest power system. The Brown Boveri air-blast breaker gives extremely fast, effective protection; is free from fire hazard and requires a minimum of maintenance. It is of simple, robust construction and is easy to install and operate. Many successful installations prove its suitability under Canadian operating conditions.

Indoor types DB are available for open or cubicle mounting in the following ranges: 4-69 KV service voltage; 400-4000 A.; rated symmetrical rupturing capacity, 200-1000 MVA. Main characteristics (based on 60 c/ps) — total interrupting time, 3 cycles; arcing time, ½ cycle. Reclosure with adjustable dead interval from 12 cycles up.

Outdoor types DCF from 69-390 KV service voltage, 800/1200 A.; rated symmetrical rupturing capacity 1500-5000 MVA. Main characteristics — total interrupting time, approximately 3 cycles; arcing time ½ cycle. Single and 3 phase high speed reclosure with dead interval adjustable from 6 cycles up.

Actual field tests on largest networks prove conclusively that this breaker will easily interrupt short circuits up to full rating even under extreme conditions of phase opposition with twice service voltage across breaker interruptors. It will also break charging currents of long transmission lines without re-arcing, thus avoiding heavy voltage surges.

Unique design permits complete interchangeability of individual breaker parts between breakers of different ratings.



Type DCF, 138 KV, 800 A, 2500 MVA.

Investigate now the many advantages of using Brown Boveri air blast breakers on your system. Complete technical and service facilities at your disposal in Canada.

BROWN BOVERI

POWER & MINE SUPPLY CO. LTD.
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MINE EQUIPMENT CO. LTD.
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VANCOUVER

BROWN, BOVERI (CANADA) LIMITED

1111 BEAVER HALL HILL, MONTREAL

Canada has been receiving about 1,000,000 tons of steel each year from the United States, but has received only about 750,000 tons in 1950. When the new steel controls were announced, it was also stated that the government will withdraw, effective January 1, emergency exchange import controls on capital goods. This will eliminate all the import controls imposed late in 1947 to conserve Canada's dollar supplies.

•

Government Construction Purchases.—Procurement of new construction projects for the Department of National Defence is now being carried out by a Crown company to be known as Defence Construction Limited.

In announcing the formation of the company, the Right Hon. C. D. Howe, Minister of Trade and Commerce, said "Owing to the accelerated programme of defence construction, currently estimated at $100,000,000, it was felt desirable to charge a single Crown Agency with the special task of expediting the letting of contracts for defence construction projects and supervising their completion". The services, facilities, and construction personnel of Central Mortgage and Housing Corporation will be made available to Defence Construction Limited. These facilities include five regional offices located at Halifax, Montreal, Toronto, Winnipeg, and Vancouver. Engineering and inspection personnel are already established at most of the sites where defence construction will be carried out.

"For engineering and supervision of some structures, existing facilities will be augmented by the employment of private consulting engineering firms. Contractors holding contracts for new construction arranged through the Canadian Commercial Corporation, are being advised that, effective immediately, their contracts are under the administration of Defence Construction Limited. Contactors bidding on projects which are currently the subject of advertised invitations to tender by the Canadian Commercial Corporation, should submit their tenders to the Canadian Commercial Corporation, as called for in the advertisement and forms of tender. Arrangements have been made to transmit tenders to Defence Construction Limited immediately following their opening in the offices of the Canadian Commercial Corporation at the advertised time.

"President and General Manager of Defence Construction Ltd., will be R. G. Johnson, who was recently appointed construction consultant for the Canadian Commercial Corporation, on loan from the Canadian Construction Association, of which he is General Manager". Head office of Defence Construction Ltd., will be at Ottawa.

•

Temporary Heating.—For heating on construction jobs, quarries, and a host of other temporary applications, portable "Thermoblocs" are being manufactured by Prat-Daniel Corporation of East Port Chester, Connecticut—represented in Canada by T. C. Chown Limited of Montreal. The portable units provide complete heating facilities, including fuel tank. They are mounted on easy-operating trucks.

This equipment is very efficient and requires less space than salamanders or other conventional methods now in use. In addition, the heater may be effortlessly moved about until the position of most effective diffusion is found. Units giving 100,000, 200,000 and 300,000 b.t.u.'s are available. Complete information may be obtained from the parent company or from the Canadian representative.

•

"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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We manufacture all kinds of Springs, large and small, for every purpose.

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C. M. Lovsted & Co. (Canada) Limited, Vancouver

HORTON WELDED STEEL TANKS

provide dependable storage facilities

The welded flat-bottom tanks shown above are providing dependable storage facilities at the Commercial Alcohols Limited's new plant at Gatineau, Que. The tanks are 30 ft. diameter and 24 ft. high and are used for the storage of denatured and ethyl alcohols which are manufactured at the plant.

Horton flat-bottom tanks are built in standard sizes from 500 to 150,000 bbls. or special sizes to meet your requirements. Write our nearest office for complete information.

HORTON STEEL WORKS LIMITED
TORONTO, ONT. FORT ERIE, ONT. MONTREAL, QUE.
REPRESENTATIVES
Mumford-Medland Ltd., Winnipeg, Man. · Gordon Russell Ltd., Vancouver, B.C.

THE

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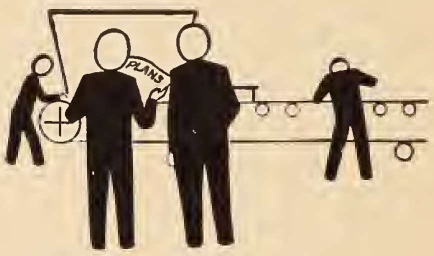

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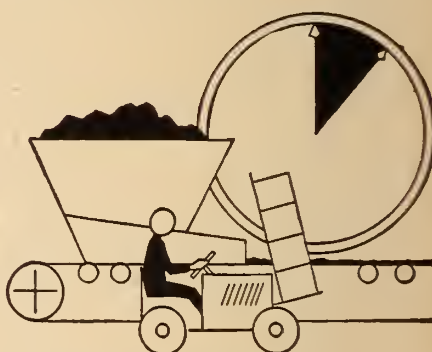

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