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ESTABLISHED 1893.

WITH WHICH IS INCORPORATED

THE CANADIAN MACHINE SHOP.

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CIVIL, MECHANICAL, STRUCTURAL, ELECTRICAL, LOCOMOTIVE, STATIONARY, MARINE, MINING, METALLURGICAL, AND SANITARY ENGINEER, THE SURVEYOR, THE MANUFACTURER, THE CONTRACTOR AND THE MERCHANT IN THE METAL TRADES.

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HANDS ACROSS THE SEA.

Possibilities of an Iron and Steel Clasp Between Britain and Canada.

The following article reviews in some detail the growth of those Canadian industries which directly or indirectly affect the demand for iron and steel. Remarkable as has been the expansion in this connection, it is safe to say that greater growth is but the natural sequence of the immense amount of capital which is being invested in the Dominion, and the rapid strides which are being made to develop the country. It is impossible in one article to set forth each and every trade opportunity which exists in Canada for the British iron and steel manufacturer. But from the following particulars, he cannot fail to see that the possibilities for the expansion of his foreign trade are very numerous and most attractive.

"The Canadian Engineer" will be happy to place its staff, its Toronto head office, and its Montreal, Winnipeg, and Vancouver branch offices at the disposal of the engineering interests, and the iron and steel manufacturers of Great Britain. Any inquiries they may make, it will be pleased to answer, and would ask the British manufacturers to make use of its exceptional facilities for obtaining such information as they may desire.

Canada to-day presents a most remarkable story of growth, expansion, and development. We have passed the days when welding and looming was done by the workman's fireside. There is romance attaching to the stories of the hand-loom. We wonder how this old world of ours wagged along with its finger-performed industries. We hark back to the time when the great labor riots, caused by the introduction of labor-saving machinery, were in full swing. But romance is frequently shattered by development. It was said in those days that the new machines would take the bread from people's mouths. It may have taken the bread for a short time from a few. But it very soon gave bread to those who did not possess it. It quickly buttered it for those who did possess it.

Notes on the New Tariff.

Canada has a red-hot iron on the commercial anvil. The Dominion is, as yet, not quite a sufficiently strong blacksmith to strike. It is therefore looking around the world for a blacksmith of experience. Its red-hot iron is its engineering and machinery trade. Captains of industry are continually looking for new markets. They have not yet discovered the possibilities which Canada affords to the British iron and steel manufacturer.

The publication of the new Canadian tariff is slightly more favorable than the "flat" preference which existed heretofore. Canada's fiscal policy is to bring Great Britain commercially nearer. The intermediate tariff at first created somewhat of a scare. It was thought that Great Britain's trade with the Dominion would be damaged and in danger. But the scale of intermediate duties, all of which gave less than 10 per cent. reduction on the general or non-preferential rates, is not in reality an offer to reciprocate with the United States and Germany, who are Great Britain's rivals in the markets of the world. Time alone can tell how the small changes on various British imports will affect the trade. The changes on the whole will most decidedly benefit the large British manufacturing firms. For instance, structural steel and rolled bars paid $4.66 2-3 per ton of 2,000 pounds under the old tariff. They will now pay only $4.25. Duty to the amount of $35,270 was paid in 1905 on 21,162 tons British pig-iron.

Had the new tariff then been operative, the aggregate duty would have been $30,885—nearly five thousand dollars less. Other examples of similar nature might be given.

Growth of Railways.

Let us consider the openings for the industry. Perhaps the most striking example of Canadian de-

velopment is seen in the network of railway lines which now traverse the country throughout its length and breadth. Canada has grown on her lines of communication. In 1905, there were 20,487 miles of steam railways; in 1871, only 2,695, a mileage increase in 34 years of 660 per cent. The mileage increase of the 1881 figures over the 1871, was 172 per cent.; of 1891 over 1881, 88 per cent.; of 1901 over 1891, 38 per cent.; and of 1905 over 1901, 14 per cent. It could hardly be expected that the large mileage percentage increases of the early years could be continuous, but there is more railroad building than ever. Fifteen years hence, a comparison of the total length of track with that of 1871, will produce an astonishing result.

A brief review of the histories of the chief Canadian railways will give a better idea of the vast amount of construction work which has been undertaken and which will increase for some years to come.

The Grand Trunk system now comprises 4,177 miles of railway, of which 921 miles on the main line are double-tracked. This does not include the Central Vermont and Canada Atlantic lines, which, with a joint mileage of nearly 1,000, are under Grand Trunk control. The system includes also three great viaducts and the St. Clair tunnel. The viaducts are the Victoria Bridge at Montreal, completed in 1860 and rebuilt in 1898; the Niagara Falls Bridge, completed in 1897, to replace the suspension bridge built 40 years before; and the International Bridge, near Buffalo, opened for traffic in 1873 and rebuilt in 1901. The Sarnia tunnel was finished in 1890. During 1905 the system carried over 11,000,000 passengers and nearly 15,000,000 tons of freight. The Grand Trunk was chartered in 1852, and is still adding yearly to its mileage.

The Grand Trunk Pacific Company was incorporated in 1903 to build a railway from Winnipeg to the Pacific Ocean, and to operate this along with a Dominion Government line from Winnipeg to Moncton as the "National Transcontinental Railway," with a total mileage on its main line of about 3,300.

The Canadian Pacific Railway charter dates from 1881, and during the quarter of a century that has since elapsed it has acquired the ownership or control of a grand total of 11,321 miles of completed road, exclusive of all the branch lines put under construction in 1906. The main line, taken up by the company in 1881, was completed in 1885, and since the latter date the mileage of its system has been constantly increasing.

Steam and Electric Traction.

The Canadian Northern system is made up of a number of widely separated short lines, mostly in Manitoba, Saskatchewan, and Alberta, though a new section has just been completed between Toronto and Parry Sound. Construction work was begun by the company in 1896, and in 1905 the completed mileage was 2,557. The main line extends from Port Arthur, on Lake Superior, to a point 50 miles beyond Edmonton. The Canadian Northern owns or controls several railways in the Eastern Provinces, which increase the total to 3,350 miles.

The Intercolonial Railway and the Prince Edward Island Railway are owned and operated by the Dominion Government. The former extends from Montreal to Halifax, with several branches, the most important being extensions to St. John, in New Brunswick, and Sydney, in Cape Breton. The total mileage of the Intercolonial and its branches is 1,446.

The number of operatives, exclusive of those engaged in construction, is about 75,000, and it is predicted that for the next seven years 20,000 men will be occupied in the building of new tracks alone. It can at once be realized that openings for construction supplies, are almost illimitable.

We are told that steam traction in Canada is in its infancy. Electric traction is scarcely out of its cradle. Power from Niagara has been utilized and other waterfalls are to be made use of commercially. It is no wide stretch of imagination to say that electrical development has an immense future before it in this country. In four years, electric railway mileage has increased 18 per cent.

Buildings have sprung up rapidly throughout the country. It is only natural that they should, as the population is increasing by leaps and bounds.

Rapid Building Development.

Letters have been received by the "Canadian "Engineer" from almost every big city, from the coast, from the West, the North-West, and the East, telling the story of the remarkable increase in new structures, during the past year. There were erected in Montreal during 1906 1,484 new buildings, valued at $7,745,023, as compared with 1,145, valued at $4,779,380 in the year preceding. The annual report of the Builders' Exchange shows that the building operations of 1906 in Montreal, included 1,240 houses, 2,242 dwellings, 70 stores, 28 warehouses, 41 factories, 4 churches, 6 schools, 1 hotel and 3 office-buildings. Individual structures to the number of ten each exceed in estimated cost $100,000.

The value of the building permits in Toronto for the past year have increased over 1905 by $2,812,488, and have now reached the total of over $13,000.000. There is also marked development in the Northwest. The value of new buildings erected during 1906 in Regina was $1,982,330; in Edmonton, $1,863,894; and in Calgary, $1,109,161.

The building industry has recognized the great possibilities of cement and concrete as construction materials. One might think this had no bearing on the iron and steel industry. But there is an enormous demand, one which is growing rapidly for metal skeletons. Then again steel plays a prominent part in reinforced concrete erections. A glance at an interesting trade journal—the Canadian Cement and Concrete Review,—(published in Toronto), and especially at its illustrations, clearly proves that steel and reinforced concrete construction will assume a very important role in the history of building in Canada. For example, Winnipeg has in view a handsome new grain exchange. It will be six stories high, and the entire construction, with the exception of the enclosing walls, is to be of concrete reinforced with metal rods.

The largest reinforced concrete bridge in Canada has recently been constructed across the Rideau River, a few miles above the city of Ottawa. The reinforcement consists of twenty-four round steel rods of one and a quarter inches diameter in the intrados, and the same in the extrados. One-half inch round shear bars are attached to these rods at right angles, so as to hold the two sets of bars in the required position. One inch round steel rods, two feet apart, are also placed transversely to take care of temperature stresses.

Steel and Concrete Era.

These are but two examples of hundreds. An interesting article, which recently appeared in the Canadian Cement and Concrete Review, on this subject, says:—"The fact that cement is playing a more "and more important part in almost every kind of "construction work causes frequent enquiry as to the "reasons which have induced such a development in "constructural practice. The latest and perhaps most "rough-and-ready process of mixing concrete, which "consists of mixing cement, sand and gravel with "cinders or broken stone, and then flooding the mix-"ture with water from a hose, may be seen in opera-"tion on all big works—house and hotel building, "railroad, piers and bridges, sidewalk construction, "and a hundred other enterprises."

"There are three strong reasons why cement is "the material of the epoch in permanent buildings. "Firstly, there is scarcely anything in which cement

"cannot be used; secondly, it can be handled with remarkable rapidity; and thirdly, it is cheap in relation "to its real commercial value."

The use of cement and reinforced concrete means the utilization of large quantities of steel.

Bridge construction will in the next few years require tons of iron and steel. The march of civilization is sweeping away what only a few years ago were considered unnegotiable ravines, and rivers, and mountains. The iron and steel and concrete bridge has, and will more so in the future, conquer nature's obstacles to commercial progress. The biggest span bridge in the world is to be placed over the St. Lawrence River near Quebec. There are dozens of wooden bridges which Canadian municipalities have tolerated for many years. These will be superseded by up-to-date structures. Just as trade follows a flag, so will railways follow bridges. There is now and will be a greater market for locomotive rolling stock of every description, and all appurtenances which go with the construction camp.

The Canadian mining industry is experiencing a boom—a real boom. Machinery is not needed to mine speculators imaginary ore. But a great deal is required to unearth the enormous and rich mineral deposits which lie buried in the bowels of the earth.

The famous Cobalt district is but one centre of mining activity. It was discovered by mere chance. If you had told the average Canadian that away up in Northern Ontario were the richest silver mines on earth, he would probably have given you an introduction to Barnum and Bailey as an advertising agent. The Ontario Government thought that it was necessary to open up the Ontario country with a government railway line. Its construction led to the discovery of the valuable silver deposits.

Smelting Plants Wanted.

The majority of companies in that district ship their ore to the United States smelters, simply because smelters do not exist within the province. Canada has not provided adequate means for smelting and refining its ores. No less than $28,000,000 worth of ore was sent to United States refineries for treatment last year. Shipments from the mines have fallen off in many cases, owing to the inability of smelters to handle ore.

Agricultural machinery is another important branch of the industry in Canada. The constant stream of European immigration means the development of the rich prairies, and a demand for mowing machines, harvesters, and agricultural machinery generally. The new Canadian tariff reduces the duties on practically all such machinery. The following table gives a comparison of the duties paid on agricultural machinery and stoves in 1906, with the duties on the same quantity of similar articles payable under the new schedules.

	Paid in 1906 under old tariff.	Payable under new tariff.
Mowing machines, harvesters, binders, and reapers	$26,882	$23,521
Cultivators, ploughs, harrows, horse rakes, seed drills, manure spreaders, weeders, and windmills	173,891	171,793
Thrashing machine outfit	89,996	71,997
Hay loaders, potato diggers, horse-powers, separators, n.o.p.; wind stacker, fodder or feed cutters, fanning mills, hay tedders, rolls and other agricultural implements	28,763	28,685
Axes, scythes, sickles, or reaping hooks, hay or straw knives, hoes, rakes, n.o.p.; pronged forks	13,099	11,789
Shovels and spades, shovel and spade blanks, iron or steel cut to shape for same, stoves of all kinds	118,326	118,594

The Dominion is not a shipbuilding country. That it will be in years to come is almost unquestionable. Large and valuable deposits of coal exist in many parts of the country. It would seem to be but matters of time, enterprise, and capital before this industry will be fully established.

Nova Scotia is peculiarly fitted for steel shipbuilding. Indeed, large municipal and other cash subsidies are promised to the capitalist who will establish this useful industry in the province.

Steel Shipbuilding in Canada.

Canadians are great exporters. This country is destined to supply Trans-Atlantic, Oriental, and other markets with enormous quantities of her products. Then there is a large coasting trade. Thus it will be seen that a great number of steamships are, and will be, needed to handle the country's waterway traffic. To a great extent the tonnage at present used by Canada is borrowed abroad, it is not going too far to say that this is but a temporary arrangement.

In the days of wooden shipbuilding Eastern Canada was one of the greatest shipbuilding countries of the world. Dozens of towns sprung up within a stone's-throw of the sea. Each possessed its shipyard, and a population employed in building, repairing, or outfitting sailing vessels. Canada's maritime flag then floated proudly in the breeze. With the advent of steel shipbuilding came the downfall of this source of prosperity. Wooden ships of 2,000 tons could not compete with vessels of 20,000 tons. Canada's shipbuilding industry was then practically transferred to British yards where iron, coal, skilled labor, and capital were cheaper than elsewhere. Instead of being high up on the list, Canada is now only eleventh of the ship-owning countries of the world. The registered tonnage has decreased from 1,333,015 tons in 1878 to 672,838 tons in 1904. This notwithstanding expansion in every line of trade.

Besides the smaller firms who have now entered the steel shipbuilding business in Canada are the Algoma Steel Co., Limited, Sault Ste. Marie; the Canada Iron Furnace Co., Limited, Montreal; the Collingwood Shipbuilding Co.; the Canadian Shipbuilding Co., Toronto.

British Columbia has aspirations to the establishment of a shipbuilding industry within its borders.

Development of provincial resources will doubtless proceed at a more rapid rate since both English and American in addition to local capital is being enlisted in large enterprises. Mr. H. F. Bullen, of Victoria, B.C., was recently in England in connection with the establishment of a large floating dry-dock at Vancouver, and the ultimate intention of having a plant at Esquimalt to construct the largest of steel vessels.

In spite of the few facilities which at present exist in this country for shipbuilding, some very creditable vessels are turned out. Only a few weeks ago the Collingwood Ship-Building Company built and launched the largest boat ever made in Canada. She is 486 ft. long, 51 ft. wide, and 31 ft. deep, and will carry a cargo of 10,000 tons on a draft of 21 ft. The equipment of the new steamer is of the very latest type. It consists of two Scotch boilers, 15 feet 6 inches in diameter by 12 feet long. These will supply steam to triple expansion engine with 23-inch, 38½-inch, and 63-inch diameter cylinders, with a stroke of 42 inches. The engine will develop 2,200-h.p. The boat also possesses the latest type of steam steering gear, deck winches, and steam mooring gear.

Vessels Built on the Clyde.

The present fleet of the Montreal Transportation Company has been found inadequate to handle the large amount of shipping. To meet the demands of trade, they are having built on the Clyde two regular canal vessels, which will be a big improvement on the present style of lake steamers, and are intended prin-

cipally to carry steel rails to the western ports such as Port Arthur and Fort William.

The Dominion Iron and Steel Company have ordered three vessels built on the Clyde by the MacMillan Company. The Steel Company are working up a large trade with the West, and will utilize the steamers for the conveyance of their rails. The three steamers being built for the Steel Company are of the Cantilever type, two of 7,000 tons capacity each, and one of 3,600 tons.

The industry which keeps busy the greater number of people in the west of Scotland, is shipbuilding. Not shipbuilding simply, but marine engineering in all its branches.

Opportunities in Shipbuilding Industry.

The Clyde cannot boast of sending a great number of vessels to Canada. During the year 1906 there was launched at Fairfield, the second of the big C.P.R. boats, the Empress of Ireland. To find another Canadian vessel we have to make a big jump in variety for a screw tug of 50 tons gross was launched at Ardrossan in April last, for service in Canada. The screw steamer, Dundee, was launched in October by the Caledon Ship-Building Company, for the Mackay interests of Hamilton, Ont., for the grain trade on the Great Lakes. Then there was a new Donaldson Liner, the "Cassandra," which was launched at Greenock in June. Orders have been placed with the Fairfield Company for two new C.P.R. boats and two new Allan Liners are yet on the docks.

Thus it will be seen that there is no very large shipbuilding industry as yet from Britain to Canada. But it will be seen there is a good opening for a considerable trade to be done by British marine and engineering firms in the manufacture of the smaller engines for installation in vessels built in this country.

The country lives in hopes of having its great mercantile marine trade. Until steps are taken to develop the shipbuilding business, there is an exceptional market in Canada for British iron, and steel, and vessels.

British iron and steel structural materials cannot but help finding Canada a valuable market. Structural iron and steel are needed for plates, for vessels and boilers, for locomotives, for bridges, and for many other similar purposes. Only until a few years ago, the United States practically controlled the Canadian market. Great Britain recently realized its possibilities and now imports almost as many plates as our cousins over the border. The girder span bridge which is to cross the St. Lawrence just below Quebec city has already been mentioned. It is one example illustrating the demand for these plates. The bridge will be a cantilever with a length of 3,300 ft., consisting of a central suspended girder of 675 ft., with cantilever arms each 526 ft., anchor spans each 500 ft., and bridge spans each 210 ft. At the manufacturing works of Phœnixville, Pa., no less than 20,700 tons material lies awaiting transportation to the river shore. The bridge has been in course of construction for nearly two years, and 11,300 tons have already been used.

Some Big Canadian Bridges.

The great trans-continental railway, the Grand Trunk Pacific, will cross the St. Lawrence by the Quebec bridge, it will traverse the Saskatchewan valley two thousand miles westward, crossing the river at various points. Its terminus will be Prince Rupert, and there it will be necessary to erect a bridge of almost a mile in length, in order to cross from the mainland to Kaien Island.

Away in the North-West, five enormous bridges have been thrown across the Saskatchewan River for the Canadian Northern Railway. A large part of the structural material was purchased from Great Britain by the Canadian firms who built the bridges. By the time five more such huge bridges are required, there is no reason why Great Britain should not supply all the structural material.

The Canadian Northern Railway Company will shortly span the Saskatchewan River at Edmonton. This new bridge will be the biggest in that valley. Then again tenders have been called for the reconstruction of half a hundred railway bridges between Montreal and Quebec.

Steel and Concrete Bridge Construction.

They are to be constructed to bear the heaviest traffic. English railway rolling stock is light compared to the great trains of Canada. The bridge built for heavy traffic is of fairly heavy construction, and heavy construction means money for the iron and steel manufacturer who will be first in the field. From the blue books, are quoted the relative importations of iron and steel structural material by weight and value, from Great Britain, the United States, and Germany. The figures are for the twelve months ending June 30th, 1906:—

	Weight, Cwt.	Value. $
Angles, Beams, Girders, Tees, etc., not punched or drilled:—		
United States	616,419	920,942
Great Britain	112,238	162,359
Germany	337,996	348,698
Less than 35 lbs. per lineal yard—		
United States	214,577	301,945
Great Britain	158,494	220,116
Rolled Iron and Steel Plates under 30 inches wide:—		
United States	493,886	771,109
Great Britain	95,027	132,927
Total		
United States	1,324,882	1,994,096
Great Britain	365,759	515,402

It is known that it is impracticable to ship plates more than 40 ft. in length, by water. The cramped capacity of the ship's hatchway makes this almost impossible. Plates under 40 ft. may easily travel by water. Those up to 60 ft., such as special girders used in the building of travelling cranes for machine shops and certain bridge work, must necessarily be shipped on two flat cars. Considering the market as a whole the majority of iron and steel structural work specifies plates under 40 ft.

Statistics are said sometimes to be delusive. The average man is content to depend on officially compiled figures on which to base his arguments and estimates.

British Iron and Steel Statistics.

Great Britain's exports of iron and steel are very large. During the year 1906 they totalled £93,000,000, while its imports were £18,000,000.

In glancing at the British Board of Trade returns it is possible to obtain many details of these exports, though it is not always to be ascertained what proportion comes to Canada. The following table shows in detail the exports of British iron and iron manufactures in 1905 and 1906. The figures are given in millions of £s.

	1905.	1906.
Iron and steel and manufactures thereof	31.8	39.9
Cutlery, hardware, etc.	8.9	10.1
Electrical goods	2.4	2.4
Machinery	23.3	26.7
Ships	5.4	8.7
Cycles	0.9	1.1
Motor cars	0.5	0.8
Railway wagons and carriages	2.0	3.2
Firearms	0.2	0.2
	75.4	93.1

Even this list is not quite complete for it does not include old ships, scrap iron, military exports and a few other items.

England's iron and steel exports are greater than those of the United States. The Canadian market is

a weight which will turn in time the scales of one of the two countries which are likely to bid for Canada's iron and steel trade. United States exports of pig-iron are small, not running into six figures, while British pig-iron exports in 1906 ran into seven figures. America's crude steel exports, on the other hand, run into six figures, while the British exports barely attain five. British rail exports are very heavy, the United States lighter, although their total production is several times that of the British. In wire and nails they are far ahead. In most other lines they are far behind, particularly so in sheets and tin plates.

The appended table of miscellaneous items have practically no counterpart in the American statistics, partly because they cover lines which the United States export, but do not have returned as to tonnage, and partly because they cover lines in which the United States have practically no export trade.

British Iron and Steel Exports.

	Gross Tons. 1905.	1906.
Scrap	149,060	177,704
Pig iron	982,876	1,664,442
Crude steel	8,594	11,736
Rails	546,569	463,240
Chairs and sleepers	78,700	73,363
Other railroad	80,493	80,489
Structural material	63,965	107,382
Plates, ⅛ and over	147,675	200,118
Plates, under ⅛	56,893	74,940
Pipe and fillings	218,502	295,302
Galvanized and cor. sheets	406,815	443,131
Black plates	68,839	65,698
Tin plates	354,864	375,414
Hoops, etc.	41,980	45,310
Steel bars	151,879	198,948
Wrought bars	143,309	151,052
Wire	81,261	95,119
Nails, screws, rivets	24,647	29,460
Miscellaneous	261,446	321,147
Totals	3,868,367	4,873,996

The United States' total exports in 1906 amounted to 1,353,900 gross tons.

Referring to the census of manufacturers published by the Dominion Government, there is a detailed and interesting statement of Canada's iron and steel products. It is not possible to give these for a later date than 1901.

Canada's Iron and Steel Products.

	Establishments.	Capital.	Cost of materials.	Value of products.
Axes and tools	21	1,169,607	367,603	1,038,705
Boilers and engines.	59	5,552,862	1,783,915	4,626,214
Bridges, iron and steel	6	1,755,379	1,012,563	1,693,000
Cutlery and edge tools	7	316,325	82,710	257,275
Dies and moulds	3	16,000	9,930	33,600
Foundry and machine shop products	315	16,274,645	5,293,248	15,292,445
Gas machines	4	29,850	7,899	29,121
Hardware, carriage and saddlery	6	418,381	164,774	401,821
Iron and steel products	29	9,829,560	3,801,129	6,912,457
Printing presses	5	541,064	90,139	362,135
Safes and vaults	3	232,610	70,100	225,200
Saws	7	419,534	127,685	314,312
Scales	8	279,414	92,153	285,240
Screws	4	714,586	198,025	385,810
Sewing machines	3	1,110,167	342,976	752,308
Wire	15	1,599,118	1,060,011	1,693,995
Total	517	40,861,164	14,816,891	34,878,402

(To be Continued.)

BIDDING FOR MEXICO'S TRADE.

Next month, the "Georgia," one of the new subsidized steamers, will make her first trip on the Mexican-Canadian route. That the possibilities of the country are generally appreciated is proved by the enterprise of the Canadian Government in granting a subsidy to the new steamship route.

President Diaz is the firm ruler of the Southern Republic. By some, he has been labelled harsh, but under his just and wise ruling, the country has made rapid progress. Mexican mining always has monopolized attention, but of late numerous other industries have been given birth. Mexico will naturally become a great distributing agency. Cattle raising is showing signs of becoming a potent rival of our own Western farmers. On the Northern plateau, where cattle ranching and stock-breeding were originally instituted, there is excellent grazing throughout the year. The Canadian farmer must pray once a year for the Chinook, which mitigates the hardship of the snow, and allows his cattle to graze. Mexico is endowed with an almost perpetual spring, which is an advantage our Western farmer has not. Its soil is very fertile and comprises three-quarters of a million square miles.

There are four important gateways on the northern frontier of Mexico. Nogales, one of them, is the port of entry for the city of Sonora, and the towns of the Pacific coast. Through bills of lading are issued to Nogales from all important points in Canada and the United States. The railways connect the interior of the Republic with the ports of the Gulf of Mexico. Water routes through Veracruz and Tampico handle the greatest part of Mexican trade. The customs collections at Veracruz alone amount to about one-third the total amount collected of the water routes through this city, Tampico handles the greatest part of Mexico's foreign trade.

Eastern Canada has at present no way of reaching the Pacific coast ports of Mexico unless it be with long and expensive journey via Panama. Western Canada is in the same quandary, so far as the Gulf ports and the West Indies are concerned. Eastern Canada will benefit by the recent opening of traffic on the Tehuantepec National railroad. Through lack of transportation facilities, the connection of the port of Coatzocoalcos on the Gulf, and the port of Selina Cruz on the Pacific, have not played any important part in the freight trade. A large sum of money has been spent in the construction of extensive port works, and these will make the National railroad an active competitor of the Panama route. With the completion of these facilities, Eastern Canada should be able to make a successful bid for the Pacific coast trade of Mexico, especially in manufactured articles. British Columbia will have yet another market, being able to send fish and lumber to Eastern and Central Mexico at low freight rates and with expedition. The Mexican Central railroad is completing its extension to Manzanimo with all rapidity. This line will be opened possibly by July, and bring Mexico city within about thirty-six hours of the Pacific. The track lies its whole length through a rich, fertile, and populous country.

The adoption of the gold standard in Mexico, and the rise in the price of silver has given an impetus to Mexican expansion. The gold standard in this case is no myth as in some countries. There are no less than fifty million pesos in circulation and in possession of the banks. The short wheat and corn crops in the country will create a large demand for these staples. The wheat which finds favor in Mexico is No. 2 red, and Canadian red grown east of Port Arthur is well suited to the market. The Mexican Government has reduced its tariff on wheat by one-

half from February 15th to July 30th. The normal duty is 69.7c. per hundred weight.

Everything points to Mexican development and expansion. The railways have shown unusual enterprise in connecting the Republic with all cities and ports which will bring trade to the country. Capital both from Canada and the United States has been invested freely. The Canadian and Mexican Governments have subsidized the new Canadian steamship line. It now remains for Canada once again to materialize its commercial motto "Canada first."

EDITORIAL NOTES.

An item that will interest Canadians engaged in the slate industry is to the effect that a company has been formed to work the slate quarries at Birchy Cove, Bay of Islands, Newfoundland. These quarries have been developed for some time already by an American syndicate. The new company has a capital of $300,000, and the slate in the deposit is said to be equal to the best in the Penrhyn quarries in Wales. Fifteen expert Welsh slate miners are already at work, and $12,000 worth of machinery has been installed. Thirty-five more miners are expected in March. There are 30 Newfoundlanders now employed on the quarry, and 60 more will be taken on later. In 1905 Canada imported $93,238 worth of slate, of which $82,513 came from the United States. This gives Canadians another opportunity for colonial trade. The quarries are conveniently situated on the west coast, and the slate can be shipped on vessels via the St. Lawrence to Montreal, and the larger cities on the Great Lakes. The conditions for the development of a considerable trade are very favorable. If the quality of slate is satisfactory, and the price right, Canada will no longer have to buy this material outside the British Domain.

* * * *

The independent telephone movement flourishes in Canada. The recent connection with the Stouffville Company and the Mount Albert Company marks an epoch in independent telephony in Ontario. The following six companies are in the York and Ontario Independent Telephone Union, with more than 420 subscribers:—The Scarboro, the Markham and Pickering, the Bethesda and Stouffville, the Central, of Altona, the Claremont and Ashburn, and the Mount Albert. These companies are absolutely independent, and cover a district of 39 miles by about 12 miles. There are 36 post-offices in the district, of which about 30 have independent telephones, as well as all the banks. Subscribers have intercommunication with all six systems. This work has been accomplished within about a year, which goes to show that the independent movement in Canada has taken deep root, especially in the smaller urban districts, where it is still impossible to get Bell telephones installed at any price. The Mount Albert Company will connect with another independent company in spring. When this is done the union will have a line of communication from within three miles of Toronto to Jackson's Point on Lake Simcoe, a distance of a little over 50 miles.

* * * *

An example of rapid bridge construction was recently shown on the St. Maurice Valley Railway, built to connect the Shawinigan Falls and the C.P.R. at Three Rivers. Prince Louis of Battenberg turned the first sod in the late summer of 1905, and work was commenced on the twenty-two miles of road early last year. To secure large subsidies from the Government the road had to be completed before the end of 1906. Work on two of the heavy bridges was delayed until November, but the first bridge was completed by December 1st. Work on the second bridge was started on December 15th, and finished fifteen minutes before the close of the year. This bridge is 135 ft. high and 330 ft. long, not including the approaches. Three shifts were placed on the work, so that the construction went on continuously during the fifteen days. Before midnight on December 31st, 1906, the first train passed over the completed road, and the company won its reward. When it is considered that the winter months of last year were somewhat severe this piece of construction work may well be remembered as an almost marvellous accomplishment of the Canadian bridge builder.

* * * *

The farmers have begun the deposit of petitions against the continuation of the iron and steel bounties. On the other side, the unfavorable conditions of the revised tariff have produced such declarations as that which imputes to them the imminent closing of the Malleable Iron Works at Oshawa, which are the backbone of industry in that agreeable Ontario town. Meantime, tariff or no tariff, the users of iron and steel have more than they can do to meet orders, a condition which applies the world over, as business letters to the "Engineer" from Europe as well as the United States testify.

* * * *

The weekly edition of "The Canadian Engineer" was announced in the February number, since when three issues have been published with gratifying success. The papers have not been as complete as we would like, which is always the case with extensions in journalism. But the reception accorded the "Weekly Engineer" has been even better than we expected, and there is no reason why the paper should not continue to grow in circulation and influence, even as it has multiplied the number of its appearances. Except a summary of the proceedings of the annual meeting of the Canadian Society of Civil Engineers, none of the subjects dealt with in this number has been mentioned in the weekly edition, which means that the amount of reading matter has been increased by about 50 per cent., and still there is room and demand for more.

* * * *

The presidential address of Mr. Lumsden to the Canadian Society of Civil Engineers reads almost like a chapter from prehistoric Canadian times. It is a valuable contribution to the literature of surveying, the only fault of which is that it is too short. The discovery of routes between the Lakes and Hudson's Bay has involved an amount of exploring and hardship which the laying out of the Canadian Pacific did not entail through the Ontario wilderness; for a far greater stretch of country, much farther removed from the haunts of civilization has had to be covered by Mr. Lumsden's intrepid helpers. Mr. Lumsden lifts a small corner of the curtain which hides the pathos of railroad pioneering in the north when he tells of the loss of valuable lives in canoe accidents, of which the public knows little or nothing. There could be no more remarkable proof of the uniqueness of the conditions under which surveying parties work than the fact that for transportation of supplies—the most vital element in the work—winter is better than summer. The pioneer in railroading is like the pioneer in most other things. He has the heaviest labor and, comparatively, the least reward. But better times are coming, even for the hardy engineer.

* * * *

Every company its own lawyer! The Birmingham Small Arms Company have established a legal department, which will supply the professional advisors of the company with information, and relieve departmental heads of all matters in which legal difficulties may arise. The innovation should meet with great success, as, very often, large industrial establishments would save valuable time and considerable expense if advice from experts, on the premises, in legal matters were quickly available.

THE ELECTRIC FURNACE: ITS EVOLUTION, THEORY AND PRACTICE

By Alfred Stansfield, D. Sc., A.R.S.M., Professor of Metallurgy in McGill University, Montreal.

Article VII.

Future Developments of the Electric Furnace.

In concluding this series of articles, an attempt may be made to indicate in what directions future developments of the electric furnace may be expected, and to what extent this development is likely to proceed. Such an attempt can hardly fail to prove incorrect, however, on account of the great changes that take place in the economic conditions of the world, as well as on account of the discoveries and improvements which are made with increasing frequency.

The following questions may be asked:—

1. How far will the electric current replace fuel in furnaces for the smelting and refining of metals?

2. What untouched fields of usefulness are waiting for the electric furnace?

3. What limits are there to the commercial development of the electric furnace?

Electric furnace operations may be roughly divided into two classes, first, those which can scarcely be effected in any other way, and in which electrical heating must always hold the field, such as the production of calcium carbide, carborundum, and aluminium. Second, those in which either fuel or electrical heat may be used with a fair measure of efficiency, and in which the price of the two sources of heat must be compared, in addition to the efficiency of each, before deciding which to employ.

The relative prices of coal and electrical energy, and the amount of electrical power that will be available, are considerations of the first importance in determining the future of the electric furnace.

Until a few years ago the electric current was a wonderful and expensive commodity, and the idea of using it for heating on a commercial scale was preposterous. About 13 tons of coal were needed to produce one electrical horse-power for a year, and this electrical energy, would furnish less heat than one ton of the original coal. Such a method of using coal was evidently extremely wasteful. The greater efficiency of electrical heating somewhat reduces this difference, and together with the smaller cost of water-power has made it cheaper in some cases to use "white coal" instead of black, in the furnace.

In comparing the supplies and prices of coal and electrical energy, it should be remembered that one short ton of good coal produces as much heat as 1¼ horse-power years of electrical energy, but that the efficiency of the electrical furnace is from 2 to 30 times as great as the efficiency of ordinary metallurgical furnaces, so that an electrical horse-power year will produce as much effective heat as several tons of coal. (The figures for different operations are given in Article III., page 170, May, 1906).

The world's production of coal at the present time is about 1,000 million tons a year, and is steadily increasing. The electric furnace draws its energy mainly from water-powers. The water-powers of the world that have already been utilized are very small in comparison with the present coal output, having in all only about 1 per cent. of the heating power of the latter.

In view of the fact that coal mining is a long-established industry, while the electrification of water-powers is only of recent growth, it is reasonable to suppose that the latter will increase more quickly in proportion than the former. In both cases there are limits, however; the coal mines will ultimately all be discovered and worked out to a depth at which the cost becomes prohibitory, while on the other hand the water-powers will all be developed, leaving only those that are too expensive to utilize. When these limits are reached the coal supply will have sunk to a small proportion of the amount needed for heating and power, but the water-powers will continue to give a steady supply of power for all time with only maintenance and interest charges.

The exhaustion of the coal supplies may not be reached for hundreds or thousands of years, but if the development of the mines proceeds, as at present, at increasing rates like compound interest, their practical depletion may be less distant than now appears probable. In any case it seems likely that as coal can only be used once, while water-powers are not deteriorated by use, the latter may be expected ultimately to largely replace the former for motive power and to some extent for furnace work.

The present age, especially on this continent, is one of the barbaric use of the mineral assets such as coal and ore. As the population increases and the development of mines is pushed to its limit, the increasing scarcity both of the ore and of the fuel to smelt it, will make it necessary to spend more money in utilizing these to the very best advantage, using the coal with the greatest economy and extracting every possible product from the ore. It has been suggested that the present enormous production of iron and steel for example can only represent a temporary condition, that of extracting the iron from its ore. When most of the iron ores have been converted into iron or steel our descendants will have to be content to use over again the metal so produced, merely making good the deficiency caused by rusting and the increase in population. Iron is, however, a very plentiful metal, forming perhaps 4 per cent. or 5 per cent. of the earth's crust, and the coal will last for a large number of years, but the time must come when it would be extravagant to use coal, mined at great expense, for the mere production of heat. As coal becomes more scarce it will be used for its chemical properties of reducing iron and other metals from their ores, while the necessary heat would be produced electrically. At that time Canadians may have to heat their houses electrically, or if, on account of the large population in Canada at that time, such method of heating were too expensive, they may have to live underground during the winter.

In the more immediate future there will no doubt be a great development of electrical power, which may in consequence replace coal to some extent in some furnace operations such as the production of steel and iron from certain ores, and in certain localities; on the other hand the rapidly increasing market for electrical power will tend to keep the price from falling, relatively to the price of coal, and it is therefore unlikely that coal and coke will be at all largely replaced for smelting purposes by the electric current for many years to come.

When the possibilities of the electric furnace have been more fully ascertained it is likely that some large water-powers that are situated conveniently with regard to metallic ores may be utilized for their reduction, the electric plant being available for other purposes after the exhaustion of the ore supply. At the present time such a large return can be obtained from capital in Canadian industries that only the most easily developed water-powers are considered. When the country becomes more thickly settled and when capital is more abundant, a smaller return will be expected and the interest charges on permanent developments such as hydro-electric plants will be less; thus enabling powers to be utilized that would be too costly under present conditions.

With regard to the probable future developments of the electric furnace it will be instructive to review shortly the progress that has already been made:—

I. The electric furnace has rendered available a range of temperature from about 1,800° C. to about 3,700° C., or

in other words it has doubled the available range of temperatures above the freezing point.

II. In the electric furnace substances can be heated to any temperature within this increased range with the complete exclusion of air, furnace gases or any other substance that would be objectionable to the operation in question, while with other furnaces it was very difficult and sometimes impossible to exclude the furnace gases from the substance to be heated.

III. The greater efficiency of the electric furnace, over the fuel furnace, which is particularly noticeable at high temperatures, has enabled the electric current, although more expensive, to replace fuel for certain purposes.

IV. The electrolytic furnace enables a direct electric tension to be applied to break up compounds that cannot be dealt with by the ordinary chemical reactions at high temperatures.

The increased range of temperature that is now available has resulted in a complete new chemistry of high temperatures. At these temperatures all metals are reduced from their oxides by carbon, and many of them unite with more carbon to form carbides, some of which have valuable properties. Other compounds such as silicides and borides have also been obtained and studied. No doubt in the future many other compounds will be obtained, from the elements silicon, carbon, calcium, oxygen, and aluminium, which form such a large proportion of the earth's crust, as the work that has already been done in this direction can only be considered to have scratched lightly in the virgin soil that has been placed at our disposal. Counting in the other elements it will be seen what an immense field for discovery lies open to the electric furnace worker. Another power which the electric furnace has furnished is the ability to separate and purify substances by fractional distillation at these high temperatures. What could formerly be done by the chemist in the separation of organic liquids by distillation in glass vessels can now be effected in the electric furnace in the case of such bodies as iron, lime and silica, not to mention the more fusible metals such as gold and silver. The removal by distillation in the electric furnace of the ash forming matters from anthracite, during its conversion into graphite, is one commercial example of a process which will no doubt be largely employed in the future.

The high temperatures that can be obtained, together with the ease with which air can be excluded, and the high efficiency even at high temperatures, has made it economical to smelt electrically such metals as chromium, manganese, tungsten, titanium, and the element silicon, whose reduction had been difficult, expensive, and incomplete in ordinary furnaces. Other elements will, no doubt, be added to this list, and a large number of alloys and compounds of these will certainly be discovered.

The electrolytic furnace has already enabled aluminium, sodium, potassium, magnesium, calcium, barium, strontium, and other metals to be obtained from their fused salts, together with chlorine and other substances. Although most of the ordinary metals that are amenable to this treatment must have been experimented with already, there are no doubt many new processes of this character waiting to be discovered, and it seems likely that a far greater use can be made of the alkali and alkaline earth metals that have been made available in quantity by this means.

The very high temperature of the electric furnace has enabled it to be used for melting refractory metals and still more refractory substances such as silica, lime, magnesia and alumina. The possibility of fusing these substances in quantity will lead to fresh uses of these and other materials. The conversion of amorphous carbon into graphite is an example of a physical change in an elementary substance at a high temperature, that may not soon be duplicated, though the problem of its conversion into the diamond is still unsolved commercially.

One very important use of the electric furnace is for experimental work in the laboratory. Here the matter of cost is not a matter of great importance as the operations are usually small and occasional. The results of such experimental work are frequently very important and far-reaching. For such purposes the electric furnace will be increasingly employed, and standard forms will be devised for heating substances, and carrying out reactions with the complete absence of oxygen, carbon, or other objectionable substance. Vacuum and pressure furnaces will also be constructed and employed.

One probable development of the electric furnace in the near future is made possible by the intermittent use that is made of electric power for lighting and motor purposes. When electric power is produced hydraulically, large quantities could be sold for electric furnace work at moderate prices provided it were only used between certain hours. Although the smelting of ores could hardly be carried on in this intermittent fashion, there are many purposes for which electrical heat could be applied in this way. One of these has been suggested by Richard Moldenke in an article entitled "Electric Smelting for the Foundry,"* in which he suggests that foundrymen should make their own steel castings by means of the electric furnace, preferably the induction furnace; that even iron castings would be made better in this way than in the cupola, and that the electric furnace would be ideal for brass melting. Such operations could, of course, be conducted continuously, or as has been suggested above, intermittently so as to obtain the power more cheaply.

In conclusion it should be remembered that water-powers are not the only available source of electrical power for furnace work. One other important source of such power is the waste gases from the iron blast furnace. These if used in large gas engines will frequently furnish a considerable amount of power in excess of what is needed for running the plant, and this excess could be used for the electric smelting of steel or similar purposes. Prof. J. W. Richards† has stated that there is as much as 1,000,000 horse-power available from this source in the United States alone.

For some electric furnace processes even coal burned in steam boilers may be used to generate power, but a considerable saving can now be effected by the use of coal, which need not even be of very good quality, in gas producers for running large gas engines.

Other sources of electric power, which may be used in the future, when the price of coal is getting higher, are the immense movements of water known as the tides. Attempts have also been made to harness the ocean waves whose great power is attested by many rock bound coasts, and although their irregularity renders them unsuitable for electric lighting and other uses of electricity where constancy is an essential factor, it would seem possible that certain smelting operations could be conducted in this way.

The strides of physical science in recent years have been so enormous that there seems to be no limit to what may ultimately be possible, and if in the future we are able, as suggested by Lord Kelvin, to draw endless supplies of power from the ether itself, we can await with quiet minds the exhaustion of the coal supplies of the world.

*Electro-chemical and Metallurgical Industry, Vol. V., 1907, p. 42.

†Trans. Am. Electrochem, Soc., Vol. 3, 1903, p. 67.

IRON PRODUCTION OF THE WORLD.

In a Consular report issued from the Department of Commerce of the United States it is stated that the world's iron production in 1903 was 40,004,837 tons; in 1904, 45,225,628 tons; and in 1905, the last year for which figures were furnished, 53,997,965 tons. "The United States," the report continues, "is striding forward so fast in the production of iron that it promises not only to lead the great iron-producing countries, but to lead the rest of the world combined. While the absolute gain in the United States is almost equal to the entire gain between 1904 and 1905, the advance in Canada in 1905 over 1903 is still more remarkable, for the output nearly doubled. Still more remarkable is the advance in Japan, where a gain in the two years of nearly 600 per cent. is shown. At the present rate of production the world's visible supply of iron, 10,000 million tons according to a Swedish expert's estimate, must soon be exhausted. Fortunately, these figures are believed to be far from the truth, as the United States alone is said to have more than 4,000,000,000 tons in mines that have been located."

SYSTEM IN INDUSTRIAL ESTABLISHMENTS

By A. J. Lavoie.

Article XII.

Employees' Time Card (Continued).

The checking of the time-cards is done the day following the one on which they have been used, and in this way any errors are detected at once, and while the items on cards are fresh in the memory, anything that is wrong must be adjusted without delay.

A Daily Individual Report.

The time-card is a daily individual record, since it keeps account of all that is done by the individual employee during one day's work, from the time he comes into the establishment until his departure. If the employee's check number, or his name is known, the Lavoie System time-card will give the following data concerning him:—

1st. The machine number on which he is working.

2nd. The date time-card has been used.

3rd. The name and number of the department where time has been spent.

4th. The job number on which he was working, together with detailed information of operations performed.

5th. The time he started and finished each operation on each job.

6th. The number of hours credited as regular time, overtime, bonus, piece-work, etc.

7th. Times late.

8th. Amount of money advanced on salary.

9th. Date of the following pay-day on which the time entered on said card is to be paid.

10th. Total amount of money earned every day, and which the employee is to be paid on the pay-day already mentioned.

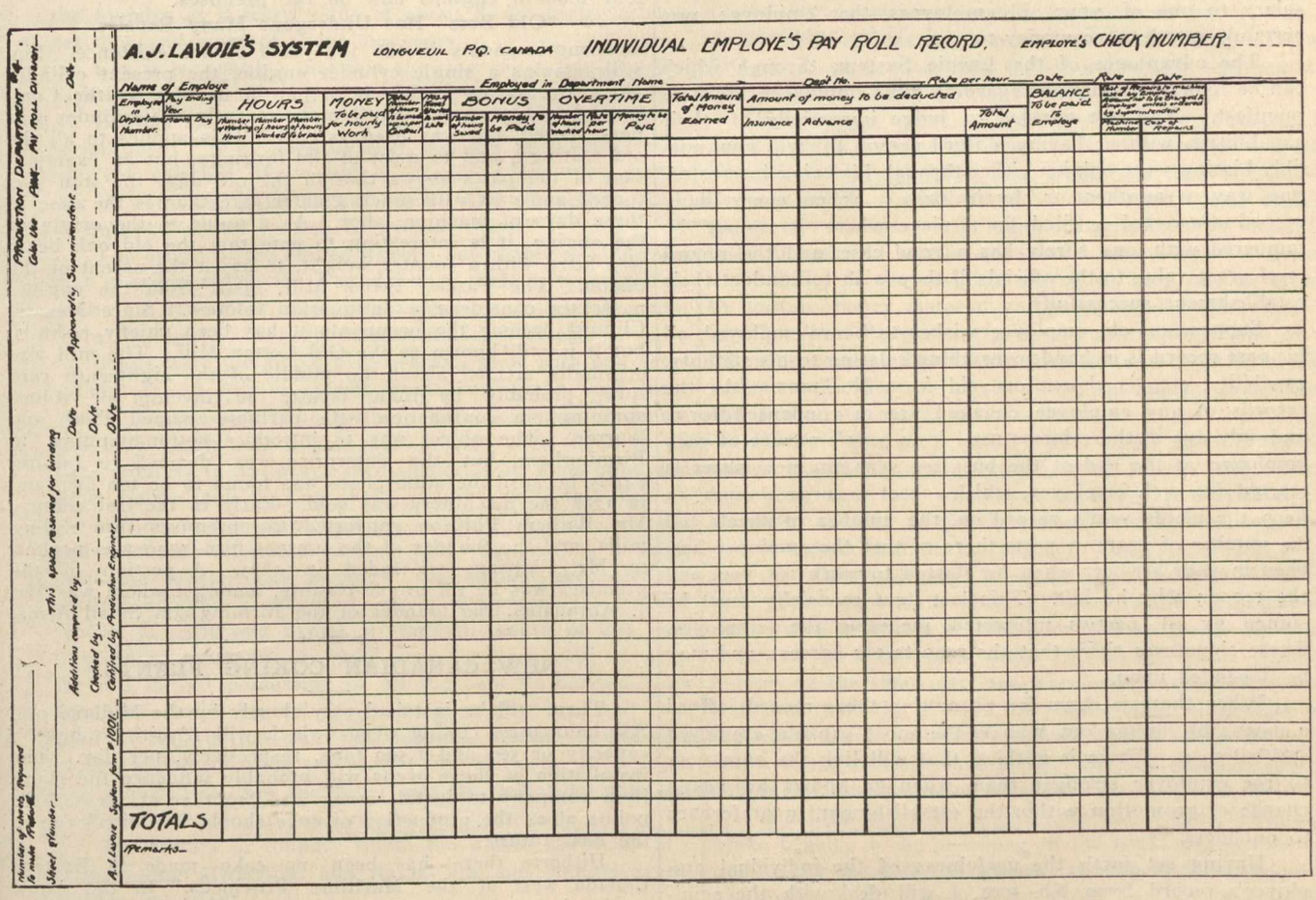
11th. The employee's signature, by which he approves his own entries on the time-card.

A strict detailed account of all the employee does is thus carefully recorded.

A Daily Individual Record.

The time-card is a daily pay-roll record, which would enable the management to pay all employees off at 24 hours' notice, and this without any trouble or extra rush on the part of anyone. Every day's work must be completed in the 24 hours following, no delay whatever must be allowed to occur.

If the productive labor is rushed one day, the clerks will have to work a little harder on the following day (not a month or two later). Whether it is determined to make the pay-day semi-monthly or monthly, to prepare the pay-roll of the individual employee it is only necessary to add the totals on the daily time-cards together, which amounts are already prepared, as all the time-cards are gathered together in an index cabinet, indexed under each employee's check number. The addition of these amounts may be performed on one of the modern adding and listing machines, which practice will secure speed and accuracy.



Form No. 1001 is of importance to the employer and employee, giving as it does a complete and true record of the employee's services, it gives the employer an opportunity to make comparisons between employees. The help of any person is not needed to find out if an employee deserves an increase in salary, or should be laid off. Through this individual employee's record is given all the necessary information to make an impartial judgment of service rendered. If any employee wishes to leave the service it does not take long to consult the records, and determine as to whether he is needed or not. With the Lavoie System there is no guess work, all facts and figures being in hand, it is up to the officials to be good judges.

Individual Employee's Record.

Whenever an employee deserves an increase in salary, give it to him promptly, as otherwise some competitor will hear about him, and will not wait long to get in touch with the employee, resulting finally in his leaving your services, by which you will be the loser. This is also the case when a capable employee finds out that he is not well paid, according to his ability. He just waits for an opportunity to let some other employers know about him, then comes the time when he will notify you that he has found a better job, and he will accept no increase you may promise, as he will have given his word to someone else, and will simply make this remark: Why can you afford to raise my salary at present, do you think I am worth more because I have found another job? This will be a hard question to answer. In business money counts, but one must not be too greedy, or they may lose what they have, as many employers have done.

Take into consideration the replacing of that employee; it possibly could not be done unless by paying a very high salary, and what about trade secrets, and a knowledge of the practice of your business. Your competitor will certainly take advantage of same. If he can afford to pay a certain salary to one of your old employees, that employee was certainly worth more money to you.

The advantages of the Lavoie System, through which can be found information regarding your employees, are here manifest. You are enabled to judge impartially of their capabilities, without having a third person to help you, possibly biasing your opinion either through his being interested one way or another, or by jealousy. When every daily record time-card is filed in a place where it cannot be tampered with, one surely has a good case, and the record is of great value to the officials if they wish to conduct their establishment successfully.

Suppose on old employee wishes to be re-employed, all his past record is in hand: everything relating to his stability, capability, etc., is shown on said form No. 1001. As the records of any employee engaged are in condensed form, and only one of these forms used for a year's service of each employee, at the end of the business year one new sheet is started for each employee, which sheet is large enough to keep the whole year's record on, the number of sheets tell the number of years or parts there of that the employee has been in your service, when he started to work for you, and the reason why he left. This last item especially must be signed by all parties interested, including the employee. These signatures show that the reports are correct, and may be depended upon.

When there is room for promotion these records afford a means of finding out who is the most capable employee entitled to it. There is nothing that will link the employee to the employer stronger than when he knows he has a chance of promotion within the establishment, in preference to outsiders.

Having set forth the usefulness of the individual employee's record form No. 1001, I will deal with the semi-monthly pay-roll record.

CORRESPONDENCE.

Carleton West P.O., Ont.

Editor, "The Canadian Engineer":

Sir,—I am sending you a clipping of the Birmingham "Daily Mail" in reference to the old steam engine, "Old Bess," which I have had the pleasure of seeing.

The enclosed clipping has been through the hands of the managers and foremen of the departments of the Wallsend Slipway and Engineering Co., the Parsons Turbine Co., the North Shields Engineering Co., and several other large firms on the River Tyne, and has been highly interesting to them. On this account I thought it would be interesting to some of the readers of your valuable journal.

Yours sincerely,

FRANK PENN.

THE FAZELEY STREET COTTON MILL.

Yesterday a representative of the "Mail" had an opportunity of viewing the old steam engine at the Fazeley Street works of Messrs. C. Clifford & Son, Limited, to which reference was made by the chairman of the company at the annual meeting on Thursday. "Old Bess," as the engine is familiarly termed by the employees of the firm, is now completely dismantled. The old oak beam, whose period of service has so far exceeded the expectations of the engineers, began to show signs of decay at the latter end of last year, and stopped for ever on December 24th. Before the engine starts again it will be provided with an iron beam, and generally overhauled. But several of the old parts, including the connecting-rod, weighing 15 tons, and 30 feet in length, will remain. As to the precise origin of the engine there seems to be considerable doubt. It is agreed that it dates back to 1767, seven years before James Watt came to Birmingham, and two years before he took out his first patent for a steam engine. Yet it is stated that the engine was originally constructed on the sun and planet system, of which Watt was the inventor. The old parts which now remain bear no name, and it is not known by whom the engine was designed or constructed. It was erected, however, by James Pickard, then carrying on business as an engineer in Lionel Street, Birmingham, but supposed to have been the man who, in conjunction with Wasbrough, of Bristol, took out a patent for a rotary engine in 1780. The engine works up to 120 H.P., and drives thirteen sets of rolls more regularly and economically than any of the four modern engines now on the premises.

"Old Bess" Has Undergone Many Repairs.

and improvements in the 135 years of her existence. She still remains a single cylinder engine, the present cylinder along the valves having been put in in 1802 by the Coalbrookdale Company. Until quite recently the cylinder was never bored, but was used as cast. This applies to all the old castings, and to most of the forgings, but an examination of the parts shows that in the old days the iron was forged and cast with much greater care than is the case in these days of machine labor. As a guide to the origin of the engine, it is interesting to note that the old oak beam was fitted with a counter weight, to assist the ascent of the piston. The Fazeley Street Mill, apart from the engine, possesses considerable antiquarian interest. Since Messrs. Clifford became the occupants it has been chiefly re-built, but it is still known as the Old Cotton Mill. The mill was originally erected about the middle of the eighteenth century, probably by John Wyatt, the inventor of roller-spinning, in conjunction with partners named Paul and Warren. The object was to introduce cotton-spinning to Birmingham, but the enterprise was doomed to failure, partly because the atmosphere was found to be too dry, and in 1788 the machinery was sold. Early in the last century Mr. William Phipson converted the premises into rolling mills, and the founder of the present firm, who was nephew to Mr. Phipson, succeeded in 1845. A portion of the premises was let off to sub-tenants, amongst whom was Mr. J. Abrahams, the founder of the Birmingham Small Arms.

NEW CANADIAN COKING PLANTS.

There will be installed very shortly by the Midland and Soo companies coking ovens which will require to have a capacity of 500 and 1,500 tons, respectively, per day. The installation of these ovens will probably influence the Hamilton company to install ovens also, so that at these three points alone the production of coke should be quite large in the near future.

Hitherto there has been no coke made in Eastern Canada west of the Maritime Provinces. In the latter section it has been made by the Nova Scotia Steel and Coal Co., the Dominion Iron and Steel Co., and the Londonderry Co. for their own smelting purposes. The Ontario companies, however, imported it from the United States. Some time since the Algoma Steel Co. strongly urged the Government to place bituminous coal on the free list, promising if this was done to erect coking ovens at the Soo which would employ much labor and distribute considerable money.

Soft Coal Practically on the Free List.

The cause of the determination of the Ontario companies to go in for the roasting of their own coke is to be found in the changes announced by Mr. Fielding on February 11th in his tariff of November 29th. Item 1019 says: "Bituminous coal, when imported by proprietors for smelting works and converted at the works into coke for the smelting of metals from ore, drawback 99 per cent. There was no logical reason why this should not have been done before, as the duty prevented the adding of this valuable industry to the country without interfering with any interest. The iron and steel companies mentioned are admirably situated on the lakes to bring in their coal by vessel from Lake Erie ports. The Midland Co. will shortly have an output of 300 tons of pig per day and the Soo an output of 1,000 tons. This will call for about 500 tons of coke at Midland and 1,500 tons at the Soo, and ovens for this capacity are expected to be installed as quickly as arrangements can be completed.

THE CHILLED CAST IRON WHEELS*

By W. E. Fowler.†

The chilled cast-iron car wheel would appear to be a product peculiar to this continent. I believe its birthplace was here, and certainly its home is with the American, and particularly the North American railroads. I do not think it would be untrue to say that without it the immense mileage attained by railways on this continent would not have been possible; it certainly is true that it has been a great factor in the economical operation of our railways, and a primary feature which, in the evolution of the modern railway, has not been crowded out of existence, because it cannot be dispensed with. There is not another essential part of the freight car equipment which costs the railway companies so little money, compared with the service rendered, as does the cast-iron car wheel.

The 600-pound wheel costs about $10.80, new, and after giving a mileage of 40 to 70 thousand, it is turned back to the foundry at a scrap value of about $7.80, giving a cost per thousand miles of about five cents.

Can it be possible that this showing can ever be beaten with any other kind of a wheel? I very seriously doubt it. An English railway official, a short time ago, asked in all seriousness: "Is it possible that you are still using cast-iron car wheels? We would be afraid to use them under any of our cars, light as they are." And my answer was: "I do not see how we can do without them."

The origin of the chilled wheel I am unable to state, but that it originated in the United States there is no reason to doubt. I remember, however, twenty-five years ago, that there was quite a variety of cast-iron car wheels.

There were the single-plate wheels, some with and some without raised ribs or spokes, some corrugated, and some plain. Double-plate wheels there were, of many sections, and both single and double-plate wheels were made in all sizes from 30 to 42 inches in diameter, with long hubs and short hubs, some having their greatest projection beyond the outside, and some beyond the inside, with width of tread and thickness of flange varying also (but not so widely), until the Master Car Builders' Association succeeded in getting adopted a standard wheel diameter, a standard section of tread and flange, a standard length of hub, and a standard diameter of wheel seat for each size of axle. We are in full possession of all the benefits derived from these standards, beyond computation as they are, and it is hard to believe that there are railroad officials to-day who do not appreciate what the Master Car Builders' Association has achieved in this and other matters, and what may yet be done with proper support and recognition.

The factory or foundry where the wheels are made is a never-failing attraction, and its lay-out and equipment intensely important.

Until a few years ago the wheel foundry was usually laid out in circular floors or moulding sections, each floor being served by a jib crane set in its centre for handling the chills and moulds while being rammed up and prepared for the hot metal, for handling the hot metal in the ladles while filling the moulds, and for handling the hot wheels while being taken from the moulds and started towards the annealing pits.

The circular floor, however, was not economical of space nor labor, and it is rapidly giving way to the electrically-operated foundry, laid out in rectangles, the Angus foundry of the Canadian Pacific Railway being one of the latest and most improved of this type.

This foundry is laid out with the core-rooms, with their ovens, the elevator cupolas, and charging floors, along one side of the building. The floors or moulding equipments are laid out in parallel lines with nine-foot centres, each with a capacity of twenty wheels. The hot metal is supplied by buggy ladles along one end of these floors, and the finished hot wheels removed by buggies or lorries along the opposite end, one end of the building being devoted to the pits for annealing the wheels, the stacking-floor to receive them after being removed from the pits, and the foreman's office.

The manufacture of the wheels commences at the breaker, where old car wheels (to the extent of from 40 to 60 per cent. of the weight of new wheels turned out), are broken by the big drop weight, the foreman carefully inspecting the broken pieces, so that he may determine what proportion and variety of new pig shall be used with each charge.

The hot wheels are placed in the annealing pits as soon as practicable; that is, when cool enough to handle with no danger of warping or bleeding, after being placed in the pits. The wheels remain in the pits about four days, cooling slowly and uniformly, but are generally as hot as can be comfortably handled when taken out. After being taken out they are cleaned, inspected, taped, and tested, representative wheels being taken for the latter purpose.

The thermal is the only test now in force at Angus, the severity of it being sufficient, it is considered, to permit dispensing with the drop test, which was the old stand-by. Cracked plates, cracked brackets, shelled-out spots, worn-flat spots, and treads worn hollow are defects of manufacture, and should not be considered as evidence of general unreliability of the cast-iron wheel, as they can be avoided by putting better material and more careful work into the wheel. Worn flanges are generally traceable to one of the following causes: Trucks which do not curve easily, couplers without sufficient lateral clearance, cutting by brake-shoes, and inaccurate mating of wheels.

I believe that proper care is very rarely given to the last-named operation, and in consequence wheels one or more tape sizes apart are sometimes mounted on the same axle, to begin, as soon as put in service, destructive flange wear and increased load on the engine. Until quite recently the part the brake-shoe plays in flange wear has been given very little attention, but the air-brake men, in their deliberations, have called attention to the poor service given by brake-shoes set too wide apart, which in consequence of this form flanges on the shoes over the wheel rims, frequently leaving less than half the area of the brake shoe in contact with the wheel tread, with the resultant loss of frictional contact and a waste of brake-shoe metal. But the wheel flange also suffers by this improper arrangement.

Too little attention is given to the proper hanging of brake beams, to the centreing of the brake heads with relation to the tread of the wheels, as also to the necessity of uniformity in the length of the brake hangers. Any of these defective practices will result in poor braking service and injury to the wheel. A brake-shoe when first applied may overlap the rim of the wheel ever so little, but with each reduction of its thickness in service the lap will increase, and the brake-shoe on the other end of the brake-beam will be forced more and more against the flange of the wheel, gradually bringing about the condition described as worn flange.

I have described this condition particularly, because it is one which is not generally given the consideration it deserves, and I am sure that if brake heads are set at sixty-inch centres, instead of sixty and one-half inches, that a considerable reduction of flange wear will be noted, and we will wear out our brake-shoes evenly and uniformly, and get the work out of them for which they are made.

The importance and value of the cast-iron wheel in railroad service lies unquestionably in the wearing qualities of its tread or tire, the more than steely hardness of which gives more mileage for the same amount of wear (or metal removed), than any other wheel in existence. And not only does it stand up well under its present service conditions—that of carrying heavy loads over steel rails made as hard

* Read before Canadian Railway Club.

† Master car builder, Canadian Pacific Railway, Montreal.

as they can be without danger of breaking; it also withstands with comparative freedom from failure the tremendous friction of the brake-shoes when making stops from a high speed, or when descending long, heavy grades.

It is not uncommon in mountain districts to see the grease on the face of the wheels smoking from this cause, the wheels themselves being too hot to touch, and the brake-shoes red hot, and it will be, I think, very difficult to produce materials of any other kind which will give us wheels so serviceable, so economically manufactured, and so valuable when worn out as the chilled cast-iron wheel.

The design of the present wheel is a matter of evolution, or survival of the fittest. The amount of iron in the hub is that which has been found necessary in service to stand not only the pressure at which the wheel is forced on the axle without fracture, but the tremendous force exerted by the brakes when a stop is being made, which tends to loosening of the wheel on the axle seat, unless forced on at the proper pressure, which pressure cannot safely be applied without the proper amount of metal in the hub.

The length of the hub has also, of course, much to do with the question of thickness of it and the pressure at which the wheels are mounted, but both have been decided by that safest of teachers, experience, and there is practically no dissent from the Master Car Builders' Association's standard practice of to-day. The size and form of the ring core, as it is called, which gives the inner surfaces of the double plates their proper thickness and outline, is also the result of long experience and test; many slight variations have now given away, the last design of ring-core submitted by the Master Car Builders' Association being in general use.

The number and form of the brackets is to some extent not uniform, the Master Car Builders' form and number not yet being accepted by some as the most desirable, but it will require more experience and longer service to determine whether the increased number of brackets, and consequent increase of weight, will do all that is claimed for them. With the experience had on the Canadian Pacific Railway, I believe they will, for reasons to be given later.

The outline of the tread was recently subjected to some change by the Master Car Builders' Association, the slight increase in the coning making it one in twenty, instead of one in twenty-five as formerly, and the making of the coning simple instead of duplex being done to cause the wheel to run more nearly upon the centre of the tread and away from the flange, which is the weak part of the cast-iron wheel of to-day. But is this weakness surprising? The flange of the wheel of 1905 was originally designed for cars of 20 and 30 thousand pounds' capacity, the length of these cars was from 20 to 28 feet, and they were run at speeds of from 10 to 20 miles per hour, and yet, under cars of 80 to 100 thousand pounds' capacity, run at speeds of 30 to 45 miles per hour, the same flange has done fairly well, but there have been many failures.

The flange, amply strong under the light cars, developed a tendency to break off at the throat, there not being enough metal there to withstand the brake-shoe and rail friction. the latter being aggravated by the heavy car, and by the heavy lateral thrust against the rail of the wheel going at high speeds, evidence of the trouble developing first in the form of fine cracks, fine as a hair, which appear at or near the throat of the flange, and which, in continued service, extend around the wheel and into the tread, until sometimes it can be seen under the tread, having continued through the body of it, and extended across one or two of the brackets, and unless removed at once the wheel is ripe for serious trouble.

The number of wheel flanges broken during the past few years has been the cause of serious concern to the mechanical departments of the railways, and the Master Car Builders' Association, after becoming convinced that flange failures of this kind were not confined to the wheels made in any particular foundry, and accordingly not due to any special mixture, placed the matter in the care of a committee, who recommended at the last convention that the thickness of the flange be increased by 1/8 inch when measured at the gauge line, this increased thickness tapering to nothing near the apex of the flange. In doing this they had the sanction of the Maintenance of Way and the American Railway Associations, who were satisfied, after close investigation, that this increased thickness would necessitate no change in frog or guard-rail clearance, and the thicker flange has since been adopted by Master Car Builders' Association letter ballot, so that the benefits of this improvement should soon be apparent.

It is probable, however, that this will not entirely remove the trouble, and it may be necessary at some future time to further strengthen the flange.

In an endeavor to supplement this strengthening of the flange we have, on the Canadian Pacific Railway, changed the section of the wheel, making no change, however, in the tread and flange outer outline.

The change consists in making the brackets to a smaller radius, and so extending them under the throat of the flange as to make them practically continuous, and thereby add materially to the thickness of metal at this point. This practice, while not in service long enough to demonstrate the full value of it, has been of such value as to extend its application to Canadian Pacific Railway wheels for cars of all capacities, having been first proven valuable under heavy service.

Let it not be forgotten, however, that first-class service cannot be expected from wheels made with poor materials.

The finest quality of charcoal iron is none too good for the cast-iron wheel, and in as large proportion as conditions will permit.

Some of the largest wheel manufacturers on this continent state that wheels can be made from new charcoal iron that will meet the requirements of any railway service, whether passenger or freight, which would indicate that the price paid is to some extent responsible for wheel failures. Do not forget also that the best wheels made can be so misused during the assembling operations as to cut short their life.

Bore them out of true, or locate them at different distances from the centre of the axle, or mate wheels of different tapes on the same axle, and long before the guarantee limit is reached one wheel will have a worn flange.

There are other causes for worn flanges, as has been said, but those just referred to are within the province of the men who mount the wheels on the axles to prevent, and they must do so.

In conclusion, I would say, I know of no reason why so essential a part of the freight car cannot be so modified and improved as to be perfectly safe and economical under cars of the highest capacity, and if its friends will only stand by it, will successfully meet and overcome competition of any kind and from any source whatever.

SHAWINIGAN WATER AND POWER COMPANY.

Most Successful Year on Record.

At the annual meeting of the Shawinigan Water & Power Company, on January 28th, Hon. Robt. Mackay, the president, told the shareholders that the past year was the most successful in the history of the company.

The financial report was presented by Mr. J. E. Aldred, and after discussing the statement it was decided to issue the figures of the company within the next month.

The authorized capital of the company is $7,000,000; of this amount $6,500,000 has been subscribed and paid up.

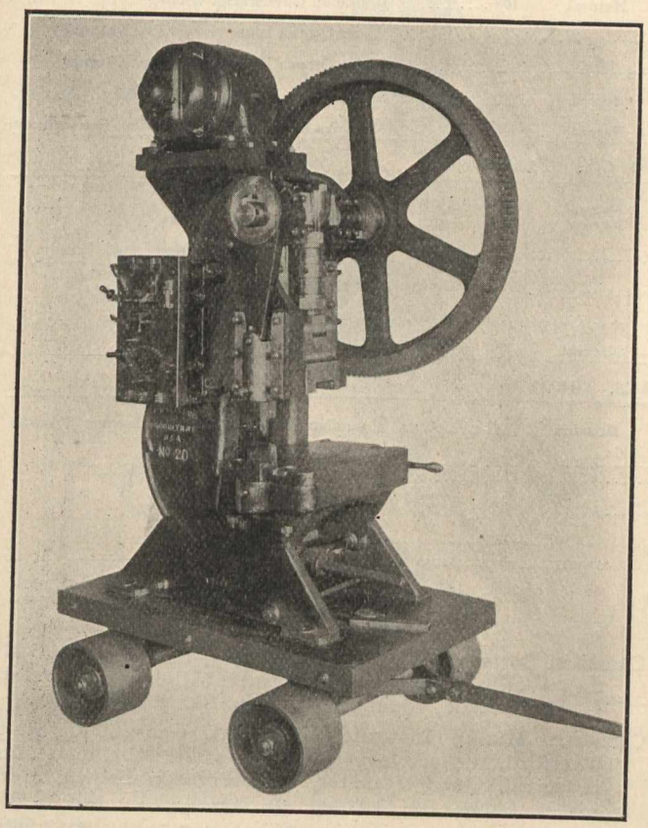
Beginning January 1st, 1909, the company is to deposit with the Royal Trust Company an amount equal to one per cent. of the total amount of bonds then outstanding. When the amount deposited aggregates $25,000 or more, it may be applied to redeem the bonds on any January 1st, or July 1st. After January 1st, 1909, at 110 and interest.

On the new board of directors for the ensuing year, the office of vice-president will be taken by Mr. J. E. Aldred, replacing Mr. J. N. Greenshields, who still remains a director. The executive as re-arranged is as follows:—

President, Senator Mackay; vice-president, Mr. J. E. Aldred; directors, Messrs. John Joyce, W. R. Warren, H. H. Melville, Thos. McDougall, Denis Murphy, William Mackenzie, J. N. Greenshields and Howard Murray, secretary.

A SMALL TRIMMING PRESS.

There are ofttimes conditions in a drop-forge shop when making small forgings where it is not always advantageous to put the small trimming dies in a large trimming press; neither would it pay to have a small trimming press alongside of each drop hammer. This fact having been appreciated by the E. W. Bliss Co., Brooklyn, N.Y., they have just designed and built the machine illustrated in the accompanying half-tone, which gives a very good idea of its appearance. It will be noted that it is self-contained, or in other words, it is direct driven by a two H.P. electric motor, the starting-box, switch, etc., all being fastened to the side of the press at a convenient height for the operator. To facilitate "range of action" the press is mounted on a truck, and it is equipped with sufficient wire and a suitable



Bliss Trimming Press.

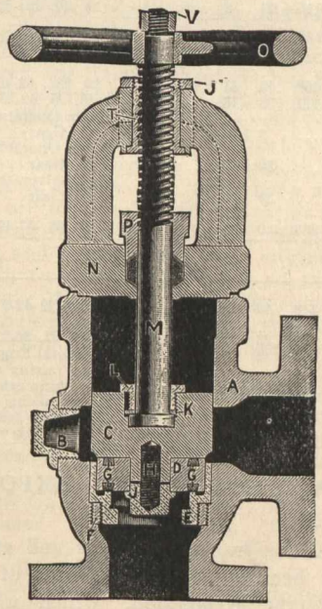
contact plug so that it can be readily moved to the desired location and started immediately without any reference to the line shaft or resorting to the slow process of finding and fitting a belt. A machine of this character must of necessity be operated in an aisle, but to occupy no more floor space than was absolutely necessary the motor was placed at the top of the machine, and, considering the possibility of someone running into it, the truck was made large enough so that the machine does not overhang at any point. The total floor space occupied by the truck is 45 x 39 in., the total height is 84 in., and the total weight, including the truck, is 3,000 pounds. The press is controlled by a positive clutch, operated by a hand lever.

AN IMPROVED BLOW-OFF VALVE.

Heretofore in all makes of blow-off valves, the seat was so located that as the disc approached same, there would be an accumulation of scale and sediment. The effect of this accumulation would be to cut the bearing surfaces to such an extent that in a short time the valve would become leaky. Various methods have been invented whereby the disc would fit tightly in the valve body, the object being to prevent the scale from passing on to the seat bearing after the disc had passed and cut off the inlet. This method, however, has not proven satisfactory, as the valve would soon wear, and, in a short time, permit the passage of scale and sediment. These defects have been overcome in this improved design blow-off valve. The plug fits snugly in a separate and easily removable bronze casing, which can be readily replaced when worn. Any accumulation of scale or sediment that might remain on the seat before the disc is brought in contact with same, is washed off by the water which passes around the plug when seating.

In the sectional view it will be seen that the plug C carries a reversible, double-faced disc D, secured to plug C by stud H and nut J. This plug C is guided perfectly in the valve body A. The bronze seat ring E is screwed into a second brass ring F, the object being to make it possible to renew E very easily in case same is worn. At the back of the valve is a plug B, the use of which is to permit the introduction of a rod to clean out the blow-off pipe when desirable. The stem M, which raises and lowers the disc C, is held in place by lock-nut L, which is prevented from unscrewing by non-rotating washer K.

The threads of the stem M operate within the bronze bushing in the top of the yoke, which bushing can easily be removed.



It will be seen from this description that all parts of the valve have been so designed that they can be easily renewed when worn or broken. The disc D, having two Babbitt-faced bearings G G, it can be replaced at small cost by the manufacturers, The Lunkenheimer Company, Cincinnati, Ohio, or the user of the valve can melt out the old Babbitt and pour in new metal, and, after this is faced off, the disc is as good as new.

In operating the "Duro" Valve, when it is desirable to close same, the disc is screwed down in the usual manner. As the edge of the disc D approaches the cylindrical extension of E, these edges shear and cut off any scale or sediment which might pass. As the disc D continues to approach the seat bearing E, the leakage of water around same will effectually wash off any scale or sediment which might have accumulated thereon. The result of this is that when the disc is perfectly seated, no scale or sediment can remain between the bearings. As the seat and disc ring can be renewed very easily and at small cost, it will be plain that the valve is very durable and will last indefinitely.

This valve, known by the trade name "Duro," is constructed of the very best materials and carefully tested, and its manufacturers guarantee it to surpass, in durability, any other blow-off valve on the market.

CORRESPONDENTS FOR THE "ENGINEER."

Correspondents for the weekly edition of the "Canadian Engineer" are wanted in every town in Canada. Descriptions and illustrations of notable construction works specially welcome. Copy should reach the Toronto office by Tuesday morning. Papers mailed to subscribers Thursday evenings.

VESSELS BUILDING IN CANADIAN SHIPYARDS.

Seventy-one vessels are under construction in the shipyards on the Great Lakes. Forty-five of these are bulk freighters, four passenger steamers, four package freighters, five tugs, two dredges, two car ferries, five scows, three hopper barges, and one quarantine steamer. Two of the bulk freighters are being built by the Collingwood Shipbuilding Company, and one by the Canadian Shipbuilding Company. The remainder by United States shipbuilders.

The accompanying table gives particulars of the vessels under construction in Canadian shipyards, for 1907 delivery.

Type or Name	Dimensions in ft. Over all	Keel	Beam	Depth	No. of Hatches	Spaced Centers, ft.	Dimensions of Engines	Boilers, dimensions in feet and inches	Draft	Steam Pressure, Pounds	Capacity Gross Tons	For whom building
CANADIAN SHIPBUILDING CO., TORONTO												
Pass. Steamer	240	230	41	10	..	....	2 engines Four cyl. trip. 15½, 24, 30, 30-22	Two Scotch 14.4Dx12	forced	180	.....	Rich. & Ont. Nav. Co., Montreal
Car Ferry	316	306	54	0	....	....	2 engines 20½, 32½, 54-36	Four Scotch 14.0Dx12.0	forced	175	.....	Ontario Car Ferry Co., Montreal
Quarantine Steamer	128	120	26	12	....	....	2 engines 12, 26-16	Two Scotch 9.9Dx11.0	Natural	160	.....	Dominion Government Ottawa
Alligator Scow	66	65	14	6	....	....	.....	.....	.....	....	.....	Upper Ottawa Improvement Co., Ottawa
Alligator Scow	66	65	14	6	....	....	.....	.....	.....	....	.....	Upper Ottawa Improvement Co., Ottawa
Freighter	510	491	56	31	14	24	1 engine 19, 28, 40, 58-42	Three Scotch 12.0Dx12.0	forced	210	9,000	St. Lawrence & Chicago Steam Nav. Co., Tor.
Pass. Steamer	120	115	23	8	....	....	2 engines 7½, 12, 19½-12	One Scotch 10.0Dx11.0	Natural	175	.....	Muskoka Lakes Nav. & Hotel Co., Gravenhurst
COLLINGWOOD SHIPBUILDING CO., COLLINGWOOD												
Midland Prince	486	466	55	31	14	24	23, 38½, 63-42	Two Scotch 15.6x12	Natural	185	5,100	Midland Navigation Co. Ltd., Midland
Tug.....	115	111	23	13	....	....	15, 25, 42-25	One Scotch 13.6x10.6	Natural	185	270	Department of Public Works
Hopper Barge	144	....	3	11.5	....	....	Steam Operating Gear	.....	.....	....	500 yds.	Department of Public Works
Hopper Barge	144	....	30	11.5	....	....	Steam Operating Gear	.....	.....	....	500 yds.	Department of Public Works
Hopper Barge	144	....	30	11.5	....	....	Steam Operating Gear	.....	.....	....	500 yds.	Department of Public Works
Freighter.	406	386	50	28	....	24	21. 35, 57-42	Two Scotch 14.6x12	Natural	180	5,500	Farrar Transp. Co. Collingwood
POLSON IRON WORKS, TORONTO												
Car Ferry Chas. Lyon	280	248	40	22	....	....	Two 22 42-30	Four Scotch	Howden	130	.....	Canadian Pacific Co. and Passenger Transfer Co., Prescott
Tug												
Hercules	105	96	23	13	....	....	13½, 22, 36-21	Water Tube	.....	200	.....	Dominion Government
Dredge	110	....	38	11	...	....	Horizontal Engines	Clyde	.....	140	.....	Dominion Government
Scow	136	....	30.6	11 6	....	....	Steam raising and lowering gear	.....	.....	125	.....	Dominion Government
Scow	136	....	30.6	11.6	....	....	Steam raising and lowering gear	.....	.....	125	.....	Dominion Government
Tug.....	80	73	17	7.6	....	....	9 18-14	Fitz Gibbin	.....	150	.....	Dominion Government

ALASKA-YUKON-PACIFIC EXPOSITION.

Frank P. Allen, Jr., an architect and engineer of wide experience, has been appointed director of works of the Alaska-Yukon-Pacific Exposition, which will be held at Seattle during the summer of 1909. It is the duty of the director of works to supervise all work done on the grounds, and after the exposition opens to have charge of the maintenance of the grounds and buildings.

Mr. Allen gained his exposition experience at the Lewis and Clark Exposition at Portland in 1905, where he had charge of the structural work. He was born in Grand Rapids, Michigan. He secured his early training in his profession under his father, Frank P. Allen, Sr., who was a prominent architect. After taking a course in civil engineering at the University of Michigan he went to Chicago, where he spent six years specializing on structural work for bridges, railroads, and large buildings.

At Portland he became a member of the firm of Lewis and Allen, consulting and constructing architects and engineers. He is manager of the General Engineering and Construction Company, of Seattle and Portland. The latter company has built the Waldorf and Perry apartment houses at Seattle, large concrete structures, and is building an immense warehouse on the water front. It also has the contract for the construction of four additional stories on the new Savoy Hotel.

The Exposition grounds cover 250 acres of the unused portion of the campus of the University of Washington, and border for more than a mile and a half on Lake Washington and Lake Union The site has been pronounced by John C. Olmsted, the famous landscape artist, who laid out the grounds, as the most beautiful ever utilized for such a purpose. Mount Rainier and Mount Baker, with their perpetual snow peaks are in plain view. Twelve large exhibit palaces will form the nucleus of the exposition. Work on the grounds has already begun under the direction of Mr. Allen.

ENGINEERING SOCIETIES.

Canadian Society of Civil Engineers.—President, Wl McLea Wallbank, Montreal; treasurer, H. Irwin; secretary, C. H. McLeod, room 877, Dorchester St., Montreal.

Canadian Mining Institute.—President, George R. Smith, Thetford Mines, Quebec; secretary, H. Mortimer-Lamb, Montreal, Que.; treasurer, J. Stevenson Brown, Montreal.

Engineers' Society: School of Practical Science.—President, T. R. Loudon, recording secretary, F. A. McGiverin; treasurer, B. W. Marrs; corresponding secretary, C. S. Shirriff.

Engineers' Club of Toronto.—President, C. B. Smith; treasurer, John S. Fielding; Secretary, Willis Chipman. Rooms: 96 King Street West, Toronto.

Canadian Railway Club.—President, S. King, Montreal; secretary, James Powell, Montreal; treasurer, S. S. Underwood, Montreal.

National Association of Marine Engineers of Canada.—Grand president, F. S. Henning, Toronto; grand secretary-treasurer, Neil J. Morrison, St. John, N. B.

Canadian Association of Stationary Engineers.—President, J. Ironsides, Hamilton; vice-president, E. Grandbois, Chatham; secretary, W. L. Outhwaite, Toronto; treasurer, A. M. Dixon, Toronto.

Toronto Branch American Institute of Electrical Engineers.—Chairman, R. G. Black; vice-chairman, K. L. Aitken.

Foundry Foremen's Association.—J. F. Gaffney, The Allis-Chalmers-Bullock, Limited, secretary and treasurer, Montreal; A. Chase, Sawyer & Massey Co., secretary and treasurer, Hamilton.

Association of Ontario Land Surveyors.—President, J. W. Tyrell, Hamilton; chairman of council, G. B. Kirkpatrick, Toronto; secretary-treasurer, Killaly Gamble, Toronto.

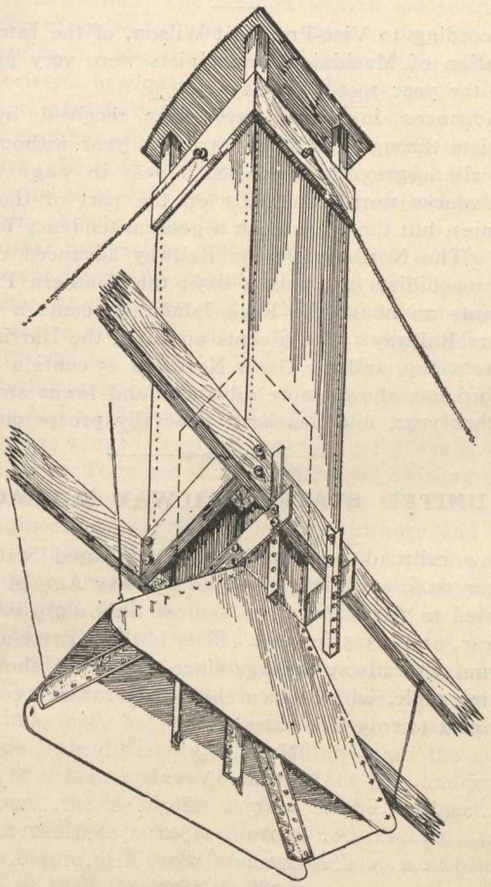
Canadian Electrical Association.—President, R. G. Black, Toronto; First Vice-President, R. S. Kelsch, Montreal; Second Vice-President, W. N. Ryerson, Niagara Falls, Ont.; Secretary-Treasurer, T. S. Young, Toronto.

Society of Chemical Industry.—Chairman, F. J. Smale; Secretary, Alf. Burton, 44 York Street, Toronto.

AN ASBESTOS SMOKE JACK.

Mr. F. P. Gutelius, Assistant Chief Engineer, Canadian Pacific Railway Company, has patented a Smoke Jack for Engine Houses, comprising supporting posts and hardened rigid asbestic plates secured thereto.

The special construction recommended is shown in the illustration. This is the standard of the Canadian Pacific



Asbestos Smoke Jack.

Railway, its special feature being the ventilation of that portion of the house above the bottom of the hood.

The framework of the Jack is of wood, iron and asbestos angles. The plates are fastened by copper rivets, bolts and nails.

As the material is waterproof, fireproof, and is not affected by fumes or climatic conditions, it is claimed that the life of the Jack is everlasting, and that its light weight and low cost recommend it for general use.

ALZENE AND ITS PROPERTIES.

Alzene, an alloy of zinc and aluminium, has recently been boomed into prominence by the lay press of America, but, as the "Iron Age" states, it is not a new discovery, nor is there any secret in its composition. The alloy, however, cannot have been used so generally as its remarkable physical properties would warrant, though it was known and tested by competent authorities years ago, and the results were then widely published. The alloy can be made by anyone having a set of scales to weigh the ingredients and a crucible to melt them in. No skill is required in the compounding. The proportions are two-thirds aluminium and one-third zinc melted together. Prof. W. F. Durand, of Sibley College, Cornell University, made an extended series of tests on the strength and other characteristics of alloys of aluminium and zinc in varying proportions. From these tests, which were reported in "Science," in the spring of 1897, he found that the best mixture was an alloy in the above proportions. This alloy, he found, had a specific gravity of 3.3, and its principal properties were ascertained as follows:—

Tensile strength deduced from small bars	22,000
Maximum fibre stress deduced from transverse tests.	44,000
Modulus of elasticity	8,000,000

Comparative experiments, independent of the above, were made between small bars of this metal and similar bars of cast-iron. The report states:—"These exhibited the same general indications, and apparently warranted the conclusion that this alloy was the equal of good cast-iron in strength and its superior in the location of the elastic limit." The other general physical properties of chief interest were thus enumerated: "The color is white, and it takes a fine smooth finish and does not readily oxidise. It melts at a dull red heat of about 800 to 900 degrees F. It can, therefore, be readily melted in an iron ladle over an ordinary blacksmith's forge or other open fire." It was found to be somewhat softer than brass and more easily worked, and it was not liable to clog a file. It was brittle, and not suited for parts requiring the toughness of brass.

Perhaps the most valuable aspect of the alloy is to be found in its casting qualities. It does not burn the sand into the casting and hence comes out clean and in good condition for the machining operations. It is exceedingly fluid, and, according to the report above cited, runs "freely to the extremities of the mould, filling perfectly small or thin parts. In this particular it is much superior to brass." The metal was thought to be well adapted for the small parts of machines, models, etc., where the necessary qualities were lightness combined with good finish, strength, stiffness, and freedom from corrosion.

PROMPT DELIVERIES.

A complete power plant—steam engine and boiler—delivered on cars for shipment two days after being ordered, is something unheard of in heavy machinery lines. The demand, however, for quick shipments has become so steady that the largest exclusive steam engine and boiler builders in the world, Atlas Engine Works, of Indianapolis, have prepared to meet it by carrying in stock a complete line of engines and boilers ready for immediate shipment. This move, so far as is known, has never been attempted by any other concern of this kind, and the Atlas Works, in spite of nearly doubling its business during the past year, are taking orders for, and actually shipping, engines and boilers of standard size in two days. Evidence of their ability to do so and to continue doing so is shown in some sample deliveries mentioned below, and in the fact that their year's business closed without a single over-due shipment on their books.

In the early fall four thousand horse-power of Atlas Water Tube Boilers were sold to the Proctor and Gamble Company, (Ivory Soap), promised for delivery on November first. They were shipped on November first, and are now being erected at their model soap factory on Staten Island.

The St. Paul Gas Light Company, of St. Paul, purchased 2,400 horse-power. These were delivered on cars Indianapolis, the day they were promised for shipment.

A ten-day delivery was made on 20 72 x 18 Return Tubular Boilers sold the Union Sulphur Company, of Sulphur, La. The Southern Pacific Railway Company purchased 11 54 x 16 Tubular Boilers which were delivered in five days, and the New River Coal Company, of McDonald, W. Va., 18 72 x 18 High-Pressure Boilers which were loaded on cars ready for shipment within twenty days.

AN IMPETUS FOR CANADIAN ENGINEERS.

The late Aeneas McCharles, a prospector, of Sudbury, Ontario, who died in August last, willed to the University of Toronto $10,000 of Ontario Government bonds, the interest of which is to be used in giving prizes similar to the Nobel prizes. The clause in the will relative to the prizes are as follows:—

"To any Canadian from one end of the country to another, and whether a student or not, who invents or discovers any new and improved process for the treatment of Canadian ores or minerals of any kind, after such process has been proved to be of special merit, on a practical scale.

"Second—Or for any important discovery, invention or development by any Canadian which will lessen the danger and loss of life in connection with the use of electricity in supplying power and light.

"Third—For any marked public distinction achieved by any Canadian in scientific researches in any useful and practical line."

MONTREAL ENGINEERS' CLUB CHANGES.

The Engineers' Club of Montreal is at present the property of a joint stock company. By a bill presented at the Quebec session by Mr. Mackenzie, it is sought to convert it into an ordinary club corporation, in which shall be vested all the property rights and privileges of the present joint-stock company. The club is to be entitled to issue stock to the amount of $50,000, the holders of which shall receive a four per cent. dividend, but shall apparently have no share in the Government of the club. The stock may be cancelled at any time by the payment of face value and unpaid dividends.

PROGRESS OF THE C. P. R. IN 1906.

Track was laid on branches and extensions of this system as follows during 1906: From Highlands to the Canada sugar refinery, six miles; from Staynerville to Brunet's quarry, four miles; from Nipissing Junction to Temagami Co.'s mills, three miles; from Guelph to Blyth, Ont., 63.4 miles; from Bolton Junction to Craighurst, 52 miles; from Winnipeg Beach to Gimli, nine miles; on Wolseley-Reston branch, from milepost 60 to milepost 122, a distance of 62 miles; from Teulon to Komamo, eight miles; on line from Strassburg north from milepost 202 to milepost 219, a distance of 17 miles; on Pheasant Hills branch, from milepost 345 west to milepost 360, a distance of 15 miles; from Moose Jaw north-west, 17 miles; on Wetaskiwin branch, from milepost 50 east to milepost 96, a distance of 46 miles. The following extensions are in progress: Pheasant Hills branch, from milepost 219 to Saskatoon, 109 miles, and from milepost 360 to Battle River, 196 miles; from Sheho north-west, milepost 42 to milepost 79, a distance of 37 miles; from Moosejaw north-west, milepost 17 to milepost 50, a distance of 33 miles; from Stoughton to Weyburn, 37 miles; on Broomhill branch, from milepost 20 to milepost 27, a distance of seven miles; on Kootenay Central, Golden, B.C., south, five miles; from Komamo, milepost 45 to milepost 57, a distance of twelve miles; from Walkerton to Proton, 38 miles; from Linwood to Listowel, 16 miles; making a total of 490 miles of new line under construction.

TO TUNNEL UNDER LACHINE CANAL.

It is quite probable that the main bridge across the Lachine Canal, Montreal, will shortly be torn down and replaced by a tunnel under the canal.

Messrs. C. A. Rivet, M.P., for Hochelaga, and J. C. Walsh, M.P., for St. Anns Division, Montreal, are bringing before the House of Commons the desirability of such a change. The bridge in question is that on Wellington Street. The traffic across this bridge is very great—more than that across all the other bridges in the city combined—so that the interruptions in the summer, due to the passing to and fro of tugs and steamers is a constant source of annoyance and expense to the business public. Messrs. Rivet and Walsh have every confidence that their proposition will meet with support.

NEW USE FOR COPPER.

A. H. Wethey, vice-president of the United Verde Copper Co., is authority for the suggestion that before long the problem of furnishing Western cities with heat will have to be solved by the generation of steam through electricity generated by water power, and that this will result in an increased demand for copper.

This is what Mr. Wethey has to say: "Fuel in the Western States, and especially in Montana, is even now scarce and high priced. The United States Government has set aside for forest reserves all the available timber land in Montana and no timber can be cut at a charge by the Government of less than $4 per thouand feet board measure for stumpage.

"This is practically a prohibitive price as is seen by the comparison with the price paid by the Amalgamated Copper Co. for all stumpage on Northern Pacific land in Montana, which was 50 cents per thousand feet.

"The Government is now taking up all the available Coal lands, with the idea of releasing them on a royalty basis. If the royalty charge is as high in proportion as its charges fixed for stumpage the cost of fuel will be still higher and it will become necessary to utilize some other method of creating heat.

"There is plenty of water power throughout the State, and I believe that a method will soon be invented which will make possible the generation of steam by electricity. Devices for the use of electricity as a heat producer are at present in a crude state and too expensive for commercial use.

"The invention of some apparatus for the production of steam by electricity would solve the heating problem for the Western towns which could then be heated from a central station."

1906 A GOOD YEAR FOR MACHINISTS.

According to Vice-President Wilson, of the International Association of Machinists, machinists were very prosperous during the year 1906. He says:—

"Advances in wages have been received by 115,000 machinists throughout the country this year without strikes, which will aggregate $8,000,000 a year in wage advances. The advances were principally on the part of the railroad companies, but there has been a general tendency to advance wages. The Northern Pacific Railway advanced the wages of the machinists 25 cents a day; the Southern Pacific 2½ to 4 cents an hour; the Rock Island 30 cents a day; the Southern Railway 1½ to 2 cents an hour; the Harriman lines 30 cents a day, and the Great Northern 25 cents a day. The year 1906 has shown more advances and fewer strikes than any other year, and has been generally prosperous."

UNITED STATES RAILWAY MILEAGE.

New railroad construction in the United States during the year 1906, according to "The Railway Age of Chicago," amounted to 6,067 miles, as against only 4,979 miles added last year, and 4,525 in 1904. This is the largest addition to the country's railway mileage since 1888, as is shown by the following table, which given the yearly railway construction in the past twenty-five years:—

Year.	New Mileage.	Year.	New Mileage.
1906	6,067	1893	2,035
1905	4,979	1892	4,192
1904	4,252	1891	4,281
1903	5,786	1890	5,670
1902	5,681	1889	5,670
1901	5,222	1888	7,106
1900	4,437	1887	12,983
1899	4,588	1886	8,108
1898	3,082	1885	2,975
1897	1,880	1884	3,293
1896	1,848	1883	6,745
1895	1,803	1882	11,569
1894	1,949		

MINING IN VICTORIA.

During the past three years, apart from the ordinary expenditure of the Mines Department, $208,120 has been voted out of surplus revenue by the Victorian government for aiding mining development by advances to mining companies and co-operative parties, boring for coal and gold, constructing new batteries, providing new and improved drills, and cutting and clearing prospectors' tracks in mountainous districts. A sum of $180,193 was voted from ordinary revenue for boring and batteries. Nineteen boring plants are at work in various parts of the State. In thirteen of these, foremen paid by the State are in charge. The net cost of working, as far as the department is concerned, after allowing for the crushing fees, amounts to $26,886. The remaining six batteries, which are managed by local committees, have been provided within the last eighteen months, and are powerful five-head plants of the most up-to-date pattern, Wilfley tables and Berdan pans being provided where necessary, the total capital cost of this new mining plant being $72,203.

The J. W. Woods have made terms with the city of Hull, whereby they will erect a plant to cost $100,000.

ANNUAL MEETING OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS

Held in Montreal, January 29th to 31st.

The annual meeting of the Canadian Society of Civil Engineers is now over. The reunion was all too short, but it was brimful of interest to those who were fortunate enough to participate in it. For three days (January 29th, 30th and 31st) the Society's headquarters on Dorchester Street, Montreal, were crowded to overflowing with members of the profession, drawn from all parts of Canada, and even from the United States. Friends of long standing greeted each other with reminiscences of days gone by, and the oft-told tale was on the tongue of every member

In no other profession, probably, can such a variety of interesting experiences be gained as in that of engineering. Here were men who had first met each other under conditions vastly different to those existing at the Society's comfortable rooms on Dorchester Street. Their friendships had been cemented during months—it might even be years—of hardships. They had worked together and fought together while the thermometer ranged from 90 degrees in the shade to 20 or 30 below zero. Together they had breathed swirling dusts and beaten the pathway to the camp under the snow. All sorts of engineering experiences in low altitudes and high altitudes were theirs. Survey work in all its branches, railway and bridge construction, canal, sewer and hydraulic power construction, and, in short, everything big in Canada, made by hands, they had worked at,

A more cosmopolitan gathering it would be hard to imagine. The greetings between old friends were hearty, as may be imagined, but where there was no acquaintanceship, it made little difference. No calling takes the superficiality out of a man and so quickly makes him understand the "show me" theory of life as that of the engineer. In his calling a pedigree soon becomes a non-essential—something in the nature of a vermiform appendix or a fifth wheel to a coach—so that about all the real engineer asks of another is, "What has he done?" Then he speaks to him, if he feels like it, as if he had known him all his life.

The meeting is now over, and these men have again dispersed to the uttermost corners of the earth—meaning Ontario, Quebec, Alberta and the Maritime Provinces, not to forget Paspebiac and the United States. They have carried away many pleasant memories, but in so doing they have enriched those whom they left behind, so that they are assured of a royal welcome when they come back again.

OPENING SESSION—TUESDAY MORNING.

It was half-past ten on Tuesday morning, the 29th, when President Lumsden—he was president then—called the meeting to order. After the minutes of the last annual meeting had been read and confirmed, the appointment of the usual committees of scrutineers was proceeded with. One committee was for the opening of ballots for the election of president and members of council for the ensuing year, the other being for the same purpose in connection with the Nominating Committee. Following were the scrutineers appointed:—

For President and members of Council—H. R. Lordly, chairman; Messrs. C. Leech, J. Ewing, Beullac, Burnett, McLeod, Smith and Charlton.

For Nominating Committee—Messrs. N. H. Greene, G. Stead and Barton.

Annual Report.

Owing to a motion at Toronto last year by Mr. Walbank by which the report of the Council is required to be in the hands of the members in advance of the meeting, no time was lost in reading the report, it being accepted as read.

The report of the Council for 1906 shows that there have been fourteen deaths in the membership of the Society during the year. There are at present 1,521 members, an increase of 134, made up as follows: Members, 16; associate members, 48; associates, 3; students, 67. There are also 134 applications for membership before the Society, which would bring the total membership up to 1,655. The report includes a brief outline of the annual meeting, held in Toronto in 1906, a full account of which appeared in the March issue of "The Canadian Engineer" last year.

Sixteen meetings of the the Society were held during the year, four business and twelve sectional, a number of interesting and important papers being read at the latter.

During the year a branch of the Society was formed in Toronto, with headquarters at the Engineers' Club. Mr. E. H. Keating, past president of the Society, was appointed chairman, Messrs. C. B. Smith, M. J. Haney, and C. H. Rust an Advisory Committee, and Mr. S. Gagne, secretary-treasurer. A branch is contemplated in Winnipeg, and application has been made for the formation of a branch in Winnipeg.

The Canadian Mining Institute has continued to occupy rooms in the house of the Society.

A delegation presented a memorial to the Premier in April last, and as a result a commission was appointed, and is now actively engaged in considering the best means of reorganizing the various surveying branches.

Dr. R. B. Owens was appointed to represent the Society at the meetings of the International Commission on Standardization of Nomenclature and Ratings of Electrical Machinery, held in London, England, June 26th, 1906.

Mr. G. C. Cunningham was appointed to act for the Society at the International Association of Testing Materials at Brussels. A prize fund for students' papers was established during the year.

Treasurer's Report.

The treasurer's report still continues to be satisfactory. The receipts amounted to $8,779.99, and the expenditure $7,963.42, the balance on hand being $816.57, which, added to the balance carried forward from 1905 of $1,320.30, makes a total balance of $2,136.87. The expenditure during 1906 was $2,094.32 less than in 1905.

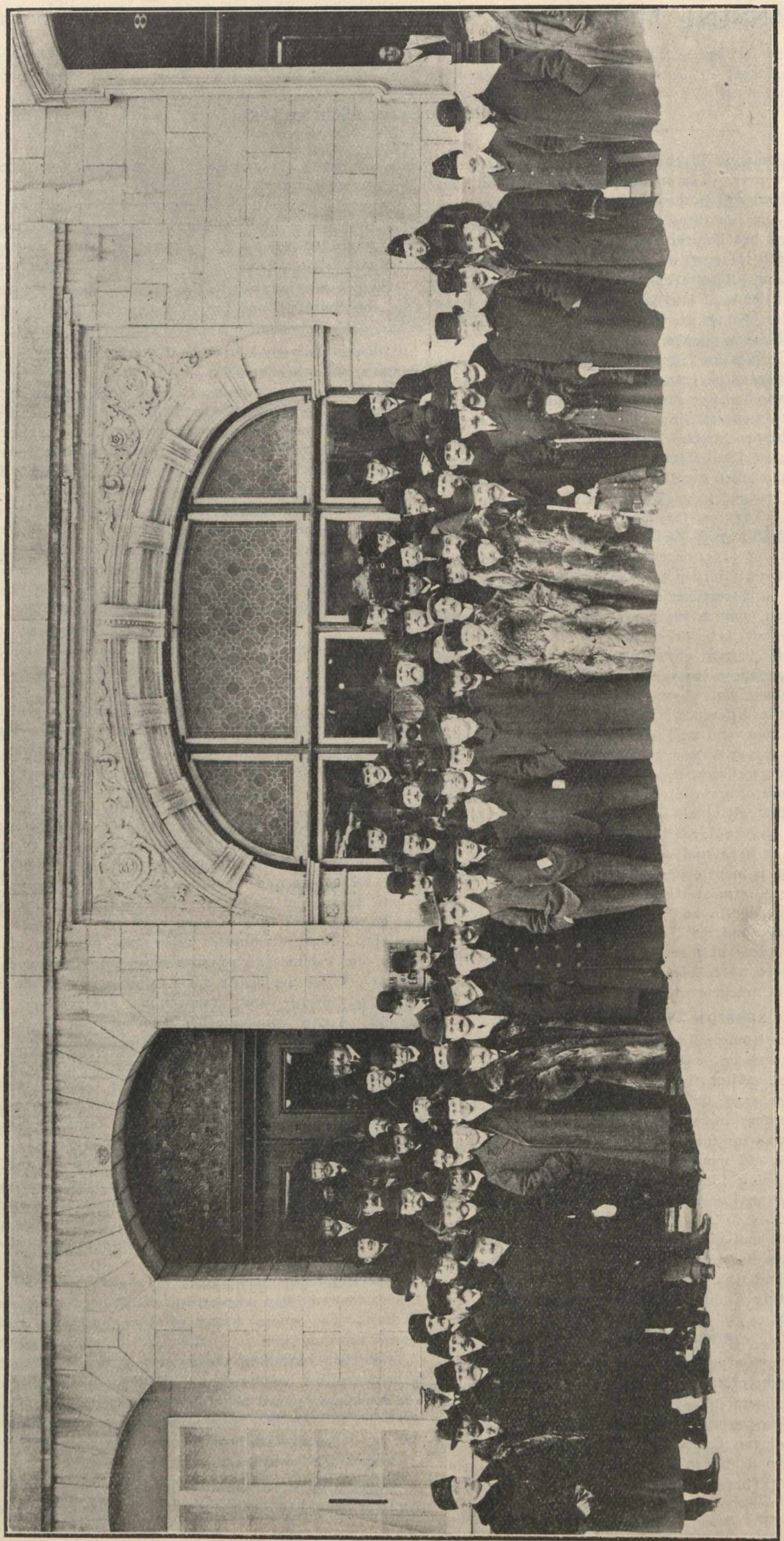
The Library Committee report the purchase of fifteen books, and twenty-one volumes have been presented to the Society. There are nearly 2,000 volumes now in the library, and 175 journals and transactions are received by the Society. A card catalogue has been made of all the books, periodicals, and pamphlets. A subject index of the authors has been prepared, and printed copies are now ready for distribution. In addition to the above the card catalogue of the John Crerar Library, of Chicago, is now available, and will be kept up-to-date. The report contains a complete list of the periodicals received by the Society.

President Lumsden moved the adoption of the report and Mr. Walbank seconded the motion, thus opening the report for discussion. This year an unusual interest was taken in the report, and the discussion respecting its various items occupied almost the entire morning and afternoon sessions.

The first thing that aroused the members was the matter of a student who had been struck off the list for non-payment of dues. The whole matter of dues was canvassed and thoroughly gone into.

Criticism regarding the portion of the report referring to the increased membership of the Society was also offered. The members seemed to think that it should only have been necessary to state that their numbers had increased to 1,521, and that it would have been better not to have spoken of the 134 names now awaiting acceptance.

Some wanted to know the names of the four outside members who had been appointed on the commission for



MEMBERS OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS, PRESENT ON THE FIRST DAY OF THE ANNUAL MEETING IN MONTREAL. PHOTO TAKEN BEFORE THE SOCIETY'S ROOMS ON DORCHESTER STREET. PAST PRESIDENT LUMSDEN IS IN FRONT OF THE WINDOW, AND PRESIDENT WALBANK IN THE DOORWAY.

co-ordinating surveys which had been suggested to the Government last year by the Society. They considered these names should have appeared in the report.

Others asked why there were no reports from the Society's representatives at the meetings held in London on the Standardization and Ratings of Electrical Machinery, and in Brussels on the Testing of Materials.

Prizes not Limited to Students.

The report stated that an unappropriated account had been made the nucleus of a prize fund for students' papers. Mr. Walbank asked to have the word "student" eliminated. The fund was the remnant of some $300, left over from the subscriptions towards the entertainment of visitors from Great Britain to the St. Louis Exposition, and, as treasurer of the fund, he distinctly remembered that he had no intention to confine the prizes to papers of students.

The matter was looked up and the word was eliminated.

With this one exception the report was adopted, but not before the meeting had criticized the treasurer's report and asked for details of many items, besides which, Mr R. L. Lordly and others poured some hot shot at certain apparent inconsistencies in the Library Committee's report, and criticized them for reducing expenses in their department.

To Revise the By-laws.

Mr. Walbank then took up the matter of the by-laws of the Society. He claimed they were in a most unsatisfactory state at present, and that they were badly in need of revision. He, therefore, moved, seconded by Mr. J. A. Jamieson, that a committee be appointed to revise them, the committee to report to the Council, and the Council to the Society by ballot. This was adopted, and the committee was appointed, consisting of the mover and seconder of the the resolution, and Messrs. Geo. Mountain, Ottawa; C. H. Rust, Toronto; G. A. Keefer, Vancouver; Col. Ruttan, Winnipeg; L. A. Vallee, Quebec; C. W. Dodwell, Halifax; and Phelps Johnson and Professor McLeod, Montreal.

An unusual amount of interest was displayed throughout both the morning and afternoon sessions in the affairs of the Society, and, while there was much criticism, much pleasure was also expressed at their satisfactory condition.

Mention should also be made of the luncheon given in the rooms of the Society at one o'clock, which function was well attended. Previous to the luncheon the members present were marshalled on the sidewalk in front of the Society's rooms by Mr. J. W. Heckman, and the evidence of their presence is to be seen in the group picture.

The afternoon was well advanced before the business brought before the meeting was concluded. The president's address is naturally an event which is looked forward to with considerable interest, so that there was a good attendance for the final item on the programme. When Mr. Lumsden rose to deliver his address he was greeted with much applause.

PRESIDENT'S ADDRESS.

In concluding my year as president of this Society I must thank the members for the honor conferred upon me, and I trust they will excuse my many shortcomings while in office.

I believe it is customary for the retiring president to make an address to the Society at the close of the year, and I must beg of your indulgence while endeavoring in the following remarks on the subject of railway location to give some idea of the methods adopted in connection with the surveys for the location of the Eastern section of the Transcontinental Railway, and my ideas in regard to railway location generally.

Having been appointed Chief Engineer of the Eastern section of the Transcontinental Railway by an Order-in-Council, dated August 20, 1904, I assumed the duties connected therewith towards the end of that month. The first regular meeting of the Commissioners of the Transcontinental Railway was held in Ottawa on the 2nd of September, 1904, the Commission being composed as follows: F. B. Wade, chairman; C. A. Young, R. Reid, A. Brunet, Commissioners; P. E. Ryan, Secretary. We at once proceeded to organize an engineering staff, with Mr. M. J. Butler as Assistant Chief Engineer.

Its Transcontinental Railway.

The assumed distance between Moncton and Winnipeg was 1,890 miles, and this was divided into six districts, averaging, say, 315 miles each.

A district engineer was appointed to each district as the work progressed, and the control of the survey parties in each was directly with such district engineer.

In District "A," New Brunswick; District "B," Eastern Quebec, and the prairie or westerly portion, or about 65 miles of District "F" being comparatively easily accessible, the parties on preliminary surveys consisted of an engineer-in-charge, transitman, leveller, topographer, two rodmen, two chainmen, picketman, five axemen, and a cook. When location was commenced these parties were supplemented by the addition of a draughtsman and one or two axemen.

The country from the St. Maurice River westerly to within, say, 100 miles of Winnipeg, on the route laid down to be explored, was one of which little was known outside of explorations made by the Geological Survey Branch up various streams, which almost all ran at right angles to the general course of our line, and one or two survey lines in Northern Ontario and Manitoba. The survey parties employed in the unknown districts were considerably larger, having, in addition to the members before mentioned, five or eight men as axemen and packers, who were continuously employed in bringing in to their parties provisions from the nearest caches or depots.

Grand Trunk Pacific.

Previous to our commencing work the Grand Trunk Pacific Company had put a number of parties in the field between Winnipeg and North Bay, and made a preliminary survey of a greater portion of the route, and in the winter of 1904-5 we took over from them all the plans, profiles and information they had obtained of that portion of the country, and made use of them where practicable; also taking over what provisions they had on hand in that district. During the winter of 1904-5 we had, in all, eleven parties making preliminary surveys in New Brunswick, eleven parties between New Brunswick and the Quebec boundary and Weymontachene, on the St. Maurice River, or Clear Lake, eight parties between the last mentioned points and the boundary between Ontario and Quebec, and two parties, one south and one north of Lake Abitibi. In January, 1905, one preliminary and five exploration parties were sent out in District "F," between the north-west angle of Lake Nepigon and the Manitoba boundary, to make a thorough examination of the country, with a view of shortening and improving the line previously run by the Grand Trunk Pacific Company. It will be seen that at the end of March, 1905, we had thirty-eight parties, and by the middle of the summer forty-five parties in the field, of which about one-half were in inaccessible districts, necessitating the transport of supplies for their maintenance for distances up to, say, 200 miles from the nearest available transport routes. Owing to the heavy snow and lack of much knowledge of the possible routes to reach the various parties, great difficulty was experienced during the first winter in keeping parties fully supplied, but since then, by better knowledge of the country and the cutting of a few winter roads to the principal distributing points or depots, and pack trails thence to caches on or near our line, or to points to which transport by water in the summer is good, we have now little trouble, and not one-third the expense in keeping parties fully supplied, and maintaining at least a bi-monthly communication with all of them.

Printed books of instructions to engineers were issued early in 1905, in which were set out the duties of various classes of engineers, transitmen, levellers, topographers, field-draughtsmen, etc., and giving general instructions as to the plotting of plans, profiles, etc. They also contained memoranda of necessary camp outfit and supplies, medicine chests, stationery boxes, etc., for eighteen men for two

hundred days. These were modified according to the circumstances under which parties were working. Supplementary instructions were also issued from time to time in regard to the engagement and paying off of men, the making up of pay-rolls, expense accounts, the precautions necessary to prevent forest fires, and copies of the regulations in force in each Province for that purpose; also instructions and precautions to be taken by men in charge of canoes. During the summer months the numerous waterways were practically the only routes available, and with the exception of a few jointers or lumbermen's boats, canoes were the only means of transport. This necessitated a larger amount of manual labor packing outfits and provisions over the numerous portages, varying in length from a few yards to several miles. Great difficulty was found in procuring a sufficient number of men suitable for this service, as only those who had previous experience in this sort of work were at first of much use for the arduous labor of packing. Numbers of men, thinking because they had been frequently in canoes, they were quite competent to take part in such work, soon found that canoeing for pleasure was a different matter from this, and that the carrying of numerous loads of 100 pounds or more on their backs, over even a portage a quarter of a mile in length, was more than they could stand, while men such as half-breeds and Indians, who had been brought up to such work, would with ease carry double the load the novice could do, and keep at it all day.

W. McLea Walbank, B.A., Sc., the New President.

The principal canoes used for this purpose were made of basswood, but a few cedar and canvas canoes were also employed. They varied in length from 16 feet, which were used for light work and the carrying of mail, to 22 feet, the latter being of extra beam and depth, and capable of carrying over a ton of provisions, together with the necessary crew.

During the summer of 1905 we were exceptionally unfortunate, and the accidents to parties in canoes were numerous, causing the loss of a number of valuable lives.

Our experience has been that by far the most economical means of transport, outside of rail or steamer, is by horses and sleighs where practicable, and the cutting of a few miles of winter road connecting or following large bodies of water has been the means of saving thousands of dollars. The provisions also were delivered in much better condition, rainy or very hot weather, leaky canoes and carelessness of men contributing largely to the depreciation of the value of many kinds of goods while in transit by canoes. The distribution by teams beyond certain distances was found to be impracticable, owing to the fact that either all fodder had to be brought in at great expense, or no lakes and streams were available, and the amount of provisions required was not sufficient to warrant the cutting of sleigh roads for the entire distance. To overcome this difficulty we have been making use of a number of men, dogs and toboggans with very satisfactory results, distributing from our main caches or stores to smaller ones in the vicinity of our line, say, ten or twenty miles apart. Few people who have never had the actual experience with the use of dogs as a means of transport can form any idea of their capabilities, and the ease with which they seem to do their work, provided the men in charge take proper care of them, and see that they are regularly fed and sheltered on cold or stormy nights. A team of dogs may consist of any number from two to six, or even more, but in a rough, timbered country from three to five is the most one man can conveniently handle. The dogs used by us were all, with a few exceptions, bought in the towns and villages, and as long as they were of sufficient size, and not too young or too old, they were acceptable. Very few days are required to break in a team of dogs, especially if one broken dog can be found for a leader. A man and five dogs will, in a moderately rough timbered country, move five hundred pounds six to eight miles a day and return for another load. In a level country, with a good trail, they can make ten to twelve miles a day and return. Where lakes and rivers are available, and there is good going, thirty to fifty miles a day have been frequently covered by dogs with a light load. For freighting purposes every dog's load can be considered as a hundred pounds. The drivers of dogs should be active, hardy and of good temper, and all that is necessary for a dog trail is that several men go over it with snowshoes, cutting out all brush and logs for a width of, say, two feet, avoiding as far as possible all sharp turns or steep hills. The more such a trail is travelled over the better it becomes, especially where in a timbered country it is protected from drifting snow. The toboggans used are about eight feet long and fourteen inches wide, preferably made from split-out strips of birch, maple or ash, one-half inch in thickness. Each toboggan is provided with a canvas cover, in which all goods are securely covered and lashed to the toboggan with cod line or light rope, a light rope being also attached to the rear end of the toboggan for the driver to hold on to, and enable him to hold back when going down hill. Regular leather harness is provided for dogs, the only precaution necessary being to see that the collars fit each individual dog and do not gall the shoulders or neck.

Having personally had considerable experience on the location of railways, I may state that, in my opinion, when surveys are to be conducted in a country which is timbered and little known, it is in the long run a great saving in time and money if it is practicable to have the engineer who is to have charge of the survey, accompanied by a good assistant and, say, half a dozen or more men, go over the country as best he can, running rough compass lines, using a micrometer, pacing or estimating for distances, taking barometrical altitudes, and generally becoming acquainted with the nature of the country and the principal difficulties he may expect to have to overcome. Having gone over the whole of the section allotted to him, and thoroughly explored the country for several miles on either side of his rough compass line, he will have naturally formed some idea of the best route to be followed and save the cost of a large party running instrumental lines that may prove after weeks of hard labor utterly impracticable through running into some unforeseen obstacle. The engineer in charge of work of this character should be one who has had considerable experience in a timbered country, able to find his way anywhere and not afraid of being lost. He should be able to establish his latitude and approximate longitude by observation, though owing to the difficulty in carrying a reliable chronometer the latter is seldom to be relied upon. On reaching his point of departure, his aneroid barometers, of which he should have at least two, or better four, having all been previously compared and rated, he will assume a datum for elevation for his work, and all altitudes should be reduced to that datum. By arranging the movements of his party he can provide that one barometer will always be stationary, and if a half-hourly record of its readings is carefully kept all altitudes taken by the party in the field

can be reduced to one datum, the party having kept record of the time at which the observations were made. As it is well known, such barometrical altitudes cannot be explicitly relied upon, but with care and good barometers it is surprising what close approximation to the true altitudes can be obtained. My experience has been that the aneroid barometers best suited for rough work are those about two and a half inches in diameter, divided to read five feet. The range of such barometer does not generally exceed two thousand eight hundred feet, but they are much less liable to get out of order than the larger ones, which are supposed to read by verniers to one foot.

Having thoroughly explored the country through which he is to operate, the engineer-in-charge selects a route for his preliminary line, and having been joined by his transitman and the rest of his party, he proceeds with the running of such a line. If the country is rough and broken a transit should be used, but if tolerably level a picket line run by the aid of field glasses, the angles being turned with a transit or box sextant, is generally the more rapid method, and sufficiently accurate for preliminary purposes if the line is checked by compass bearings. The chainage should be done with a light steel chain.

Having assumed a datum for elevation, the levelling should in all cases be carefully done and checked wherever practicable, bench marks being established at least every half a mile. Cross sections should be taken by the topographer as frequently as the nature of the country may require, to enable him to show contour lines for every five feet of elevation on either side of the line for considerable distances. As the through levels are not in any way affected by the cross section work, these sections can be taken with sufficient accuracy with a good hand level, the distances right or left being measured with a chain or tape. It is a good practice to insist that the field notes of all instrumentmen be plotted up by the men who made them each night as the work progresses; this will save time and avoid many errors.

Having completed his preliminary line, the engineer-in-charge lays down on his plan, with the aid of contour lines, a proposed location and proceeds to stake it on the ground, the levels being checked with those of the preliminary line, and bench marks established every thousand feet.

Having completed his first location and made any revisions that may have occurred to him, the engineer who has been in charge of such work should be moved on to other work and a new man put in charge for final location. This new man should, before taking charge of the party, be furnished with the plans and the profiles and given ample time to go over the lines run by his predecessor. He may or may not be able to improve on the previous line, but in any case the judgment of two in place of one is obtained on final location.

In conclusion, I may say that the commissariat for a survey party to-day is a very different matter from what it was thirty years ago. Formerly, if a party was well supplied with the necessaries of life, in the shape of bacon, beans, flour, tea and sugar it was all that they expected, whereas to-day the addition of canned meats, dried fruits, vegetables and canned goods generally has added much to the variety of food supplied, but the one thing that in the old days contributed more than others to the well-being and comfort of a party is still the same, namely, a good cook.

SECOND DAY.

Wednesday was a gala day with the engineers. It was nothing but play and visit all day, and at night, eat, drink and be merry.

First upon the programme provided by the Entertainment Committee, the names of the members of which will be found in the account of the dinner, was the visit to the Simplex and the Canada Car Companies' works. These are situated about two miles west of the city.

The Montreal Street Railway provided the cars to convey the Society to their objective point. Three cars were necessary for the purpose. They were of the splendid, large new type, so severely criticized by Montrealers recently, and known as the "pay-as-you-enter" cars. It was "up to" the Street Railway on this occasion, however, so that the engineers did not join in the agitation.

The Simplex Works.

Shortly before ten in the morning the cars, three in number, drew up in front of the Windsor Hotel, the rotunda of which had been gradually filling up with engineers for half an hour previously. The cars were soon filled and speeding on their way to Rockfield.

The Simplex Railway Appliance Company's works were first visited, and here, as in the car works, every facility for inspecting the operations had been placed at the disposal of the visitors. Now, although the work of an engineer is intimately associated with the product of works of the nature of the Simplex and the Canada Car Companies, the actual process of manufacture makes such rapid strides that only those who are in constant touch with it can possibly keep up-to-date, so that the sights seen in the two factories were a source of the deepest interest and surprise to perhaps the majority of the visitors.

Canada Car Works.

"All aboard!" is now called, and the cars speed off to the Canada Car Works. Here the process of building the cars goes on. The visitors there saw the passenger and freight cars, for which all Canada, including the much-reviled railways, is howling, growing before their eyes. Here the most modern appliances are found, and the work of car-building goes along with a speed that is almost on a par with that of "Aladdin and his lamp."

A visit to the power-house is most interesting. Here are two turbine engines, which to the casual observer do not appear to be operating, but they are operating nevertheless. They are running so fast that after the steam has been shut off and the load removed they will continue to revolve for nearly an hour—more than forty minutes, certainly.

Luncheon Among the Cars.

It is now lunch time, and the Canada Car management has had the kindness to provide luncheon. The visitors were hungry and did justice to their hosts. Afterwards they gave them many cheers and much thanks. The management suitably replied, and all were glad to listen. Mr. M. J. Butler thanked the Company for their courtesy, and replies were made by Mr. Coleman, president of the Company, and Mr. King, superintendent. The visitors learned, among other things, that the Car Company had erected their shops and turned out their first cars within a year after the work was begun, thus breaking the record for speed, as compared with any similar undertaking on the continent. They also learned that the company was turning out more than a car an hour, and that they could not get them out as fast as needed, and would have to extend their plant.

Visit to Rubber Works.

Once more the cars were boarded, and, after a run through the city, the visitors found themselves at the Canadian Rubber Company's works. Here they saw rubber handled in as wonderful a manner as the other factories handle the iron and steel. The work, however, was of a more painstaking and delicate a nature. They saw a crude material worked into all sorts of shapes. It became tubes, and hose, and tires, and ropes, and bands; in fact, everything that rubber can become. The visit was a most enjoyable one, and altogether, it was the opinion of the engineers that they had seen enough since early morning to provide them with material for pleasant and profitable memories for many a day to come. After thanking the management, cars were taken for the up-town portion of the city again, in order to make preparation for the Society's dinner at eight o'clock.

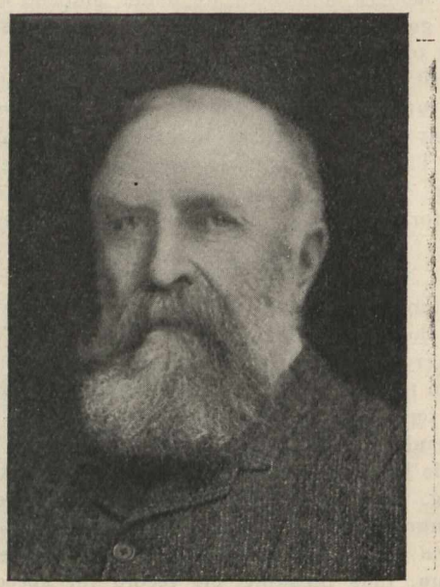
Annual Dinner.

About eight o'clock in the evening the members began to gather in the rotunda of the Windsor Hotel. Shortly afterwards the movement towards the banquet hall commenced, and by nine o'clock some two hundred members and guests were seated at the tables.

Too much praise cannot be given the Entertainment Committee for the programme provided. Although some of the speakers were unavoidably absent, their places were taken by able substitutes, and everything passed off pleasantly and without a hitch. The toast list was just the right length, and the speeches, without exception, were short and to the point. The tables were arranged much in the form of the letter E. At the centre of the head table sat Mr. Butler, with some of the oldest members to right and left. At the end of one of the flank extensions sat Mr. Marceau, and at the end of the other, Mr. Walbank. These three, in succession took charge of the proceedings and proposed the toasts, the turn of each coming twice. There was still the toast of "The Press," and this devolved upon Col. Anderson. The arrangement was a happy one, and somewhat of an innovation.

The music provided by the orchestra was unusually good, the songs sung by Messrs. Kilkenny, Gilmour and Furlong were excellent, and Mr. Giles, in his recitations from Dr. Drummond, was in demand. The menu supplied by the Windsor Hotel did the well-known hostlery great credit.

The committee which so ably arranged this important part of the meetings was composed of the following members: Messrs. E. S. Mattice, of the Dominion Bridge Co.; L. G. Papineau, of the Department of Marine and Fisheries; H. P. Borden, of the Locomotive and Machine Co., and R. S. Kelch, of the Montreal Light, Heat and Power Co.



H. D. Lumsden, C.E., Retiring President.

The menu was as follows:—

Menu.

Oysters on the Half Shell.
Celery. Caviare Canape. Olives.
Chicken Okra.
Fillet of Halibut, Joinville.
Cucumbers. Pommes Hollandaises.
Sweetbreads, pate Rejane.
Larded Sirloin of Beef Richelieu.
Brussel Sprouts. Pommes Noisettes.
Apricotine Punch.
Roast Turkey, Stuffed, Cranberry Sauce.
Mashed Potatoes.
Lettuce and Tomato Salad.
Charlotte Pralinee. Assorted Petits Fours.
Neapolitan Ice Cream.
Cheese. Coffee. Crackers. Fruits.

Engineers also Spoke.

After spending an hour and a half over the menu, Mr. Butler, in the unavoidable absence of President Lumsden, proposed "The King."

Mr. Marceau proposed the toast, "Sister Professions," remarking upon the pleasure it gave him to have the opportunity of cementing the friendship which already existed between the sister professions.

This was replied to in a few words by Mr. Alcide Chausse, for the Quebec Association of Architects, the president being absent.

The reins then passed into the hands of Mr. Walbank, who introduced Major G. W. Stevens, one of whose institutions—the Rubber Co.—the Society had visited during the course of the day.

Mr. Stevens, before proposing the toast, "The Society," made one of his usual happy speeches. He congratulated the Society upon its twenty-first birthday, and upon having thus attained its majority. He referred to the necessarily close relations which had existed, and must ever exist, between the engineering profession and the progress of a country such as Canada, the development of which constantly called for stupendous engineering works. It was a far call since the day when, with Jacques Cartier as Premier and the Algonquin chief as leader of the Opposition, the first Parliament met on the Isle of Orleans. The progress made since that day was largely due to the engineers of the country. Twenty-one years previously, while many of the members present were organizing this Society, he was in the city of Turin, and there saw the monument erected to a great engineer, who had planned the tunnel which pierced the Alps. We in this country had not yet begun to erect monuments of this nature, but every foot of progress in railway building and in the other great engineering works of Canada was a monument to an engineer. Major Stevens here said: "Above all, I am a Canadian. You have no doubt heard that the new Harbor Board has decided to bring in an outsider to look after the engineering work of the harbor. You have also seen that we took occasion to deny the report, and to say that until we are convinced that there were no men in the country capable of attending to the work we would not look abroad." He then repeated the assurance that Canadians would first be sought. He spoke of the great achievements of Canadians, referring to the St. Lawrence channel as the greatest in the world, and to the Transcontinental Railway system as the only continuous one across the continent. Canadians had also constructed a magnificent canal system, and they would do yet greater things. It was only necessary to mention such men as Page, Shanley, Gzowski and Keefer. These were names that all the world could honor. He also spoke of Thos. C. Keefer, Sir Sanford Fleming, Collingwood Schrieber and Hobson, and said that there were many more at the table who might also be mentioned. "I may be permitted to say," said he, "that within the past month I have become acquainted with Mr. John Kennedy, and I want to say that the respect of the whole Canadian nation is due to him for the work he has done in Montreal harbor." (Cheers).

After a few more remarks Mr. Stevens took his seat amid much applause.

First Meeting of Engineers.

Major Stewart Howard, in replying to the toast, said that he well remembered the organization meeting of the Society. It was held in the Harbor Commissioners' offices. After that, the meetings were held in McGill, then still later at the Society's rooms, corner of St. Catherine and Mansfield Streets, whence the Society moved to its own premises, now occupied by them. The Society now numbered over 1,400 members, including associate members and students. He referred to the Acts which were before Parliament in the interests of the engineers, and concluded by thanking Major Stevens for his remarks.

Mr. Butler then read a telegram from Toronto, saying: "Professor Galbraith confined to his bed, and cannot travel for a day or two."

After expressing regret at the news, Mr. Butler proposed "Our Guests," calling upon Messrs. C. H. Catelli, president of the Chambre de Commerce, and Mr. King, of the Canada Car Works, to reply.

Mr. Catelli, in a brief yet eloquent speech, said how little the passengers who were whirled across Canada in rolling palaces, and who viewed the magnificence of the Rockies from plate glass windows, knew of the brain and the muscle that had gone into the making of the iron way. He spoke of the influence of the engineers in bringing together the nations of the world, and in placing Canada in the highway between Europe and the Eastern countries.

Mr. King referred to the splendid work which had been done in subduing the rugged Rockies and in binding Canada together with bands of steel. He had no doubt that this work would be continued until Canada had become as populous and great a country as that on the other side of the line. Some even proposed to dam the ice at Belle Isle, and to change the course of the Gulf stream, so that, in time, we might expect to grow oranges in Montreal in the open air. It was just possible that one of the students might have the honor of carrying out that work. (Laughter.) One of the members had told him it could be done for eight or nine million dollars, and, as this would be only a dollar or so from each person in the Dominion, the project should not be a difficult one to finance.

Mr. King then, in serious vein, spoke of a matter which he thought required immediate attention. In a recent speech in the United States a railway man made public some mortality figures which were shocking in the highest degree. The number of persons killed by accident far exceeded those killed in the most destructive wars. Gettysburg and other battles all paled before the frightful loss of life going on constantly. When one considered that next week 1,100 persons would be killed by accident in America, and 1,100 the next week, and the next, and so on, the number constantly increasing rather than diminishing, it must surely cause him to stop and ask if something could not be done to stop this frightful loss of life. Said he: "It is for us to devise some means by which transportation may be carried on from ocean to ocean with less loss of life. The master car-builders had tried to devise some means to this end. It is the duty of each of us to put forth an effort to better this state of affairs so that these people shall live out their days in safety."

Retiring President Toasted.

Mr. Marceau then called upon Mr. C. E. Dodwell to propose the health of the retiring president and council.

After some remarks which called forth laughter, Mr. Dodwell took occasion to state that the society was not twenty-one years of age, as had been stated. It had been brought into being in 1887, and this was consequently only the twentieth annual meeting, although it so happened that this was the twenty-first dinner. He then referred to the work of the president and members of the council during the past year. They had safely piloted the ship and brought her into port again. To-morrow they would hand the vessel over to a new president and council, and they all hoped that the new crew would navigate her as safely and as satisfactorily as the old. No one yet knew who the new officers would be, but all in advance wished them success.

He then spoke of the time when, twenty years before, the Society held its first meeting in John Kennedy's office. There were many profitable meetings held at that time, and those now held were also profitable. Unfortunately, the retiring president had not been able to attend as many meetings of the Council as he would doubtless have liked, his important engineering position demanding much of his attention. All bade farewell to Mr. Lumsden with great regret. He had been a prominent member of the Society throughout its existence, and he hoped would long continue to be such. He proceeded to mention the names of several of the past presidents of the Society, commencing with T. C. Keefer, the first president, and proceeding to Sam. Keefer, Sir C. Gzowski, and others, some of whom served many presidential terms, Mr. T. C. Keefer having also been president of the American Society of Engineers, a most unusual honor for a Canadian. He hoped that, in all cases, after members had occupied the president's chair, they would not forget that the Society had conferred upon them its highest honors, and that their interest in the Society should not flag when they became past presidents.

The Academic Members.

Dr. Porter, of McGill, replied. He spoke of the many duties devolving upon the members of the Council. They had to attend meetings of the Council at least once a month. They had also to look after legislation, and besides this and other work they have at times to put their hands into their pockets also. Altogether, a member of the Council earned all the honors given him, though, added he, "I do not in the least wish to belittle this honor."

Dr. Porter said that it was sometimes felt by some members that the academic members of the Society occupied, perhaps, a little too much prominence in the Society's affairs. He did not think that this was so, though he allowed that the university members were deeply interested, and greatly appreciated any honors conferred upon them by the Society. It followed, as a matter of course, that colleges would be well represented in the councils. They were in close touch with the students, and whether in Toronto or Montreal, or any other university city, the university would be prominently associated with the Society. He concluded by saying that, no matter how much credit might be given the members of the incoming Council at the end of their term, he was sure, if they did their duty, they would feel that they had earned every praise.

Mr. Walbank then proposed "Our Visiting Members," saying that the Montreal members were always quick to welcome the visiting members. Making a reference to Mr. King's speech, he said that there was at least one comfort in the thought that oranges might grow in Montreal, and that was that there would then be no frazil ice to bother the engineers. He called upon Messrs. Mountain, Mitchell and Rust to reply.

Mr. Geo. Mountain, Chief Engineer of the Government Railway Commission, thanked the Montreal members for all they had done for the visiting members on this and other occasions.

He felt proud, after seeing the enormous engineering establishments they had been shown that day, to think that the head office of the Society was located in a city like Montreal. He again thanked the resident members for their kind attentions.

Mr. Mitchell, Niagara Falls, said that he was sure the non-resident members of the Society would bear him out in thanking most heartily their resident brethren for all they had done to make their visit enjoyable. It was much pleasanter to be a host who could really entertain—like their Montreal hosts—than to be a guest even. To-day they had become indebted for a most enjoyable and instructive visit to the Simplex Company, the Canada Car Co. and the Rubber Co. The evidences of expansion there reminded him of the expansion in the Engineering Society. They had begun to plant colonies. Recently one had been established at Toronto, and one was about to be established at Vancouver. "Let us forget that we are resident and non-resident members, and let us all get under the wheel and all push along together."

The Toronto Contingent.

Mr. Rust, of Toronto, was also asked to speak for the visitors. Said he: "On behalf of the Toronto members I thank you for your hospitality. We are always heartily welcomed here, and we are glad that we had an opportunity of entertaining you a year ago. We hope that we will have opportunities of entertaining you many times in the future. We recently formed a branch of the Society in Toronto, and I think and hope that it will flourish and do well."

Before proposing the last toast on the list, that of "The Press," Col. Anderson made reference to the influence of the universities upon the work of the Society. Some of the most valued officers and members of the Society were connected with universities, and he was glad to see them take such an interest in the work.

Referring to the Press, he said that it was closely bound up with the work of the engineer. In a country like Canada, where there had been much work accomplished, but where the work to be done and which was already in

sight was so enormous, there should be no occasion for newspapers to publish anything but news which was reliable, and which would be of advantage to the public generally. He spoke of the important function performed by the Press, and called upon Mr. T. C. Allum, the editorial representative in Montreal of "The Canadian Engineer," to respond.

Mr. Allum thanked the Society on behalf of "The Canadian Engineer" and the Press generally for their kind words. As to "The Canadian Engineer," it had an entirely new programme for the coming year. In future it would be issued weekly instead of monthly, and he thought that this would give a much better opportunity for the editors to give the engineers the news in which they were most interested. The publishers of "The Canadian Engineer" had opened an office in the Board of Trade Building, and he hoped that both resident and non-resident engineers would take full advantage of it.

"Auld Lang Syne" was then sung, and the annual dinner was over.

FINAL DAY OF CONVENTION.

The interest on Thursday, the final day of the Convention, centered in the results of the election of officers. The vote was an unusually large one, and the work of the scrutineers was long and exacting.

The members began gathering at the rooms of the Society about ten in the morning. The hour was considered somewhat early by some of those who had attended the dinner the night before.

Mr. Walbank was in the chair in the absence of Mr. Lumsden, and Secretary McLeod was in his usual place. The first matter discussed was introduced by Major Howard, and concerned the co-operation of the engineers in the proposition respecting the establishing of an engineers' corps. After a few words of explanation as to the project, which involved the assent of the engineers to a system of military instruction and their formation into a corps which might be called upon for the defence of the country in time of war, Major Howard moved that a committee be appointed to take charge of the matter. Mr. McNab seconded the motion, and it was carried. A committee was then appointed, consisting of the following: Col. Anderson, Major Howard, Major Lordly, and Messrs. Dodwell, Marceau, McNab, of the G.T.R., and Leech, of the C.P.R.

On motion of Mr. McPherson, seconded by Col. Anderson, the committee was instructed to take no formal action until formally approached by the Military Council.

Czowski Medal Awarded.

Mr. Walbank announced that the award for the Gzowski medal competition had been decided in favor of Mr. W. J. Francis for his paper upon "The Mechanical Canal Locks of Canada."

Mr. Francis was not present at the moment, but upon his arrival a short time later, Mr. Walbank made the announcement to him officially. Mr. Francis expressed his pleasure at the decision, and intimated that should he find time to write a paper respecting other features of the topic which had come under his notice while he was collecting the data, he would be glad to have the opportunity of reading it before the Society, providing no one else treated the subject in the meantime.

A discussion then arose regarding the appropriateness of the title chosen by Mr. Francis for his paper, the term "mechanical" being called in question as too indefinite. Mr. Francis ably defended the title.

Cement Weights and Tests.

A very important topic was then introduced by Mr. J. A. Jamieson. The Society, he said, had now reached a position of importance in the country, which justified it in taking a stand upon certain matters which more particularly concerned the engineering profession. He would now speak of one of these matters, and later would introduce the other. The first related to the testing of Portland cement. Cement was a most important material, and one with which all engineers were dealing. Notwithstanding this, there were no modern specifications in the rules of the Society respecting the uniformity of test. The American Society had rules touching the subject, and he thought it would be well for the Canadian Society to follow their example. He, therefore, moved that a committee be appointed to investigate the matter, and to formulate uniform rules for testing cement, and to report results to the Council before the 1st of next October.

The motion was seconded by Mr. Dodwell and carried, and the following were appointed members of the committee, with power to add to their number: Messrs. Rust, for Toronto; McPherson, for Ottawa; Dodwell, for Halifax; Gutelieus, for Montreal; and Denis, for the West, with Mr. Jamieson as convener or chairman.

Committee on Testing.

Mr. Jamieson then stated that the other question referred to by him was that of what should be the weight of a standard barrel of cement. "At the present time," said he, "cement is sold both in barrels and bags, and these packages run in all sorts of weights. Some barrels are 325 pounds, and others 350 pounds, while American cement runs 375 pounds. In Canada, and also in America, the manufacture of cement in barrels is going out to some extent and shipment is taking place in bags. This variety in package and weight causes much confusion and no doubt quite a little loss, as light barrels will sometimes be delivered in place of heavy. The time has come when we should buy our cement exclusively by weight. If it were put up in 100-pound bags it would suffice. I move that this meeting instruct the incoming Council to memoralize the Government suggesting that cement should be sold in Canada as soon as practicable by weight."

Mr. Francis seconded the motion, adding that the Government had been an offender in this matter itself, and claiming that 100-pound bags would be most convenient. The motion was carried.

Mr. Skaife at this juncture made a short speech which created not a little merriment. He concluded by suggesting that, as the time had now arrived when the Society would require the services of a permanent secretary, the present board could not do better than to secure, if possible, the services of their present secretary, Prof. McLeod, for that purpose, providing that he could devote his whole time to the work of the Society.

Mr. Skaife's proposition met with the general approval of the members, judging by the manner in which it was received.

President Walbank's Address.

The report of the scrutineers was then received, and the announcement that Mr. W. McLea Walbank had been elected president brought forth prolonged cheering from the members. When the numbers of the ballots cast were announced it was shown that Prof. Galbraith, who was detained in Toronto through illness, had polled a tremendous vote. He had received 176 against 199 for Mr. Walbank, the total vote being more than twice as large as had ever been polled in the history of the Society.

Mr. Walbank, who, as chairman in the absence of Mr. Lumsden, was already in the president's chair, gave a short address. He said:

"Gentlemen of the Canadian Society of Civil Engineers,—I need scarcely tell you that I feel highly honored by being elected to the highest office in the gift of the Society. I assure you that I will use every endeavor to discharge my duties to the best of my ability, and I am sure that I will have the faithful support of the members of the newly-elected Council.

"I would like to appeal to the resident members of the Society to encourage the Council and its committees by attending the meetings and contributing papers and taking part in the discussions. If you do not do so you will soon find that the branch societies will take the lead, and the tail will be wagging the dog. I again thank you for the great honor you have conferred upon me, and I asuure you that I fully appreciate it."

The reading of the scrutineers' report was then continued. An interruption shortly occurred respecting the

manner in which the scrutineers for the Nominating Committee had reported, and they were asked to provide certain fuller details. During their absence votes of thanks were tendered everyone who had assisted to make the Convention interesting and enjoyable, among these being the Simplex Railway Appliance, Canada Car, Canadian Rubber and Street Railway Companies, the Railway Passengers' Association, the scrutineers, the Entertainment Committee, and the retiring president and Council.

The New Council.

After announcing the results of the election, as below, President Walbank declared the meeting adjourned:—

President—W. McLea Walbank.

Vice-Presidents—M. J. Butler, Phelps Johnson, and J. S. Dennis.

Council—Messrs. G. A. Keefer, Vancouver; D. McPherson, Ottawa; G. H. Duggan, Sydney; C. W. Dodwell, Halifax; C. H. Rust, Toronto; W. McNab, Montreal; W. F. Tye, at present in Mexico; E. V. Johnson, Ottawa; W. H. Breithaupt, Berlin; J. A. Jamieson, R. S. Lea and R. A. Ross, Montreal; G. J. Desbarats, Sorel; J. Kennedy, F. P. Gutelieus, W. H. Laurie, R. J. Durley, L. G. Papineau, J. Hardman, all of Montreal, and A. Dion, Ottawa.

Nominating Committee—For Ontario: C. H. Rust, C. B. Smith, M. J. Butler; for Quebec: Wm. McNab and H. R. Lordly; for North-West and British Columbia: J. S. Dennis; for Maritime Provinces: C. W. Dodwell; for Newfoundland and outside: J. Kennedy. Three past presidents also act on this committee.

Mr. W. McLea Walbank, the new president of the Canadian Society of Civil Engineers, is one of the best-known members of the Society in Montreal, and even in Canada. Mr. Walbank's name is familiar to thousands in Montreal who know nothing of his engineering connection. He has occupied such a prominent place in the city for many years past, more especially in connection with power projects, that scarcely a week passes without some reference to his name being made in the daily press. Mr. Walbank is Vice-President and Chief Engineer of the Montreal Light, Heat and Power Company.

About a mile above the outskirts of Montreal, along the St. Lawrence River, and just at the foot of the Lachine Rapids, there extends out into the stream a massive power-house, with its accompanying dam. This work will ever be connected with the name of W. McLea Walbank. It was he who took up the idea of developing power out of the Lachine Rapids—which had been spoken of as far back as the memory of the oldest inhabitant can carry—laid out the plans, promoted the enterprise, carried it to a successful conclusion, and afterwards managed it for some years as a going concern. It was in 1891 that he first entertained the idea, in 1896 it took form, and so quickly was the work carried out that in eighteen months thereafter the structure was complete. Notwithstanding the grave dangers which necessarily attend such an undertaking, carried on in the midst of a boiling cataract, not a man lost his life. There is a development of 12,000 H.P. in these works, though only 8,000 H.P. is being taken from them. After the completion of the project the company opened offices in the centre of the city and carried on a thriving business. The Montreal Light, Heat and Power Co. could not afford to let them continue in opposition, so, in 1903, after many months of negotiation, the big consolidation swallowed up the Lachine, with its auxiliary steam powers, the Standard and Citizens'. It cost them $190 cash for each share of the two million dollars worth of Lachine stock and some $400,000 for the auxiliaries. Mr. Walbank took office with the purchasing company; and, as may be supposed, the Lachine stockholders were well pleased with the profits from their investment.

While this undertaking was easily the most important carried out by Mr. Walbank, others which involved much skill and judgment were the inauguration of the sewerage systems of St. Gabriel and Montreal West.

Besides being one of the chief officers of the Montreal Light, Heat and Power Co., as already related, he is a director of the Provincial Light, Heat and Power Co., an account of whose undertakings in the Soulanges Canal appears in the February 1st issue of "The Canadian Engineer." He is on the boards of many other companies.

His connection with the Canadian Society of Civil Engineers extends back many years. He comes honestly by his present promotion, having been several times on the Council, and has also just completed a term as vice-president of the Society. He is president of the electrical section, and is on the Finance Committee of the Society, so that he is thoroughly familiar with its workings, and has already devoted much time towards placing it in its present position of prominence. He is a B.A. Sc. of McGill and a Provincial land surveyor, having been for years on the Board of Examiners of the latter, and being one of its past presidents.

Standing Committees.

A meeting of the newly formed council was held in the afternoon of the last day of the Annual Meeting, and the following standing committees were appointed:

Finance Committee: Phelps Johnson, chairman; H. Irwin, treasurer, and Messrs. W. H. Laurie, J. A. Jamieson and C. H. Rust.

Library Committee and House Committee: Wm. McNab, chairman; R. J. Durley, L. G. Papineau, R. S. Lea and W. H. Breithaupt.

The appointments as president and vice-president of the various sections were not obtainable up to the time of going to press.

The question raised by Mr. Skaife earlier in the day, at the final session of the Annual Meeting, concerning the appointment of a permanent secretary, has been left in abeyance, Prof. McLeod having consented to act in his former capacity in the meantime.

The following names were registered as being in attendance at the meeting:—

Montreal.—W. McLea Walbank, Ernest Marceau, Henry Holgate. L. G. Papineau, C. H. McLeod, Alcide Chausse, Geoffrey Stead, Lewis Skaife, J. W. Heckman, R. E. Hunter, J. A. Burnett, W. McNab, Thos. Kirk, E. A. Rhys Roberts, H. R. Lordly, E. A. Wallberg, R. S. Kelsch, E. S. Mattice, E. Fusey, Arthur Vincent, R. M. Hannaford, C. de B. Lephron, J. Ewing, Jno. B. Porter, J. Ls. Michaud, Wm. Kennedy, jr., W. Chase Thomson, Chas. S. Leech, Major Stuart Howard, H. Irwin, Jno. Kennedy, J. A. Jamieson, Wm. A. Duff, Jno. R. Barlow, H. P. Borden, B. I. Forrest, N. Hansen Green, Walter H. Francis, L. W. J. Haskell, N. L. Engel, D. E. Black, E. G. Burr, S. Barton Brown, V. V. Taylor, Prof. L. A. Herdt, H. F. McDonald, H. G. Pickard, Geo. E. Bell, Geo. N. Otty, O. H. Cote, J. W. Neilson, Robt. A. Ross, F. H. White, W. G. B. Brown, F. F. Griffin, C. O. Brennan, H. R. Ives, Robert Gardner, R. J. Durley, G. D. de Montague, Ernest Belanger, Geo. Holland, A. Bromley Smith, J. L. Carnegie, J. Warren, G. Fiset, Jas. S. Costigan, J. B. Harvey, G. E. McCuaig, C. N. Coburn, A. T. Spencer, L. A. Disy, C. N. Monsarrat, P. B. Motley, S. Blumenthal, E. O. Temple Piers, Jos. Rielle, J. A. U. Beaudry, A. F. Bigers, M. Beullac, R. S. Lea, Alex. A. Belanger, N. Cauchon, A. Stansfield, F. E. Came, T. A. Morrison, E. G. Quirk, F. J. Gilman, N. S. Pedley, N. J. Slater, Chas. Hosten, E. Brown, E. S. Holloway, L. B. Kingston, Harry M. Lamb, Hugh A. Lumsden, Phelps Johnson, Fred. G. Smith, Fred. G. MacLeod, J. G. Campbell, Jno. J. Macnab, J. G. Wheaton, H. S. Poole, Arthur Massey, N. Hanson Greene, W. M. Edwards, F. P. Shearwood, J. G. Dickenson, G. H. Garden, J. Ewing, J. A. Jamieson, E. G. M. Cape, R. M. Wilson, H. M. Mackay, M. A. Sammett, R. H. Balfour, S. F. Rutherford, H. J. Borden, H. C. Kennedy, Paul C. T. Dumais, H. M. Haughton, W. J. Camp, S. B. McConnell.

Quebec Province.—Sorel, Que., G. J. Desbarats; Shawinigan Falls, Que., T. S. Scott; Paspebiac, Que., J. V. Nimmo; Farnham, Que., N. D. Walker, R. F. Alexander; Lachine, Que., F. Dupont; St. Hyacinthe, Que., H. Dessaulles; Melbourne, Que., H. B. Aylmer; Richelieu, Que., H. B. Pope; Buckingham, Que., Thos. Simmons; Quebec,

Thos. Breen, Louis A. Vallee, A. Leofred, W. D. Baillairge, E. A. Hoare.

Ontario Province.—North Bay, Ont., G. A. McCarthy, R. T. Gough; Kingston, Ont., L. W. Gill; Berlin, Ont., W. H. Breithaupt; Stratford, Ont., J. D. Barnett.

Alberta.—Frank, Alberta., T. A. MacLean, jr.

Ottawa.—Messrs. Hugh D. Lumsden, R. Bickerdike, jr., Pierre Chartoy, Karl Weatherbe, J. B. Spence, C. H. Pimbey, Geo. Mountain, Ormond Higman, H. Davy, H. W. Jones, C. L. Coutlee, R. F. Uniacke, J. J. Collins, Wm. P. Anderson, F. W. Cowie, A. A. Dion, Arthur Ames, Duncan MacPherson, M. F. Cochrane, M. J. Butler, E. E. Perrault.

Toronto.—C. B. Smith, C. W. Dill, G. B. Ashcroft, A. Gibson, C. H. Rust, Norman McLeod, C. H. Mitchell.

New Brunswick.—St. John, N.B., Guy Dunn, Horace Longley; Woodstock, N.B., Guy R. Ballock; Chatham, N.B., Geoffrey Stead.

Nova Scotia.—Halifax, N.S., C. E. W. Dodwell, Alfred A. Putnam; Bridgewater, N.S., C. G. Henry.

VARIABLE SPEED ELECTRIC DRILLS.

Through the courtesy of the Armorduct Manufacturing Company, London, England, we are enabled to show three illustrations of a very useful electric drill, which has been named by the manufacturers the "Little Hustler." This machine is finding favor where the use of stationary machines is impossible, and it is at present being used in shipbuilding yards, dock yards, machine shops, motor car work, and in many other places where manual labor has been found too costly. A feature of the drill is that it is adjustable to three speeds. With the majority of tools of this class the motor is constructed as a series-motor, which in working under varying loads means a considerable waste of energy, while other variable speed machines are con-

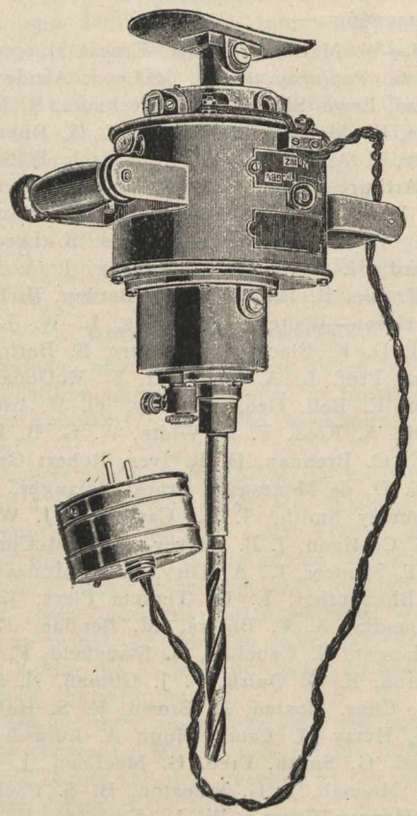


Fig. 1.—The "Little Hustler" Electric Drill.

structed on the out-of-date "put-in-resistance" method, which again means waste, and with such tools it is often found, where the full power of the motor is required, that the tool refuses to work.

The motor of the machine under notice is a shunt-wound motor, and gives its full power on the different speeds; the latter are obtained entirely by the agency of a special gear, there being no waste of energy in any direction. The arrangement of the gear is such as to make steel work on bronze throughout. The bearings are very substantially made, and the bore pressure is absorbed by ball-bearings. Both motor and gear are totally enclosed. For the purpose of reducing the weight of the tool all non-magnetic parts are made of an aluminium alloy. The carbon brushes of the collector are self-adjusting, and the machine, as shown in the cut, is provided with a breast-plate

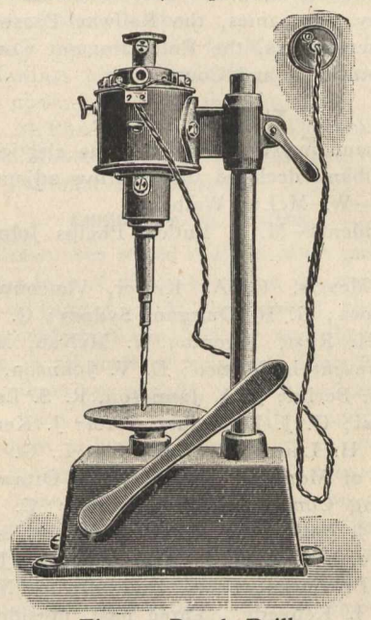


Fig. 2.—Bench Drill.

and two handles. The switch is actuated by the thumb of the right hand, and so fixed as to make it unnecessary for the operator to relax his hold of the tool when starting and stopping.

The plug-top, which is attached to the flexible cord, contains an ingenious overload device in the shape of a maximum cut-out, adjusted to a given maximum current

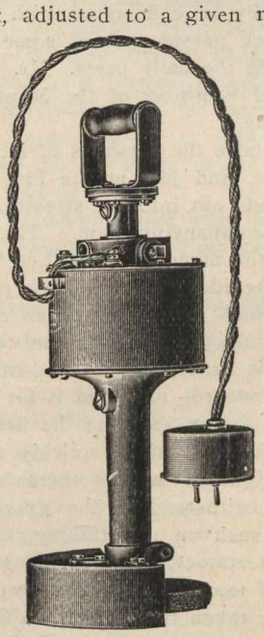


Fig. 3.—Hand Grinder.

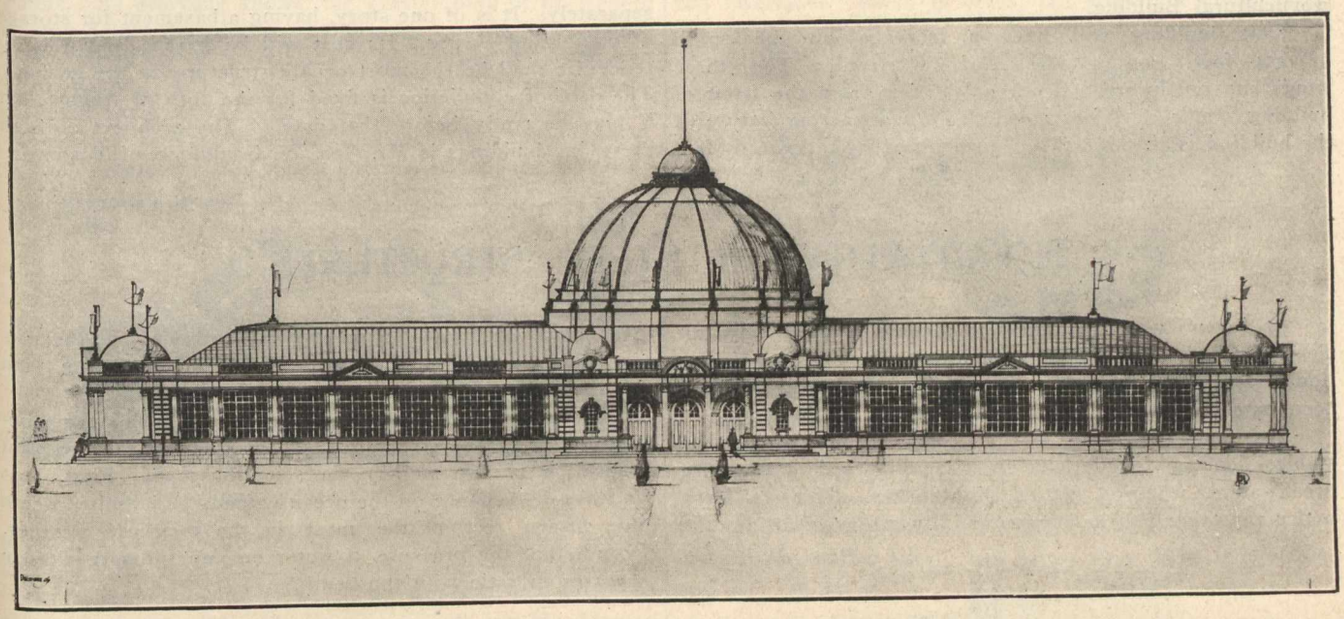
and which in case of overload stops the tool, which automatically restarts when the boring pressure is reduced to normal. The makers claim that with this simple device it is impossible for the motor to burn out, making the tool absolutely "fool-proof." For the purpose of taking the weight of the tool off the operator's hands, shoulder straps can be attached to a small eye-bolt, which is fixed to the tool for this purpose.

CORRESPONDENTS FOR THE "ENGINEER."

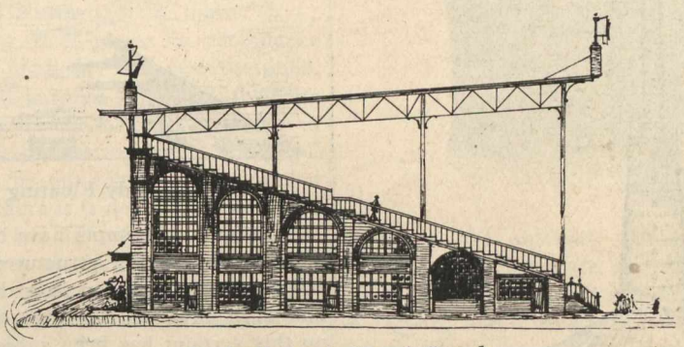
Correspondents for the weekly edition of the "Canadian Engineer" are wanted in every town in Canada. Descriptions and illustrations of notable construction works specially welcome. Copy should reach the Toronto office by Tuesday morning. Papers mailed to subscribers Thursday evenings.

TORONTO EXHIBITION NEW BUILDINGS

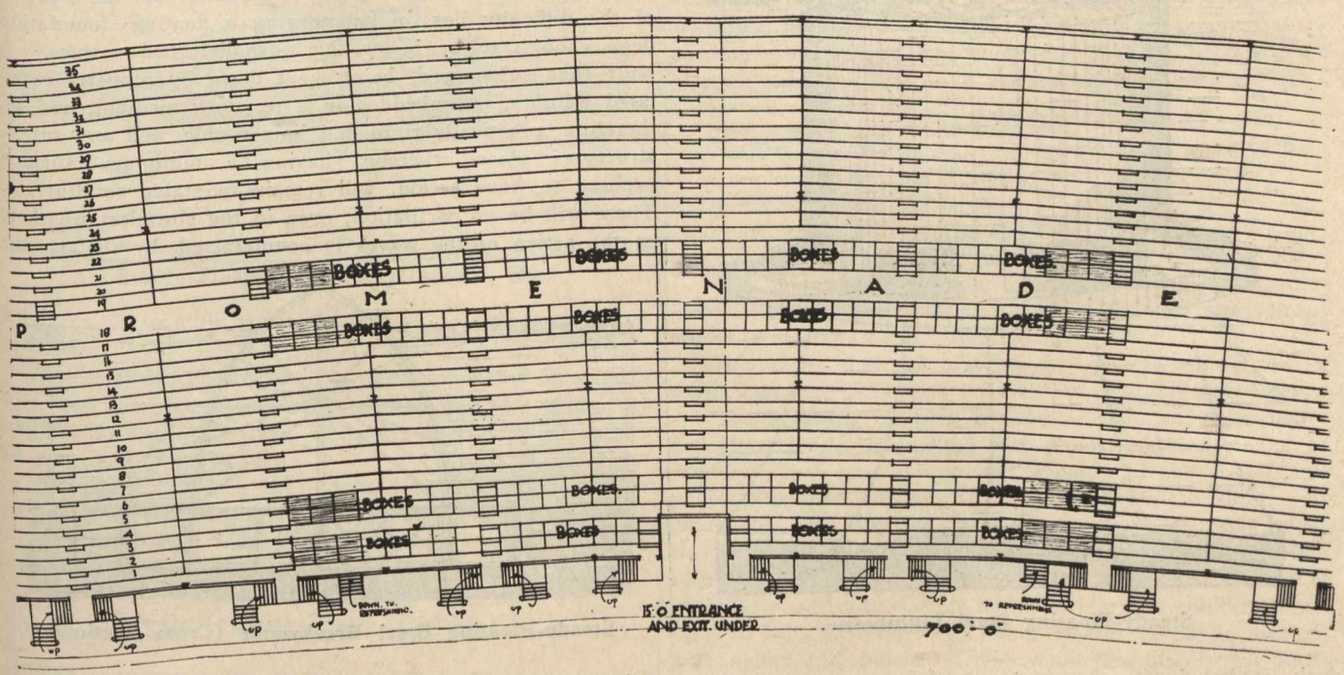
Through the courtesy of the architect we are able to give our readers some illustrations of the new and handsome Horticultural Hall of the Toronto Exhibition, and of the substantial fire-proof structure which will replace the grand stand, burned some months ago.



Front Elevation Horticultural Building.



End View of Grand Stand.



Plan of Grand Stand.

Grand Stand.

The stand will be crescent in shape, one story high, enabling every individual to see perfectly the proceedings in front of it. The dimensions are 700 feet in length and 113 feet in depth. The height at the rear will be 54 feet, and in the front 60 feet, and it is to have seating capacity for fifteen thousand. The construction is entirely fire-proof, of steel, reinforced concrete and brick. There will be three entrances fifteen feet wide, from the rear to the front under the stand. These will be on an incline easy of access. Provision is made for 72 boxes, which will be enclosed by wrought-iron

railings. The steps to the staircases will all be of iron. Toilet rooms will be arranged under the stand, access to which may be had from the passageways entering from the Park.

This stand, it is claimed, will be the largest and most complete stand on the North American Continent, and will cost complete $217,000, and is to be finished entirely on or before the 10th day of August next.

Horticultural Building.

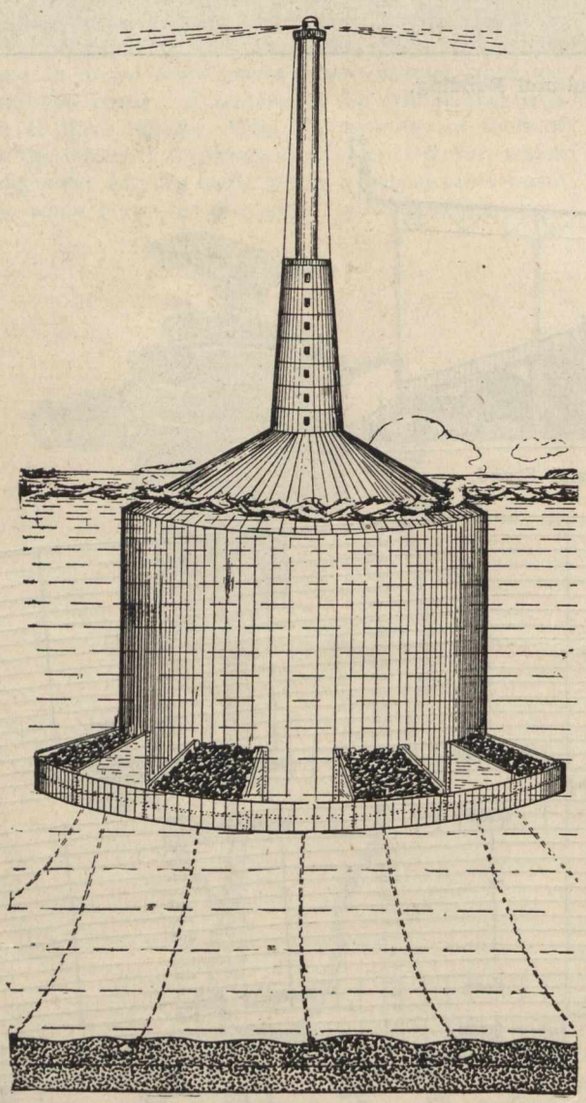
This building will have a frontage on the south of 254 feet, and a width of 58 feet. The three wings run northward a depth of 156 feet from the front of building, and are 58 feet in width. An attractive feature of the building is that it will be surmounted by a dome 65 feet in diameter by 70 feet high, to be constructed of steel and wired glass, and the ribs arranged for receptacles for electric lighting, so that a magnificent electric effect may be had in the evenings.

The building will be constructed of steel, pressed brick and cut stone, the floor throughout of cement construction. Ample toilet accommodation is provided for male and female separately. It is of one story, having a basement for storage of plants and shrubs. Its cost will be $90,000, and it is intended it shall be the most ornate structure on the grounds. The date of completion is fixed for the 10th of August, but it may be ready before that date. The architect of both these fine buildings is Mr. Geo. W. Gouinlock, of Toronto.

STEADY-FLOATING STEEL STRUCTURES

An invention that is likely to modify in many ways all classes of marine structures, and that promises to revolutionize the present practice in naval warfare, has recently been patented in all the civilized countries of the world.

This new system of marine construction will provide stable, floating foundations in wave-disturbed waters for breakwaters, wharves, jetties, lighthouses, defensive forts, and many other marine structures. By means of an annular

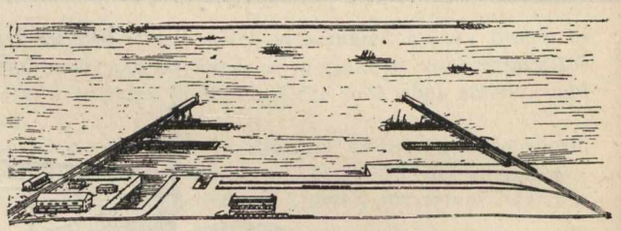


Steady-Floating Steel Lighthouse.

deck, equipped with the most powerful guns, supported on a steady-floating foundation, and, therefore, possessing great rapidity of fire, a new system of coast defence is given, calculated to render the approach of hostile fleets to harbors and shore lines practically impossible.

The inventor is a Los Angeles, California, man, William Edward Murray. Mr. Murray worked for a considerable time before arriving at a satisfactory solution, but the success which promises to follow his efforts has more than repaid him for the time spent.

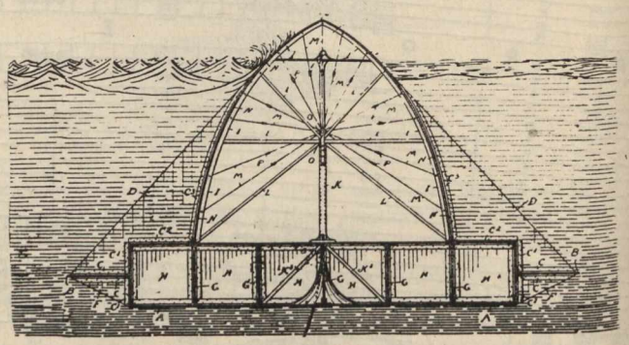
The principle on which the Murray steady-floating foundations for marine structures is based lies in the practical application of two well-known scientific laws. First, that the wave-disturbance on the ocean extends to a limited depth only, fifteen feet at the most in the roughest weather. Second, that the pressure of water on any submerged body increases in ratio with the depth.



Steady-Floating Railroad Terminal.

Numerous attempts have been made in the past to secure stability in floating structures. These attempts have been failures for the reason that the bulk of the immerged body has been invariably left in the wave-disturbed water, and on this account has been subject to the action of the billows.

It remained for Mr. Murray to discover that the solution of the difficulty lies in submerging a floating foundation deep enough to be below the wave-disturbed surface. A body thus submerged, being kept down by properly regulated weights, is embedded in a resisting medium, and is, therefore, practically rigid and immoveable, and any superstructures placed thereon, having a minimum surface exposed to wave action, will remain in stable equilibrium. There will be no oscillation, even in the stormiest weather, as the action of the waves is counteracted by the strong



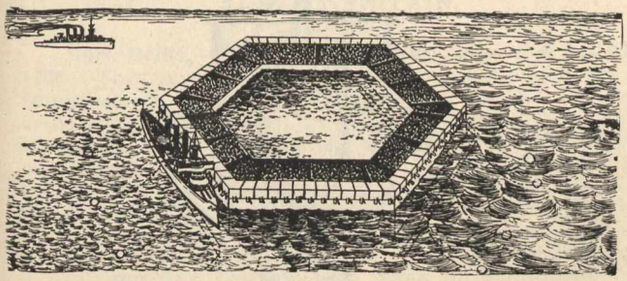
Steady-Floating Steel Breakwater (Cross Section).

resistance of the larger portion of the structure, which is immerged in the still and immobile waters.

Naturally, one might think that these floating structures would have to be sunk to a great depth, but by means of a broad, projecting flange Mr. Murray has rendered this quite unnecessary, as it would take a great pressure to move this flange, either up or down, in the dense water in which

it is placed. At a depth of from 40 to 50 feet, at which depth the water is dense and motionless, these floating foundations provide a stable platform, which gives perfect steadiness to the superstructure, irrespective of the wave action at or near the surface of the water.

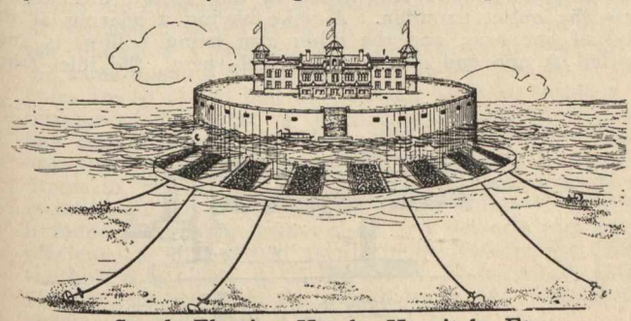
The same principle upon which these foundations are based is found in the iceberg, encountered in sub-Arctic waters. As everyone knows, the greater bulk of an iceberg is sunk below the surface of the water, and in consequence of this bergs act in directly the same manner as the Murray steady-floating steel breakwaters will act, sitting, as they do, unaffected by the storm-tossed ocean, and very often affording a shelter to ships. Icebergs that have a high pinnacle represent the steady-floating lighthouse, towering



Steady-Floating Steel Coaling Station.

up to probably a height of 200 feet, but having the greater part of their mass under water. We hear some one say: "But the iceberg drifts in whichever direction the wind and storm like to take it." This is true enough, but Mr. Murray has provided for this by a system of weights and anchorage, which will keep the structures within certain limits.

The structures are built of steel plates in accordance with present-day shipbuilding methods, and are designed, as are ships, to suit the special purpose for which they are intended, the conditions under which they are to be used being carefully considered. Their construction is not at all complicated, and, as they may be put together in sheltered waters and towed to the point where it is desired to use them, the work is neither dangerous nor difficult, as is often the case when solid marine structures are built, since they must necessarily be constructed in position. It is also possible to place these steady-floating foundations at points where it



Steady-Floating Hotels, Hospitals, Etc.

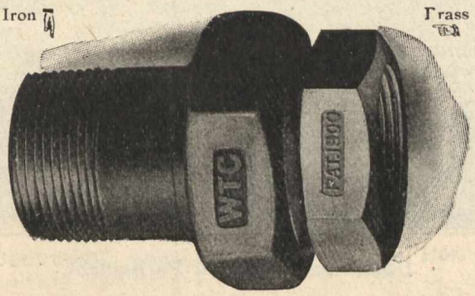
is impossible to build marine structures according to known methods.

The cost of construction has been estimated very carefully, and compares quite favorably with the cost of present methods in shallow waters, while for use in deeper waters the cost is very much less.

The uses to which these foundations may be put are too numerous to mention here, suffice it to say that they may be used for almost all kinds of marine work where it is desired to secure a steady foundation in the water.

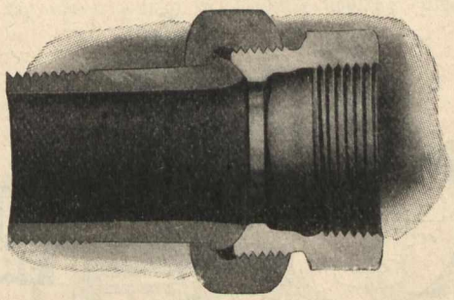
THE "KEWANEE" UNION.

The union herewith illustrated will undoubtedly appeal to the steamfitter, the plumber, and the gasfitter, together with many others who have to do with the making of pipe joins. Being a male and female union, it is a great improvement over the ordinary union, which is female at both ends. In using unions the connection is nearly always made with a tee, elbow, valve, or some fitting having a female opening, and consequently, when the ordinary union is used, a suitable nipple has also to be used. When the "Kewanee" union is used no nipple is necessary, since one end is male, and can be screwed directly into the fitting, and where any amount of work is being done this means a considerable saving. Of course when called for, these unions are supplied with both ends female. As one end of the "Kewanee" union is brass, the joint is brass to iron,



which ensures a tight joint without the use of a gasket. It also has a ball seat, so that if the pipe is somewhat out of alignment the joint will be tight. Again, as the brass and iron parts are screwed together there is no possibility of the threads rusting together, so that they may be disconnected and connected an indefinite number of times.

Before leaving the factory each union is tested by compressed air, under water, and before they leave the factory



they must be air-tight. The Western Tube Company, of Kewanee, Ill., who are the manufacturers, state that they made some tests in connection with the time lost by a man in cutting and fitting a gasket, and found that this time, together with the cost of the rubber used was more than the difference in cost between the "Kewanee" and the regular malleable union. The company invite correspondence regarding these unions, and upon receipt of ten cents will be pleased to send a sample to anyone who is interested.

PROPOSED PROCESS OF TREATING COBALT ORES.

Anson G. Betts.

It is common report that the treatment of ores from Cobalt is a difficult problem. The following suggestions might be useful to those interested:

It appears that the ore can be melted down to a speiss and that the speiss can be roasted to eliminate arsenic.

The resulting mixture of cobalt, nickle and iron oxides and silver could be smelted with galena and soda ash, to produce silver lead bullion, and a matte of the double sulphide of sodium and cobalt or nickle. While a single sulphide, like iron sulphide, may contain much lead and silver, we found in working on lead reduction * that the double sulphides of iron and sodium are readily fusible, and hold practically no lead. Cobalt and nickle are so similar chemically to iron, that the same thing would probably happen with nickel and cobalt. These show less affinity for sodium sulphide than iron, but will probably make some combination.

The chemical reaction in the lead smelting process approximates to this equation:

$$Na_2CO_3 + FeO + 2PbS + 3C = Na_2SFeS + 2Pb + 4CO$$

* U. S. patents 816,773; 821,330; 816,772.

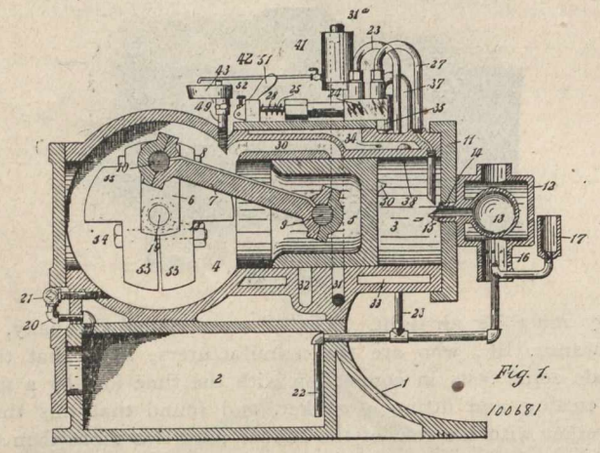
INTERNATIONAL PATENT RECORD

Dominion Houses of Parliament.

CANADIAN PATENTS.

Specially compiled by Messrs. Fetherstonhaugh, Dennison and Blackmore Patent Attorneys Star Bldg., 18 King St. W., Toronto; Montreal and Ottawa.

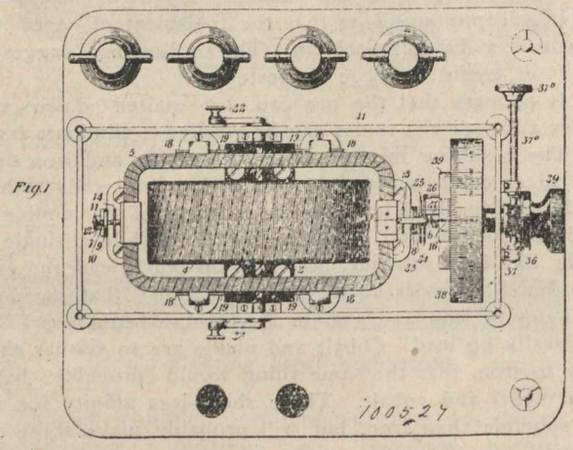
Oil Engine.—A. E. Whitehouse.—100,681.—The invention consists essentially of a cylinder and crank-case forming an air-tight casing and an air-tight oil reservoir. A carburetter is attached to said cylinder, and a wheel governor



100,681.

actuated oil-pump is arranged in communication with said cylinder. The piston operating in the cylinder compresses the air in the crank-case, and the said compressed air forced oil from the reservoir to the carburetter and oil pump.

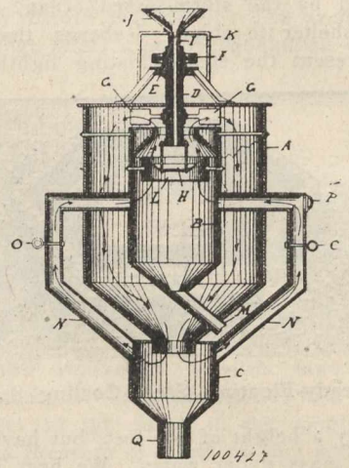
Electrical Measuring Instrument.—Canadian Westinghouse Co.—100,527.—The invention consists essentially of a stationary coil, a movable coil mounted on knife-edge bear-



100,527.

ings in inductive relation to said stationary coil, and having a pointer thereon, a movable scale secured to an arbor, spiral springs forming a communication between said arbor and said movable coil, and actuating the said scale, and a stationary index adjacent to said movable scale for taking readings.

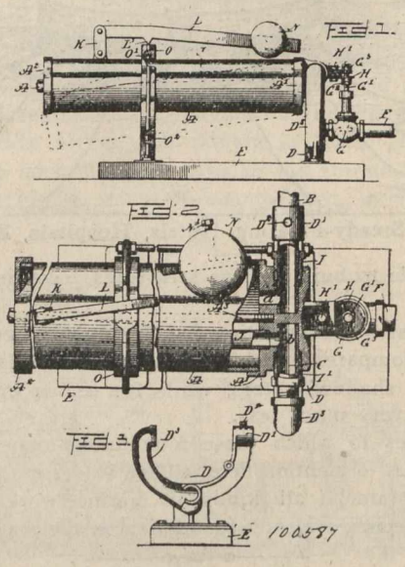
Air Separator.—C. S. Emerick.—100,427.—The above invention is designed for the purpose of separating particles of dust or dirt from a jet of air, precipitating the dust and



100,427.

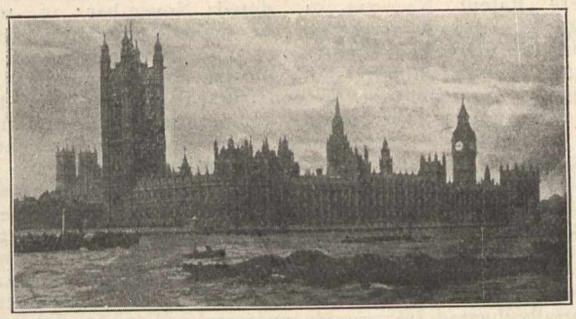
allowing the cleansed air to escape. The invention consists essentially in the arrangement of an outer casing, an auxiliary casing at the bottom or outlet, an inner casing within said outer casing, and communicating pipes from said auxiliary casing to said inner casing, a rotary discharge plate in said inner casing adapted to distribute the heavier particles. and a baffle plate to retard the said distributed heavier particles.

Steam Trap.—E. J. Ryan.—100,587.—A cylindrical vessel having hollow inlet and outlet trunnions on which one of the heads of the said vessel is mounted to swing. The inlet trunnion is connected with a steam supply pipe, and a pipe extends lengthwise in the vessel, discharging into the outlet trunnion. A yoke having a bearing at the end of one arm, and the other arm being hollow is supported at one end of the cylindrical vessel, the inlet trun-



100,587.

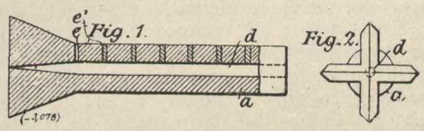
nion being secured in said bearing, and the outlet trunnion screwing at its outer end into the said hollow arm. A discharge pipe is connected with the hollow arm of the yoke, and a valve is arranged in said pipe connected with the pivotal end of the vessel, the pressure within the vessel being exerted on the top of said valve to assist in holding it to its seat.



British Houses of Parliament.

GREAT BRITAIN.

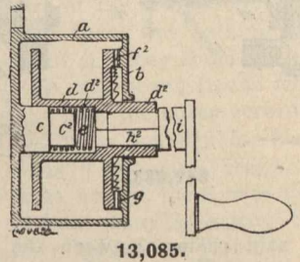
Rock-Drills.—B. H. Locke, New York, U.S.A.—23,078, 1906.—This invention relates to the construction of drills employed in power-driven machines, such as electric drills, and in which provision is made for carrying a stream of air or water through the drill stock to be discharged at or near the bottom of the hole being made by the drill for the purpose of stirring up and facilitating the ejection of the mud. Such drills are provided with longitudinal axle-bores or channels which terminate in, or close to, the drill-head. In sharpening the drills such a hole is closed, and provision must be made for re-opening it. It is also found that such a hole is liable to be plugged by a fragment of rock driven into it under the action of the drill, so that the passage of the stream of air or water is prevented. The object of this invention is to overcome these difficulties, and to provide means for admitting the stream of water or air at a point near the drill face, which shall not be liable to be rendered inoperative by plugging, shall not be closed in the process of sharpening, and shall not



23,078.

require attention, except the removal of a plug during successive resharpenings. In accordance with the invention, the drill stock **a** is provided with a longitundinal channel **d,** which is connected at the extremity of the drill stock, or at any suitable point, with a supply of air or water under moderate pressure, for the purpose of stirring up and facilitating the discharge of the mud from the hole being drilled. At frequent intervals along its length, back of the drill-head, the channel **d** is provided with lateral holes or openings **e e1,** the same opening through the side of the drill stock. These holes are so placed that one of them shall be within a short distance of the spread of the drill occasioned by sharpening, and this opening is left free, while the openings above it are plugged temporarily with small wooden plugs lightly driven in. In the use of the drill the stream of air or water issues from the hole **e** nearest to the drill-head **c,** where it is found the issuing stream of air or water acts with as much efficiency as if it issued axially in the face of the drill. If the hole **e** is closed when the drill is resharpened, then the plug is removed from the next hole, as **e1.** (Accepted November 28, 1906.)

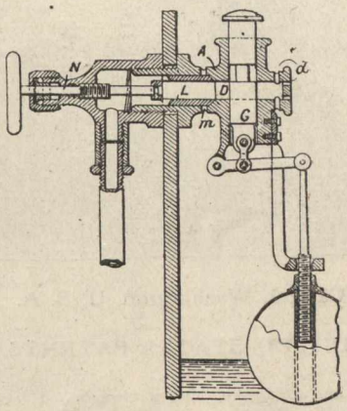
Hoisting-Gear.—Veritys, Limited, London, and F. S. Worsley, Erdington.—13,085, 1906.—This invention comprises an improved hoisting-gear particularly applicable for raising and lowering arc lamps, and for application to the interior of the lamp-post. The casing **a,** closed by a cover **b,** carries an outstanding cylindrical boss **c** upon which the



13,085.

hollow rope-winding drum **d** takes a bearing. The winding-drum also carries a cylindrical boss **d2** journalled in a hole within the cover **b.** The cover forms ample bearing for the winding-drum at the particular end, and by its removal the gear can be easily taken to pieces and to renew the broken parts. The cylindrical boss **c** has a smaller diameter **c2,** around which within a cavity of the rope drum **d,** is a spring **e** in compression, which bears at one end against the shoulder, and at the other against the drum, its tendency being to force the drum on its axis towards the lid or cover. The drum **d** is bodily slidable within the casing **a** upon its bearings, and has upon the outer surface of its outer flange a ring of teeth **f2,** which are adapted to engage with a similar ring of teeth **g** upon the cover **b.** Instead of a ring of teeth on the cover, a single tooth, or a number of teeth, may be employed. The two sets of teeth are normally pressed into engagement with each other by the spring **e.** The drum **d** has the usual socket for the shank **h2** of a detachable handle **i.** On winding, the handle is turned as ordinarily and the ratchet teeth of the drum slip over the teeth on the casing, and on releasing the handle the ratchet teeth will automatically interlock and check the tendency to unwind. When it is desired to unwind, viz., to lower, the handle is pressed inwardly, against the action of the spring **e,** which disengages the teeth on the drum from the teeth on the casing. This inward pressure of the handle is maintained whilst the handle is turned in a direction to unwind.

Controlling Boiler-Feed.—W. C. Lee, Hornsey.—10,301, 1906.—This invention relates to that type of apparatus for automatically controlling the working of boiler-feed pumps, injectors, and the like, wherein a float-operated piston permits the passage of steam from the boiler to the injector when the level of the water in the boiler falls below a certain point, and thus serves to maintain the level of the water in the boiler constant. The object of this invention is to provide improved apparatus of this character, and consists in a particular construction, wherein the tubular fitting **A** (which is connected with the feed-pump) is provided with a steam inlet **d** in the same plane as the fitting, the inlet **d** being separated from the feed-pump by a grooved plunger valve **C,** which works in a plane seating intersecting the



10,301.

tubular fitting, such construction providing a straight through passage for the steam when the valve **C** is in the open position. The invention also consists in the employment of means whereby, in the event of the holes **d** becoming stopped up, or the valve **C** becoming accidentally fixed in a position to close permanently or obstruct seriously the passage of steam, steam nevertheless may be passed in regulable quantity to the feed-pump or injector. For this purpose a sleeve **L,** open at both ends, is fitted to work in the bore **D,** this sleeve being normally seated against a shoulder at the inner end of the bore **D,** in which position it closes lateral openings **m** provided in the wall to the fitting **A.** The sleeve **L** is capable of being retracted outwards so as to uncover said openings, and allow steam to pass through them into the bore **D** between the valve **C** and the inner end of the sleeve, through which latter the steam passes to the feed-pump or injector. To enable the sleeve **L** to be moved as required, it is connected to a spindle **N.**

Rail-Anchor Chairs.—A. J. Dale, Bristol.—4,829, 1906.—This invention relates to anchor-chairs for the support of rails, and has for its principal object to provide a bed for the adjoining ends of sections of rails which at the same time affords means for their rigid connection and for permitting their alternate expansion and contraction. According to this invention, a chair support **a** of an undulating or wave section is provided, and such that the upper parts thereof may support the rail sections **b** beneath the bottom flange **c** thereof, and being, preferably, of a greater width than the bottom flange **c,** so that the edges of the bottom flange may be clamped to the chair support **a** at the upper parts contiguous with the rail **b,** which part is advantageously provided flat so as thus to permit of the rail being firmly bolted to the chair support at those parts. Such a chair support, it will be understood, may be wrought or cast of steel or iron, and in its preferred form is provided of a

substantially **W** section, yielding three points of support to the rail, the central point being at or about the point of meeting of the respective sections of rail. The section may, however, be any other corrugated section. The clamping-plates **d** provided upon the top of the rail bottom flange at

Fig. 1.

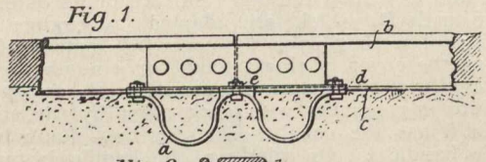
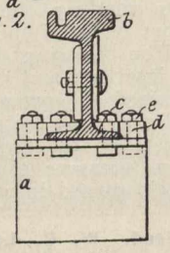
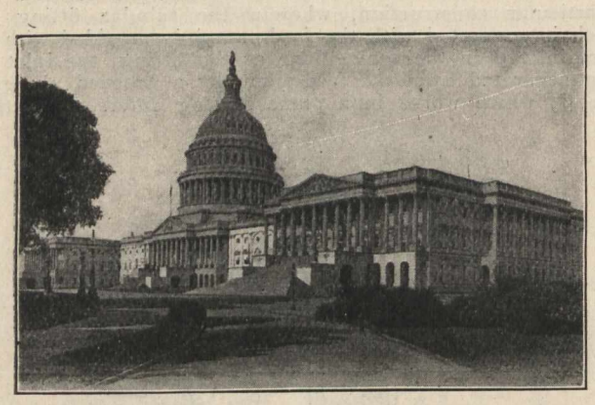


Fig. 2.



4,829.

each side are provided with their central portions extended so that a bolt **e** may be passed through the plate **d** and the chair support **a** beyond the edge of the rail bottom flange **c**, while at each end the clamping-plate is directly bolted through the rail bottom flange.

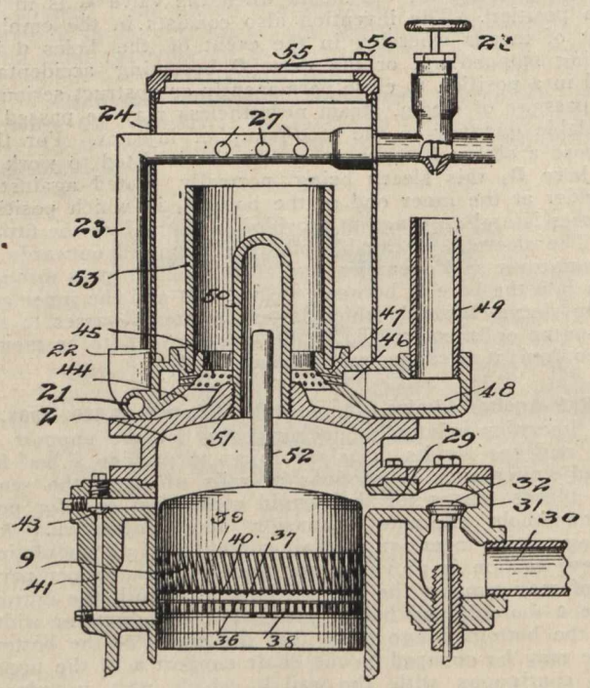


Capitol, Washington, U. S. A.

UNITED STATES PATENTS.

Specially selected and abridged by Messrs Siggers and Siggers, Patent Attorneys, 918 F. Street. N. W., Washington, D.C., U.S.A.

Incandescent Igniter for Gas-Engines.—Charles A. Anderson, Erick A. Erickson, and John Wickstrom, Chicago, Ill.—842,607, 1907.—This invention relates to improvements



842,607.

in gas-engines, and relates more particularly to improvements upon that type of engine shown in United States Letters Patent No. 714,352, dated November 25, 1902. Among the salient objects of the present invention are to provide an improved construction and arrangement of the ignition devices whereby the explosive charges are fired, to provide an ignition-tube so constructed and arranged that it is maintained at the required temperature by heat derived from the explosive charges after it has been initially heated, to provide in conjunction with an ignition-tube means for displacing the contents of the tube so as to ensure a more certain firing of the main charge and at the same time to effect such a displacement by means of a heated plunger, which operates to effect the ignition of the charge with greater certainty and uniformity, to provide improved details of construction and arrangement whereby the ignition-tube is initially heated, to provide an improved construction for effecting the transfer of the compressed charge from between the pair of co-operating pistons to the explosion-chamber without passing the gas over the surface of either piston, thereby avoiding the deposit of carbon upon the cylinder and maintaining the cleanliness of the latter, and in general to provide improvements in the details of construction and arrangement in an engine of the character referred to. It consists of a cylinder, a power-piston, and a transfer-piston reciprocating therein, an ignition-tube closed at one end, and communicating at its other end with the interior of said tube carried—said transfer-piston and placer-plunger of substantially smaller cross-section than the interior of said tube carried by said transfer-piston and adapted to enter and be withdrawn from said ignition-tube as said transfer-piston reciprocates, and means to move said transfer and power pistons in such a manner that when said power-piston is at its limit of inward movement in said cylinder said transfer-piston has accomplished part of its outward movement, whereby said displacer-plunger has completed part of its out-stroke.

Steam Turbine.—Simon Cook, East Akron, Ohio.—842,083, 1907.—This invention relates to steam-turbine wheels; and one of the principal objects of the same is to provide a turbine-wheel of simple construction, which will operate economically, and which is composed of few parts, and which will operate efficiently in either direction. Another object of my invention is to provide a turbine-wheel which may be operated by means of steam, water, hot air, or other power, and which can be quickly reversed to rotate in opposite directions. It comprises a casing, an intermediate rim

Fig. 1.

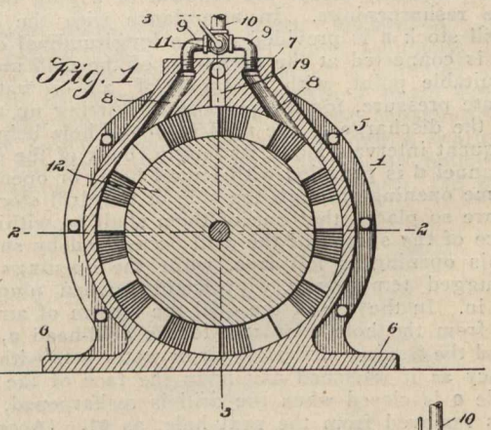


Fig. 2.

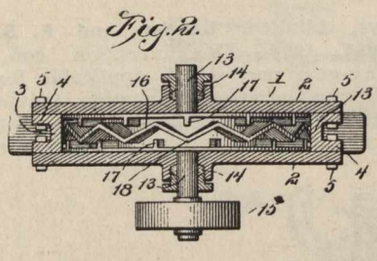
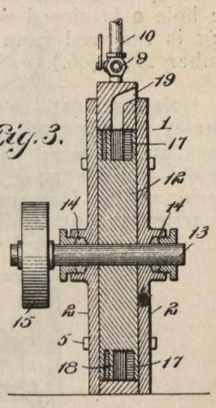


Fig. 3.



842,083.

extending around said casing between the cylinder-heads, and provided with outwardly-converging openings, a branch pipe fitted to said openings, an inlet-pipe, and an intermediate valve for placing the inlet-pipe into communication with either of said diverging openings, a rotary piston mounted in said casing, said piston provided with a zig-zag flange, and oppositely-located inwardly-extending alternately-arranged abutments.

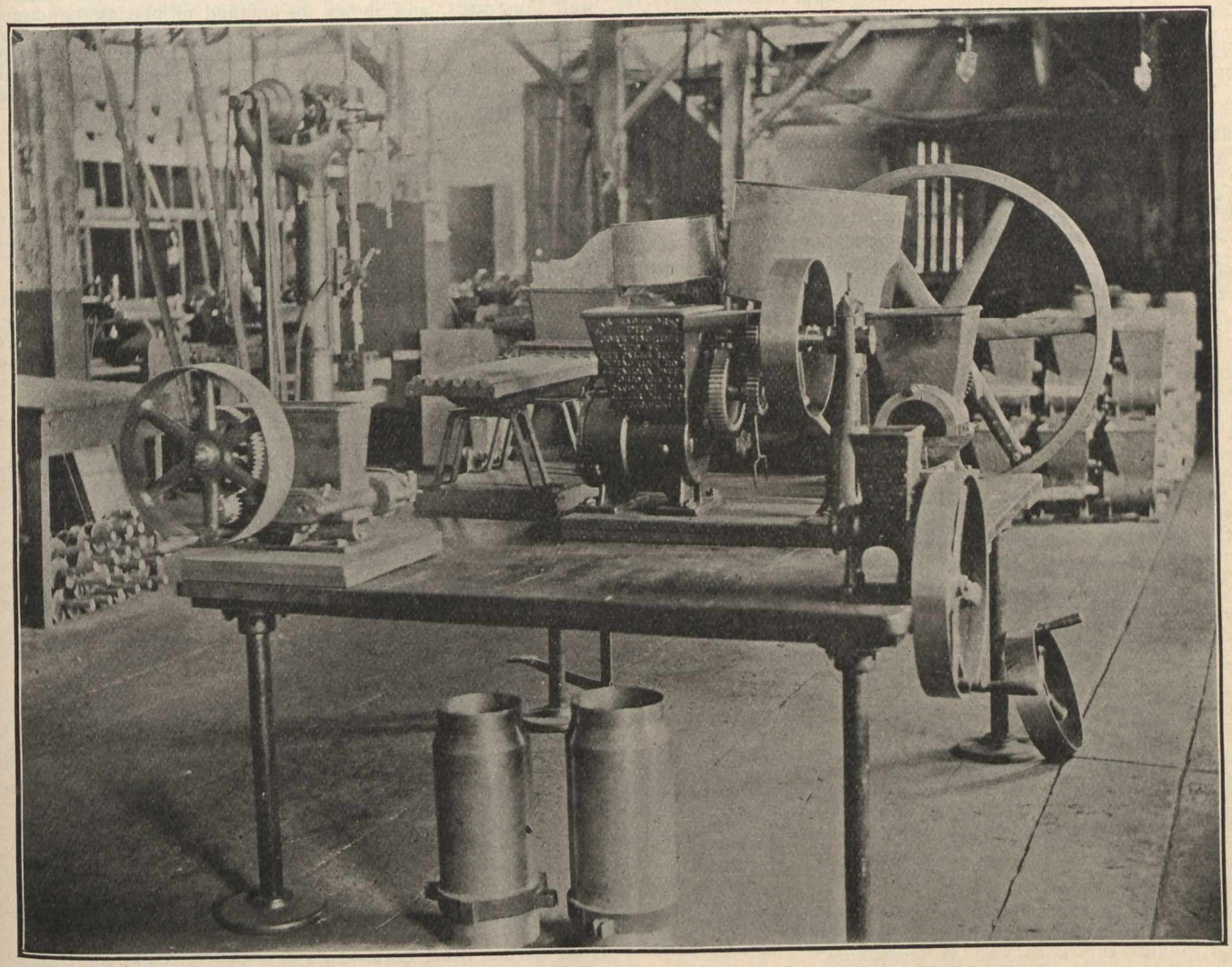
THE FOUNDRY CORE ROOM*

By Geo. H. Wadsworth.†

From personal observations of the writer, the majority of core rooms have but very little attention whatever given them from the principal heads of the foundry departments. A great many core rooms in times gone by were located in some out of the way place, or in some dark corner where it was a hard job to find them at all. This applies principally to small jobbing foundries, and we must give credit to modern foundries which have been built within recent years, and in which we can say that the core rooms are as well taken care of as regards room, light and equipment, as any other part of the foundry. But there is still room for improvement in a great many modern core rooms by necessary to go to the pattern shop to have new core boxes made before the casting could be poured.

Then, again, core boxes become worn, and how many core makers know enough to report to their foreman the wearing out of shape of a core box. Very few, and until some castings are lost by having them rejected by the machine shop, very little attention whatever is ever paid to the matter.

Customs are now changing. Since the installation of core room machinery our core makers are getting more familiar with it and how to take care of it. How did this come about? We all know that in a machine shop custom



A Modern Core Room.

the installation of core room equipment and appliances, and the giving of the necessary care and instructions, as well as in any other part of the foundry.

In times gone by there was nothing to take care of by the party in charge of the core room but the mixing of the sand, the care of the core boxes (made from either iron or wood) and the making of the cores according to the orders received by him from the foundry foreman every day. It was "Get these ready for to-day's heat." How, why, or wherefore, as long as he got them, was never taken into consideration. And how many who have charge of foundries have had their coremaker foreman report a loss of half a core box, or sometimes a whole core box, making it

educates boys to use the oil can and take care of the machines they are operating, and this is just as necessary in a core room. Was it done when core machines were first being introduced in the core room? I say no. I have personally gone into a core room after a machine had been installed and found it had never been oiled since it was received, and when an oil can was asked for it would take from fifteen to twenty minutes to find one, and when found the probabilities are that the oil would not be fit for use. But times are changing. When the men and boys take as much care of their tools and equipment in the core room as is the case in the machine shop, core machines and equipment will last considerably longer and will give a great deal more satisfaction, and it will certainly educate the core makers to have a more observing mind.

The oil can has been merely used as an example to show that small things have not been taken into consideration in the core room. Now, if so little attention is given to small

*A paper read before the New England Foundrymen's Association, Boston, February 13th.

†Superintendent Falls Rivet and Machine Company, Cuyahoga Falls, Ohio.

matters, how much is given to the larger ones which are much more costly. Core making machinery and equipment is becoming more generally used every day, and from the building of one type and operating of same, which machine made cores from ⅜ in. to 1½ in., we have to-day five different sizes and types of machines, which all originated from the ⅜ in. to 1½ in., which is generally known as the sausage-stuffing type. This machine was built and put on the market about August, 1901. The same machine was afterwards increased in size and became a standard at 2¼ in. for two or three years, until the writer designed and built a machine to make up to 5 in., for which he afterwards made larger dies and increased it to 7 in. At that time it was supposed that this would have to be a power machine, but we will be pleased to demonstrate to you gentlemen to-day the making by hand of a 7 in. core 24 in. long in from 15 to 20 seconds. Another type is our speed changing core machine which has a slip gear and can be changed in speed for small and large cores. We also have a machine for making slab cores from ⅝ in. by 4 in., 24 in. long to 1½ in. by 9 in., 24 in. long, and still another which we term our Multiple machine, which makes six 1 in. round cores at a time. This machine was designed to make knob cores .298 of an inch square, and we were allowed a variaton of two one-thousandths of an inch, one one-thousandth under and one one-thousandth over size.

Our display contains samples of each of the above classes of machines, which we will be glad to demonstrate, and will also be pleased to answer any questions any of the gentlemen may wish to ask. Concerning the sand requirements and the core binders we may say that the sand and binder to use depends upon a great many local conditions, and it will be best to take these subjects up in connection with each individual case.

Book Reviews

Electric Ignition for Motor Vehicles.—By W. Hibbert, A.M.I.E.C. London and New York: Whittaker & Co. Size, 4¼ x 6¼, pp. 128; 61 illustrations. (Price 1s. 6d.)

To those who wish to become motormen, or who are desirous of obtaining a knowledge of motor-vehicle operations, as well as those who are already familiar with petrol motors, this book should be of considerable service. The author has endeavored to explain in a non-technical manner the ways in which electric sparks are produced in the cylinders of petrol-driven motor cars. The connections for the different systems are shown, and the reason for the connections is given.

The high-tension system, with battery, and the low and high-tension magneto methods are described. The chapter on "Faults and, How to Locate Them," will be found of special value to many, since, unless the attendant has a knowledge of electricity, he will find his greatest difficulty is in locating and repairing damage in the ignition apparatus, other repairs to the machinery of the car being easy when compared to this. Even those who place the machinery in the vehicles are not always familiar with this part of the work. Hence, this chapter should prove of value to manufacturers as well as attendants.

Chapter VI., dealing with Magneto Methods of Ignition, describes fully the various methods in use.

The chemistry of primary and secondary batteries, together with their capacity, and the various means of charging same, is given in an eighteen page appendix. The work contains numerous illustrations, the greater number being diagrams. Although much of the information may be found in various books on motors, it is here written so that almost anyone can understand it. The book is of a convenient size to be carried in the pocket.

Immediate Care of the Injured.—By Albert S. Morrow, A.B., M.D., attending surgeon to the Workhouse Hospital, and to the New York City Home for the Aged and Infirm; assistant attending surgeon to the Manhattan Maternity Hospital. Philadelphia and London: W. B. Saunders Company. Canadian agents, J. A. Carveth & Company, Toronto. Size 6¼ x 9¼, pp. 340. (Price $2.50 net.)

The giving of first aid to the injured is more or less neglected in many establishments where machinery and other dangerous appliances are used. In every place where accidents are liable to happen several members of the staff should be trained to know what to do in case of accident, and the necessary appliances should be at hand.

This book, although exceedingly useful to physicians and nurses, is written in such a manner that the laymen may understand thoroughly all the subjects with which it deals. As a text-book for first aid classes it is all that could be desired. The subjects dealt with have been presented in as simple language as is consistent with clearness, and technical terms have been omitted except where absolutely necessary. The author has appreciated the fact that illustrations are often more valuable than much written instruction, and has incorporated a large number of them in his work, many of which are colored.

In order that the book might be found valuable in districts where medical aid is not always quickly available, the subsequent treatment of the more important forms of injury are given, but it is impressed on the reader that first aid should never take the place of professional services. By First Aid only temporary assistance should be given until medical aid arrives.

The book is divided into three parts, as follows:—Part 1. The Anatomy and Physiology of the Human Body. Part 2. Bandages, Dressings, Practical Remedies, etc. Part 3. Accidents and Emergencies. Part 2 is particularly well illustrated, and shows the method of placing bandages on almost every part of the human body. Part 3 tells what to do and how to act in cases of emergency. Especially interesting is the chapter on "The Transportation of the Injured," which is based on the regulations of the United States Army Hospital Corps.

NEW PUBLICATIONS.

The February issue of the "Proceedings of the American Society of Mechanical Engineers" is now ready. It contains a very interesting article on the Evolution of Gas Power, by F. E. Junge.

The February number of "Lux," the publication of the Nernst Lamp Company, of Pittsburg, is very interesting. Among other articles which appear therein, are:—"Don't Blow out the Gas;" "Thirty Hours of Sunlight in Thirty-one Days;" "The Store that Customers Prefer," and "Some Sis Hopkinisons."

"Forty Years Record" is the title of a booklet received from A. C. Leslie & Co., Limited, of Montreal. It tells briefly the history of these iron, steel, and metal merchants, from the founding of the house in 1866 up to the present time. Some excellent portraits of members of the firm, and staff are included.

A handsome leather bound memoranda book and card case, comes to hand from Messrs. Rhodes, Curry & Co., Limited, Amherst, N.S., manufacturers of steam and electric cars, foundry and machine work, building materials, office furniture, etc.

CATALOGUES AND CIRCULARS.

Electric Heating.—The Canadian General Electric Company, Toronto, are the selling agents for Canada of the Simplex Electric Heating Company, manufacturers of all kinds of electric heating apparatus for cooking, ironing, and general household use. Size 3¼ x 5, pp. 82.

Motor Applications.—In three artistically gotten up booklets the Westinghouse Electric and Manufacturing Company set forth some of the uses to which their motors can be put. They are shown in use with blacksmith blowers, air-sweeping and scrubbing apparatus, and dough-mixing machines.

High Carbon Steel Bars.—In a four-page circular the Buffalo Steel Company, Tonawanda, N.Y., give the sizes and particulars of their twisted and plain high carbon steel bars for use in reinforced concrete. Size 5½ x 8½.

Mining Supplies.—Mussens Limited, Montreal. Catalogue No. 8 is descriptive of wheelbarrows and trucks of all types. No. 9 deals exclusively with tool steels for mining purposes, the products of Walter Spencer & Co., Sheffield, England, for which company Messrs. Mussen & Co. are the agents. No. 10 sets forth various mining supplies: fuse, rails, dump mine-cars, buckets, skips, cages, hoisting machinery, pumps, crushing and grinding machinery, and engines and boilers.

Steam Specialties and Hydrants.—The Canada Foundry Company, Limited, Toronto, have just published two booklets, one describing the Walker hydrant, a hydrant that will not freeze; the other setting forth several of the various steam specialties manufactured by the company—reducing valves, pump governors, steam traps, feed water controllers, and injectors.

Pumps.—Darling Brothers, Limited, Montreal, are the Canadian manufacturers of the pumps as manufactured by the Union Steam Pump Co., of Battle Creek, Mich. The booklet which they have sent us deals with the famous Burnham steam and power pumps. Size 4 x 5, pp. 48.

Ten-Wheel Type Locomotives.—A pamphlet just issued by the American Locomotive Company illustrates and describes ten-wheel locomotives weighing over 150,000 pounds. Thirty different designs are illustrated, and the principal dimensions of each given. The designs presented range in weight from 152,000 to 201,000 pounds, and are adapted to a wide variety of road and service condition. This is the sixth of the series of pamphlets which is being issued by this company, and which now includes pamphlets on the Atlantic, Pacific, Consolidation and Ten-Wheel types of locomotives.

Unions.—Western Tube Company, Kewanee, Illinois. "Kewanee" male and female unions are claimed to be a distinct improvement over any pipe union now on the market. They can be used wherever a union is required, and no nipple is necessary in making the connection. A complete description, with illustrations, is given in a circular issued by the above-mentioned company. Size 5 x 7¼, pp. 6.

Telephones.
The Gray Telephone Pay Station Co., Hartford, Conn.—A very artistic catalogue has been received from the above mentioned company. It fully describes and illustrates Gray telephone pay stations. Size 6 x 9, pp. 80.

Metric Measures in Industry and Commerce.—By Prof. R. H. Smith, being a reprint from "The Engineering Review," December, 1906. Issued by the Decimal Association, Oxford Court, Cannon Street, London, E.C.

Fans, Blowers and Exhausters.—The Green Fuel Economizer Co., Matteawan, N. Y. Dimensions are given for 290 sizes and types of steel-plate fans for heating and ventilating, drying, mechanical draft, etc., for 27 sizes and types of planing "mill exhausters," and also for a line of steam and hot-water heating coils. There are over 20 pages of tables and data relating to air-moving engineering. p.p. 96.

Electrical Apparatus and Supplies.—Catalogue number four of the R. E. T. Pringle Co., Montreal, is one that should be in the hands of every electrician throughout the country. Messers. Pringle have spared no cost either for cuts or descriptive matter, and in consequence the excellently bound volume, is not excelled anywhere, if it is equalled, in setting forth electrical supplies, including as it does, everything from wire to glass shades. The company are to be complimented on the production of such a fine catalogue. 7 x 10, pp. 468.

Contractors' Machinery.—The Niagara Falls Machine and Foundry Co., Limited, Niagara Falls. The 1907 catalogue of this company is an up-to-date list of contractors' machinery and supplies. 3¾ in. x 1¼ in., pp. 91.

Digging Machinery.—The Hayward Company, 97 Cedar Street, New York, N. Y. Digging Machinery is the title of a well-illustrated booklet, describing excavating and coal hauling machinery, and orange peel and clam shell buckets, 6 in. x 3½ in., pp. 23.

NEW INTERLOCKING RULES IN CANADA.

The Canadian Board of Railway Commissioners has made an order amending the rules and regulations in reference to interlocking which have been in force since October 18, 1904. The following requirements are substituted for rules previously issued:—

"Rules governing the use of interlocking and derailing signals and speed of trains where one railway crosses another at rail level, or where a railway crosses a drawbridge.

"1. The normal position of all signals must indicate danger.

"2. When the distant semaphore indicates caution, the train passing must be under full control and prepared to come to a full stop before reaching the home signal.

"3. When the home signal indicates danger, it must not be passed.

"4. When clear signals are shown where one railway crosses another at rail level, the speed of passenger trains must be reduced to 35 miles an hour, and freight trains to 20 miles an hour until the entire train has passed the crossing.

"5. When clear signals are shown where a railway crosses a drawbridge, the speed of passenger trains must be reduced to 25 miles an hour and the speed of freight trains to 15 miles an hour until the entire train has passed the drawbridge."

MONTREAL SECTION.

(From Our Own Correspondent.)

Montreal, February 27th, 1907.

The market for pig-iron is quiet but firm, and there is no change in prices on this market. Purchases have been made to cover the next four or five months, and Canadian makers are all sold up for the time being. Although top prices are being maintained here, the English market shows a slight evidence of easiness. The reason of this is that, owing to the extraordinary demand existing throughout the United States for a long time past, the Americans began to scour the Scotch and English markets in quest of supplies. This very naturally had the effect of greatly strengthening the ideas of makers, the extraordinary demand having now been satisfied, the extraordinary strength has subsided with it.

In the local market, Londonderry iron is unobtainable for immediate use shipment, while prices for second half are on a basis of about $23.50 to $24, f.o.b., Montreal. Toronto prices are about $1.25 more.

Summerlee is practically the same as Londonderry, and is quoted $25.50 to $26 for immediate delivery.

No. 1 Clarence is quoted at $19 to $19.50 for delivery at Montreal, by water freights, while for immediate shipment it is $24.50.

Demand for all sorts of structural shapes, boiler plates, etc., is exceedingly active for this time of year, it being evidently the opinion that to obtain the goods, orders must be placed well in advance. As the weather becomes milder, the activity will greatly increase. Lumbering and ship-building, and similar plants will soon commence operations on a large scale again, and this will occasion a demand for boiler plates, shafting and machinery steel of all kinds.

There has been no change in prices of late, the market being steady at an advance of about 15 per cent. over last October's prices.

Stress of Weather.

The recent moderation in the weather, short though it proved to be, was of some considerable benefit to the retail merchants, the weather having been so extreme during a portion of this month as to keep buyers at home. Quite a few complaints are heard among wholesalers, of the manner in which bills are being met. The number of failures is not large, being but eight during the week, but money seems hard to get. The situation, however does not cause any anxiety as trade has been excellent, and the general view is that merchants have been making good profits and are only temporarily short of funds. All lines of hardware are active. Orders for metals are fully up to the record a year ago, and dealers in paints and oils are busy preparing for shipments at the opening of navigation. This may be said of all building and construction material.

Sewers and Paving.

The Montreal City Surveyor, Mr. J. R. Barlow, is issuing his annual report. He is laying stress upon the necessity of an early study of the drainage problem in Montreal. The problem has been made more complicated by the expansion of the city and the large amount of territory being built upon in the outskirts. There are now some 180 miles of sewers, 33 miles of which will have to be replaced with larger and more modern sewers, as they are now 40 years old. A great essential is the construction of main sewers for the purpose of intercepting the surface waters during heavy rains.

The surveyor calls attention to the failure of macadam pavements in the manufacturing districts, and urges the adoption of granite blocks, the former being useless for heavy traffic.

An Island Commission.

An Island Commission is being advocated to investigate waterworks and cognate subjects for the Island of Montreal. The Island is possibly 40 miles long and from 2 or 3 to 10 miles broad. It is now becoming thickly populated, and during the past few years a large number of suburbs and outlying municipalities have been joining with the city in the Greater Montreal idea. The increase in the population has been so rapid that the municipal services have not kept pace, with the result that the water and drainage systems are in many instances inadequate. Many questions have been raised through the amalgamations of suburbs with the city, and there is a general idea that before long a commission will have to be appointed to take the whole question into consideration and advise upon a more homogeneous system of municipal services.

There are now two main water systems, that owned by the city of Montreal and that owned by a private company, the latter supplying Westmount and other municipalities. These are both unsatisfactory to the citizens. Westmount is at the present time trying to obtain power from the

Legislature to install a system. Montreal, too, is on the lookout for improvements.

It has frequently been suggested that if the whole of the population of the island and surrounding country would but join together in a large scheme to bring water from the Laurentians, thirty to fifty miles back of the city, by means of large aqueducts, the matter would be settled for good. There would be no further pumping expenses as the grade of the aqueducts would be sufficient to raise the water to any required height.

Interesting Statistics on Pumping.

The annual report of the Montreal Waterworks Department contains some interesting figures and comparisons of costs of pumping by different methods. The following table is self explanatory:

Year.	Gallons pumped.	Power employed.	Total cost.
1903	3,713,220,951	water	$ 5,277
"	5,257,151,653	steam	50,947
	8,970,372,604		$56,224
1904	3,616,150,841	water	$ 4,600
"	6,527,887,166	steam	63,975
	10,144,038,007		$73,575
1905	3,076,348,752	water	$ 5,364
"	7,939,510,094	steam	88,083
	11,015,858,846		$93,447

About 13,000,000,000 gallons were pumped by both methods in 1906, and it is thought that the cost will exceed by $20,000 that in 1905.

Allowing 350,000 as the population of Montreal drawing on this water supply, the average shown is a little over 100 gallons per day for each person. There are not 350,000, as this water system by no means supplies the whole of the city. The allowance would be nearer 150 gallons per day.

Taking 1905 comparisons as a basis, it appears that the cost of pumping by steam is fully eight times that by water. This water-power is obtained through an aqueduct which taps the river above the Lachine Rapids and joins the river again below the rapids. It is advocated by the superintendent of the Waterworks Department that a new aqueduct should be built at a cost of over two millions, and the use of turbines for raising the water, thus eliminating the use of steam altogether.

$2,000,000 to Raise Railway Crossings.

For many years past the crossings along the line of the Grand Trunk Railway, in Montreal, have been the source of discord between the railway and the city. Deaths and accidents have necessarily been of frequent occurrence, so that the raising of the tracks has at last become imperative. The City Council appointed a committee to deal with the subject some time since, with the result that a proposition involving the expenditure of a large sum of money, is now being discussed. It is expected that the raising of the tracks will be made a portion of a comprehensive scheme by the G. T. R., including the building of a large new station and the laying of additional tracks for the purpose of accommodating not only the business of the G. T. R. but of the G. T. P., when it shall have become a factor in the traffic of the city..

Over a week ago, Ald. Payette, brought in a motion by which it was decided to support a bill at Quebec, asking power for the city to contribute a large sum to aid the Grand Trunk to raise the crossings. This sum may amount to $2,000,000, and ought to go a long way towards the cost of the undertaking.

INDENTATION TEST FOR STEEL RAILS.

Discussion of Mr. H. K. Dutcher's Paper by the C. S. of C. E. at Montreal, February 14th.

A well-attended meeting of the Canadian Society of Civil Engineers was held in the Society's rooms, on Dorchester Street, Montreal, on Thursday evening, the 14th, for the purpose of hearing the following papers read: "An Investigation on the Value of the Indentation Test for Steel Rails," by H. K. Dutcher, and "Victoria Bridge Crossing Bear River, Annapolis and Digby Counties, Nova Scotia," by J. Lorne Allan.

Mr. J. G. G. Kerry, of McGill University, presided, and in the absence of Mr. Dutcher his paper was read by Mr. John B. Harvey. The hour was late when the discussion was concluded, and it was accordingly decided to postpone the reading of Mr. Allan's paper till a later date. As the advance proof of the paper has been sent to all members of the Society, hence it is unnecessary to print same here.

The discussion was quite animated. Mr. Ernest Brown, who was present during the tests made by Mr. Dutcher, further elucidated the experiments at the request of the chairman. Criticism followed, and the general view taken was not altogether favorable to the immediate practical value of the author's work. Many, however, considered that it had a practical value, and all agreed as to the interest and importance of the subject.

Poor Steel Rails Commented Upon.

From remarks by the chairman and Mr. Holgate it was evident that engineers who have been paying attention to the subject of steel rails have of late years noted the manufacture of a very inferior rail, not only in Canada, but in other countries, and several explanations for this were given.

Mr. F. Shearwood, on being asked for his opinion, said that the greatly increased size of the rail and the rapidity with which they were turned out might have something to do with their inferiority.

Mr. H. M. Mackay, of McGill University, being asked his opinion respecting the value of Mr. Dutcher's test, spoke favorably of it. He thought there should be a test upon rails with different percentages of phosphorus.

It was apparently an open secret that the quality of rails being placed upon the market during the past few years is not looked upon favorably by engineers. The chairman, however, stated that, after all, the percentage of failures was extremely small, and if statistics could be collected it would be found that not one in an enormous number had failed.

Mr. Francis spoke of the splendid rails the G.T.R. used in the past, and the discussion brought out the expression of the belief that the poor rail and the increased size of the rail were concurrent.

Splitting of Rails Discussed.

The splitting of rails was taken up. One speaker mentioned "black heart" appearing in rails which had split. Others told of the action of billets, the indentation in the end having extended down the rail as it was being rolled, and having failed to coalesce, a split rail was turned out.

Mr. R. A. Ross, in summing up the discussion, said that evidently some joint action was needed to remedy the matter. He thought a committee might be appointed to consider if something could not be done for the public safety. Practical railway men, laboratory men, and any whose knowledge could throw light on the question and make for greater safety, should do everything possible. He moved that the chairman, Mr. Kerry, should take the subject into consideration and report upon a definite scheme of action at a later meeting. The motion was carried and the meeting adjourned.

THE FOUNDRY SUPPLY ASSOCIATION.

The Foundry Supply Association is in a very thriving condition, the membership now numbering about seventy, and the number of exhibitors having been greatly increased.

Arrangements have been made with the Otto Gas Engine Company and the Crocker-Wheeler Company for the installation of a 45 K.W. direct current generator, to be driven by a gas engine and furnish direct current at 220 volts pressure for exhibitors requiring this kind of current. The regular power current available at the Second Regiment Armory, where the exhibit will be held, is furnished by the Philadelphia Electric Company and is alternating current 220 volt, 60 cycle, 2-phase.

The fact that the interest in the Brass Founders Association is increasing, and that there is evidently going to be a large attendance of those interested in the founding and and the working of non-ferrous metals, is bringing a large number of supply and equipment dealers who are especially interested in this class of equipment into the Supply Association, and it is evident that the exhibit will be unusually complete along these lines.

The Secretary has recently made a trip through the East and spent considerable time in Philadelphia making preliminary arrangements and looking after the interests of the members. In connection with the trip many of the exhibitors have stated what they expect to show, and it is evident that those who attend the Philadelphia Convention are going to have a rare treat, for the display will surpass anything of the kind thus far held, and contain many novel and interesting features.

Canada buys more automobiles from the United States than any other country but England. The production of such goods in the United States in 1905 was valued at $26,645,000, being 22,830 in number; 86.2 per cent. of them gasoline, 7.2 per cent steam, 6.6 per cent. electric. The exports were $2,481,000 in the same year; to the United Kingdom, $610,000 worth; to Canada and Mexico, $682,609; to France, $252,000; to Germany, $154,000.

CHICAGO ELECTRICAL TRADES EXPOSITION.

Those who went to the Electrical Trades Exposition in Chicago expecting to see the same things they saw last year were agreeably disappointed. Indeed all except those who have been closely watching the progress of electricity were surprised at the great variety of new devices and applications to be seen. Electricity is making such wonderful progress that it takes an exhibition every year for one to keep track of it.

One of the most marked advances is in motor application. The electric motor is not only successfully replacing every other form of power drive, but is fast abolishing manual drive for even the smallest machines. There is scarcely any type of machine that cannot be driven more economically, conveniently and efficiently by the modern small power motor—now made in units as small as 1-25 horse power—than by hand.

In the Westinghouse exhibit alone there were to be seen twenty odd machines of widely varying types, driven by motors exactly suited to their requirements. There was

scarcely a visitor to the show who did not find some type of machine in which he was directly interested, and many went away with new ideas of economy and convenience.

There were machines not only for the manufacturer, but for the butcher, the baker and the candle-stick maker as well, and many too for domestic purposes, that interested all comers. It is only lately that electricity has meant anything more than light, in the home. That this is only one of its many uses was demonstrated by the motor-driven household utensils in operation in the exhibit, including a washing machine, an ironing machine, a sewing machine and a sanitary cleaning and scrubbing outfit. The latter device attracted universal attention through its ability to remove quantities of dust and dirt from apparently dustless clothes, rugs, upholstery, etc. The use of a plant of this nature for private residences depends upon the motor drive, as any other form of power would be too expensive and require too much space and attention.

It goes without saying that a form of power which is economical enough for domestic purposes, is well adapted to the requirements of those who cater to the domestic needs upon a large scale, and so hotelkeepers, grocers, laundrymen, bakers and confectioners found many of their machines of daily use among the motor-driven, such as coffee grinders, dough mixers, ironing mangles, refrigerating machines, clothes washers, dish washers and ice cream freezers. That electric motors furnish ideal power for all such machines was apparent to all who saw them in operation.

Among the machines of interest to manufacturers were a lathe, a saw sharpener, a ventilating fan, a printing press, a drill and blacksmith blower. Merchants found an interesting device in the motor-driven automatic pin ticketing machine, which is fast replacing the old method of price-marking goods by hand.

Those who visited this interesting and educative exhibit went away wondering if there were any machines left to the driving of which the electric motor had not been adapted. If there are any such, next year's visitors will undoubtedly find them on the list.

INDUSTRIAL NOTES

Trade Enquiries.

The following enquiries relating to Canadian trade have been received at the Canadian Government Office, 17 Victoria Street, London, S. W.:—

A London firm importing asphalte on a large scale is prepared to sell either to direct asphalte users in Canada, or to appoint agents in the various large centres of population.

A firm in the Midlands contemplates appointing an energetic agent for the sale of their chains and other similar ironwork throughout Canada.

The British Empire Motor Trades Alliance, Limited, invites inquiries from motor agents and buyers all over the world desiring information regarding British made petrol, oil, electric and steam pleasure cars, vans, lorries, tractors, public service and agricultural motor vehicles, motor boats, all descriptions of motor engines for vehicles, and for marine, agricultural and aeronautical purposes, component parts, accessories, etc. Address inquiries, giving full particulars, to J. B. King, Secretary, the British Empire Motor Trades Alliance, Limited, 11 Red Lion Square, London, W. C.

Ontario.

The Rhodes-Curry Co., of Amherst, have been awarded the contract for the round-house at Halifax. The price is in the neighborhood of $80,000.

McKeough and Trotter have closed a deal with the Huff Dredging Company, of Edmonton, for the building of a dredge, which will cost $15,000.

Bids will be received by the city of Brandon until April 11th, for supplying 6,000 to 8,000 barrels of Portland cement. W. H. Shillinglaw, city engineer.

The Smart-Turner Machine Company, Limited, are supplying the McEachren Heating & Ventilating Co., Woodstock, with an Automatic Feed Pump and Receiver.

The Smart-Turner Machine Co., Limited, are supplying the Dominion Heating & Ventilating Co., Hespeler, with an Automatic Feed Pump and Receiver, also with a Duplex Pump.

The Smart-Turner Machine Co., Limited, are supplying a Single and a Duplex Outside Packed Plunger Pump with Pot Valves to the steamship Agawa, of the Lake Superior Power Co., Sault Ste. Marie.

The Petrolea Bridge Company have been awarded the contract for the new Wiley bridge over the Thames River, south of Athens. The tenders were for the steel work $7,450, and for the concrete work $5,900.

Mr. J. C. Allan, of Vancouver, has been awarded the contract for a $16,000 building to be erected in that city. It will be of brick, two stories high, and is to be used for warehouse purposes. Mr. D. Gavin is the owner of the property.

The annual meeting of the International Portland Cement Company, Limited, was held on the 19th inst. The meeting was unanimous in the recommendation of the directors to double the capacity of the plant. The extension will give employment to between 400 and 500 men, and active operations will be begun as quickly as the season will admit of it. The old board of directors was re-elected by a unanimous vote.

Contracts have been awarded for the construction of the big dam at Eugenia Falls for the Georgian Bay Power Company, work to be begun not later than May 1st next. The spillway, on solid rock bed, will be forty feet high and eighty feet long, while the base will be 62½ feet wide, with a ten-foot crown. As the dam will be 540 feet long from bank to bank, it will hold back about thirteen million cubic feet of water. 1,500 horse-power will be developed.

Extensive improvements are being advocated in connection with Kingston Harbor. The Government has had an engineer here examining the character of the shoals, with a view to their removal next summer. It is proposed to enlarge the passageway through Cataraqui bridge to the north of the present harbor, and allow large vessels to pass through into the large and protected Cataraqui Bay. Another suggestion is to remove the bridge to a point about half a mile north of the present location, and throw it across at Bell's Island. The added area to the harbor could easily be dredged so as to greatly increase the space for vessels.

Quebec.

The annual meeting of the Williams Mfg. Co., Limited, was held lately at Montreal. The old board of directors was re-elected, Bartlett McLennan being afterwards elected president, Chas. W. Davis, vice-president and managing-director, and Alex. Dube, secretary.

The annual general meeting of the Frothingham & Workman, Limited, Montreal, was held recently, and a satisfactory statement rendered. The following were re-elected directors for 1907:—Messrs. E. Archibald, C. D. Monk, W. G. Lemesurier, E. C. Eaton, and W. C. Davis.

A syndicate of Montreal and New York merchants are making negotiations for the erection of a large departmental store in the former place. It is said the new store will cost $3,000,000.

Mussens, Limited, announce that they are the sole Canadian agents for Fraser & Chalmers, Limited, of Erith, England, manufacturers of the highest quality mining and metallurgical machinery.

A new cotton plant is the latest project in Montreal. It is stated that the plant will be established in 18 months, and will employ 800 hands, the authorized capital of the company is $1,500,000. The name of the new company is the Mount Royal Spinning Company. Those interested are W. C. McIntyre, T. E. Hodgson, A. Raine, J. W. Pyke, C. W. Trenholme, W. T. Whitehead, and F. M. Marler. Mr. Whitehead will be general-manager.

The International Steel Company, of Canada, Limited, has applied for incorporation for the purposes of manufacturing and dealing in all kinds of iron and steel products, such as contractors' equipment and railway supplies. The company will have a capitalization of $500,000, and will represent, in Canada, a large English iron and steel supply concern. The new company will have its headquarters in Montreal, and is being backed, it is stated, by interests already prominently connected with the iron and steel trade of the Dominion.

The financial statement of the Montreal Steel Works, Limited, for 1906, shows net earnings of $196,997, as against $120,798 in 1905, an increase of 63 per cent. Out of profits, a dividend of $56,000 was paid on the preferred stock, being at the rate of 7 per cent. per annum. This leaves a balance of $140,997 available to holders of common stock, and from which a 7 per cent. dividend, amounting to $46,285 was paid. After dividends on preferred, the surplus represents 21 per cent. earned on the average paid-up stock of the year. $36,000 was carried to the credit of reserve, making that account $100,000.

Manitoba.

The special committee of parliament appointed lately to investigate the existence of an alleged lumber combine in Western Canada, elected ex-Premier Greenway, of Manitoba, as chairman, and summoned witnesses from the West for the examination in regard to the practice complained of.

British Columbia.

The big $10,000,000 corporation, the Graham Island Milling, Coal & Transportation Company, is also ready to commence operations on its 102 square miles of timber lands on the island, most northerly of the Queen Charlotte group.

Vancouver is to have what will be one of the largest sawmills on the Pacific Coast. It will be erected by E. H. Heaps & Co., and the machinery will be supplied by the Prescott Company, of Minominie, Wisconsin. The mill will be capable of handling logs 110 feet long, and 10 feet diameter.

LIGHT, HEAT, POWER

Ontario.

British capitalists are negotiating with a view to purchasing the Metropolitan Electric Works at Britannia, but the English syndicate has no option on the property. About $160,000 has been spent on the construction of the power canal, and a considerable sum is still required to bring the work to completion, the amount depending upon the character of the dam, and the quantity of power it is desired to develop.

Alberta.

The city of Calgary has agreed to allow the Budd and Alexander Company to enter the city, and supply power to the corporation at a maximum rate of $24 per horse-power year, and to private citizens at $30. The company receives no privileges other than the right to put up wires and sell power.

British Columbia.

The Vancouver Power Company is installing a 10,000 horse-power generator. The plant will then have a capacity of 42,000 horse-power.

The Minister of Inland Revenue will introduce legislation at the present session to provide for Government inspection of meters used in connection with the supply of electricity for power purposes. This is done to afford users of electric power the same assurance as they already get in the case of electric lighting.

Bids have been received for Section 3 of the Loch Lomond water supply, Fort William, Ont., consisting of 4,500 ft. tunnel and intake pipe, as follows: Emile Anderson, $197,953; Flanagan & Cameron, $170,711; Gowanlock & Tomkin, $162,258; William Newman, $160,690, and Huston & Jones, $132,070. All are local firms. H. S. Hancock, city engineer, estimated work to cost $150,780. The Board of Commissioners has decided to construct this work by day labor under its engineer.

The by-law authorizing an agreement with the Hydro-Electric Commission for the supply of power to the civic electric plant at Ottawa was passed on January 7th. The corporation is applying to Parliament for authority to borrow $500,000 to purchase and develop a power plant; to lease or purchase electrical power or energy for the municipal electrical plant; for the purchase, by bond issue, of the plant of the Consumers' Electric Co.; for the expenditure of $51,133 for local improvements, and for power to borrow $11,695 for water-works extension and improvements.

RAILWAY NOTES

Ontario.

The Grand Trunk tracks between Toronto and Hamilton are to be relaid with 100 pound rails. This is being done owing to the heavy traffic which passes over this part of the road.

Quebec.

The city of Quebec has under consideration the contribution of $2,000,000 toward the cost of raising the G.T.R. tracks Between Bonaventure Station and St. Henri.

The Delaware and Hudson Railway is now following up its recent expansion in Canada by a decision to erect, at St. Lambert, the shops necessary for the repair of the rolling stock it employs in Canada.

It is understood that extensions are to be made at the Point St. Charles works of the G.T.R., and it is very probable that before long that company may be manufacturing a large proportion of its own cars and locomotives.

The Canadian Railway Commission is receiving testimony on the subject of car shortage and congestion. J. W. Leonard, assistant general manager of the Canadian Pacific, said that company had 42,250 cars on January 31st, or 10,000 more than a year ago, yet could not supply the demands of shippers. He stated that 400 loaded cars were in Montreal one day, ready to unload, but the consignees could not receive the shipments without much delay, owing to inspection by customs' officials and to being busy at stocktaking. As a result cars were sidetracked all along the line. The way stations do their work well, he said; the big cities cause the trouble.

Nova Scotia.

A new station is to be built at Amherst, N.S. Plans and specifications are under way, and as soon as they are ready tenders will be called for.

Manitoba.

W. H. Cook, President of the Duluth, Rainy Lake and Winnipeg road, has made financial arrangements whereby his road will be extended from Virginia, Minn., on the Mesaba range, to Duluth. The extension will be seventy miles in length, and construction work, it is said will be accomplished this year. The line will be ready for operation by January next. The extension will give Duluth a direct line to Winnipeg by way of Virginia and International Falls.

MINING

Ontario.

The machinery for the works of the North Ontario Mining and Reduction Company has been contracted for. It is anticipated that the plant will be in operation by the end of June.

In giving evidence before a Senate Committee on the Hudson Bay's route and the wonders of Northern Canada, Prof. Von. Hammerstein says that on the lower Athabasca River, there is building stone, clay for brick-making, sand for glass-making, and natural gas with which to melt it. A hole 860 feet deep was sunk by the Government in 1898; a rush of gas stopped the boring, but that gas has been blowing and burning ever since. At the mouth of Peace River is a deposit of gypsum, and there are signs of vast quantities of petroleum. Furthermore he declares that there is an ex-

tensive deposit of hematite iron between Athabasca Landing and the mouth of Great Slave River.

Nova Scotia.

The Dominion Iron and Steel Company are prospecting on their recently acquired coal areas, and will shortly sink several shafts. These areas are but a few miles from the company's works at Sydney.

At present the Cape Breton Coal, Iron and Railway Company are boring in the vicinity of Holmeville, C.B., and if they succeed in locating the Tracey seam there, they will sink a new colliery. Operations at Broughton, where the company first located, have been suspended for some time.

British Columbia.

A trolley system of haulage will be installed at the 400-ft. level of the Granby Mine, which installation will do away with the horses now used.

Some diamond drilling will be done on the Greyhound, Deadwood camp, which is under bond to the Rathmullen Mines, Limited, and is showing up well. A boiler and pump have been installed and the main shaft is being unwatered.

The Dominion Copper Company's Brooklyn mine was obliged to close again recently on account of lack of coal, the C.P.R. being, apparently, totally unable to deliver coal from the Crow's Nest. This is the second closing of the Brooklyn for this reason, and it is not likely that it will be started again until a steady supply of coal is assured.

MUNICIPAL WORKS

Ontario.

Fort William has filed plans for a municipal street railway system.

A 200-H.P. Canadian General Electric generator is being installed at the town of Hastings for lighting purposes.

The position of City Engineer of Stratford will be vacant on July 1st, the resignation of Engineer Parsons having been accepted.

St. Thomas is considering the installation of an ammonia plant, similar to that which has been installed at Guelph, the cost of which was about $2,000.

Galt has carried a by-law to grant a loan of $15,000 to aid a brass manufacturing company to establish there. Also one to authorize issue of $5,000 debentures for the extension of the waterworks system.

Approval of the issue of $10,000 debentures for waterworks extension is asked for by Peterboro from the municipal and railway board. Woodstock wants $3,550 debentures authorized for a similar object.

The Berlin water commission has decided to install a powerful air compressor, for the purpose of increasing the water supply of that place. The Rand Drill Company presented a proposition, undertaking to instal a machine that would guarantee a flow of 1,050,000 gallons per day, at between six and seven thousand dollars.

The owners of the Metropolitan Electric Works, at Britannia, have signified their willingness to sell out to the city of Ottawa for the sum of $200,000. A sub-committee of the Industrial Committee is securing the report of the Hydro-Electric Commission as to the available powers around the city. These enquiries are being prosecuted with a view to the possible development of power to operate the civic electric plant.

Quebec.

Mr. V. H. Dupont, engineer, of Montreal, left last Monday for St. Jerome, in the Lake St. John district, where the town is considering the installation of a waterworks system.

New Brunswick.

Two new spans are to be put in the Fredericton highway bridge, plans and specifications are now being prepared, and tenders will be asked for shortly. The work on the granite piers will commence as soon as the spring freshets recede.

Prince Edward Island.

The town of Summerside, with a population of about 3,000, will call for tenders about the end of April, for the installation of a waterworks and sewerage system, for the town, at a cost of about $100,000. V. H. Dupont, of Montreal, is the engineer.

Manitoba.

It is reported that a bridge will be constructed over Souris River at Souris. Estimated cost, $12,000.

Alberta.

Lethbridge is to have a second stand-pipe or reservoir, 30 feet diameter by 35 feet high. C. M. Arnold, City Engineer.

The city council has decided to build a municipal street railway system twelve miles long, with equipment of 12 cars. W. F. Thorold, city engineer.

The Calgary Waterworks Department have purchased an electrical thawing machine.

Saskatchewan.

T. Dunderdale, the Winnipeg gas expert, who was recently consulted by the Regina city council, strongly advises the erection of a municipal gas plant. Mr. Dunderdale will submit a detailed report affording the council all the necessary information for the adoption of such a scheme.

British Columbia.

City Engineer Topp announces Victoria will spend about $75,000 in block-paving this year. All the blocks used will be treated with the creosoting process.

It is stated that the incinerator which it is proposed to construct in Victoria, will cost between $30,000 and $35,000. Plans are being prepared, and a by-law will ultimately be submitted to the city.

The following recommendations have been made to the city council of Victoria: That a by-law to borrow $50,000 for the constructing of surface drains be prepared; that the city engineer be instructed to report on the cost of a plant for the disposal of the city's garbage, and that a plant be purchased for the treating of paving blocks, the plant not to cost more than $10,000.

NEW INCORPORATIONS.

Ontario.—Security Light Company, Toronto, $40,000; H. E. Pearce, A. Gate, T. Minton, J. W. Coe, G. Bullock, Toronto.

Sutton Bay Cobalt Silver Mining Co., Haileybury, $50,000; F. Pottage, B. M. Cook, G. O. Merson, C. E. Stewart, F. N. Tennant, Toronto.

The Tiffany Cobalt Mines, Cobalt, $600,000; E. A. Lenz, A. D. Sawin, Providence, R. I.; H. A. B. Cooke, J. Hylands, G. Ross, Cobalt.

Cobalt Silver Crescent, Pittsburgh, Pa., $500,000; T. H. Barton, F. D. Byers, O. F. Taylor, F. H. Lytle, C. A. Jackes, Toronto.

Canadian Central Mines, Toronto, $1,000,000; H. D. McCormick, D. A. Rose, G. T. Veale, R. S. Gilpin, M. W. Mayhr, Toronto.

Dominion Smelters, Sault Ste Marie, Ont., $1,000,000; H. H. Muggley, W. L. Peters, P. M. Knippenberg, W. S. Peters, T. J. MacCune, Oskosh, Wis.

Harris Maxwell Larder Lake Gold Mining Co., Toronto, $500,000; W. R. Wakefield, E. Wakefield, H. Mason, R. Paterson, Toronto. Junction; M. M. Hulse, R. Polley, J. Renwick Maxwell, Toronto; G. W. Harris, New Liskeard.

The Galt Brass Manufacturing Co., Galt, $40,000; J. Scott, B. F. Bennett, W. D. Sheldon, S. R. Sheldon, J. Smith, Galt; A. Groff, Waterloo.

The Cobalt Silver Mountain Mining Co., Ottawa, $1,000,000; F. Watts, F. S. Dunlevie, M. P. Van der Voort, S. King, J. L. Galloway, Toronto.

The Silver Rock Mining Co., Cobalt, $1,000,000; J. L. McDougall, F. H. Honeywell, J. Gillespie, H. H. Short, A. H. Rayner, Ottawa.

Carleton-Cobalt Silver Mining Co., Ottawa, $1,000,000; T. F. Elmitt, W. H. A. Fraser, H. A. Percival, R. G. Stewart, E A Larmonth, Ottawa.

Canada Arms and Rifle Sights, Toronto, $200,000; H. Dixon, C. T. Cocking, R. S. Mitchell, E. Reed, A. Carlyle, Toronto.

Commonwealth Mines of Cobalt, Toronto, $5,000,000; A. C. McRae, Toronto; J. W. Redfern, Owen Sound; A. J. McPherson, Stratford; J H. Schlund, Chicago, Ill.; F. W. Hay, Listowel.

The Foreign Rail Joint Co., Toronto, $50,000; J. S. Lovell, W. Bain, R. Gowans, E. W. McNeill, H. Chambers, Toronto.

The Brockville Cement, Pressed Brick and Concrete Co., Brockville, $10,000; B. Dillon, A. T. Wilgress, R. N. Horton, J. C. Yarwood, H. A. Stewart, Brockville.

Cobalt Eagle Silver Mines, Ottawa, $1,000,000; C. M. Farley, W. H. Newton, A. G. Pettaway, F. W. Forde, A. E. Honeywell, W. H. Cluff, Ottawa.

The Wendigo Crater Mines, Cobalt, $40,000; M. G. Buckley, New York, N. Y.; M. Mahaffy, Bracebridge; G. Ross, Cobalt; D. C. Molleson, Brownsville, N. Y.

The Otonabee Navigation Co., Peterborough, $40,000; W. H. White, J. E. Henderson, W. H. Robertson, M. M. White, S. L. Henderson, Peterborough.

The Great Northern Oil Co., Sault Ste Marie, $500,000; B. W. Harris, B. E. Rhodin, R. H. Carney, S. G. Stone, J. Bassingwaighte, P. T. Rowland, J. McLurg, W. Calder, H. A. McKinnon, Sault Ste Marie.

Societe Electrometallurgique, Toronto, $40,000; T. H. Barton, F. D. Byers, O. F. Taylor, L. Duff, G. M. Layden, Toronto.

Wayne Cobalt Silver Mining Co., Windsor, $50,000; W. G. Kay, A. Green, Detroit, Mich.; J. W. Kay, Coleman; J. W. Hannah, J. Wigle, Windsor.

The Cobalt and Blanche River Silver Mining Co., Ottawa, $500,000; J. Connolly, J. O'Sullivan, C. J. Murphy, T. O'Gorman, J. J. Connolly, Renfrew.

The Evans Rotary Engine Company, of Canada, Toronto, $250,000; J. M. Evans, K. Rose, J. H. Chewett, F. W. Carey, Toronto.

The Georgian Bay Oil Co., Fort Erie, Ont., $1,000,000; S. Johnston, F. R. MacKelcan, A. J. Thomson, R. H. Parmenter, F. B. Johnson, Toronto.

Wilgar Lake Cobalt Mining Co., Toronto, $100,000; J. E. Day, J. M. Ferguson, E. V. O'Sullivan, A. W. Bixel, Toronto.

The Veterans Prospecting and Mining Co., Toronto, $1,000,000; J. A. MacDonald, W. H. Blight, J. T. Hornibrook, W. C. MacDonald, Toronto.

The Silver Heels Mining Co., Toronto, $500,000; J. A. Macdonald, W. J. Tremeear, I. M. Dales, R. B. Lowndes, Toronto; G. O. Hayne, New York, N. Y.

The Niagara Cobalt Silver Mining Co., Niagara Falls, $750,000; E. B. Scofield, D. F. Harrington, E. E. Chamberlain, Buffalo, N. Y.; J. A. Krauss, Atica, N. Y.; J. H. Francis, Arcade, N. Y.; C. A. Williams, L. A. Woodward, Batavia, N. Y.

The Kelly Island Lime Co., Windsor, $40,000; A. R. Bartlett, N. A. Bartlett,, G. Pacaud, W. Revell, A. W. MacGregor, Windsor.

The Larder Lake Proprietory Gold Fields, Toronto, $3,000,000; T. H. Lennox, J. F. Lennox, G. T. Veale, H. D. McCormick, R. S. Gilpin, Toronto.

Devil's Rock Silver Mining Co., Ottawa, $500,000; H. G. Ketchum, J. L. Rochester, C. J. Booth, J. S. Ketchum, D. J. McDougal, Ottawa.

Duchess Silver Mining Co., Toronto, $75,000; W. R. P. Parker, G. M. Clark, J. A. McEvoy, G. Russell, E. M. Lindsay, Toronto.

Airgiod Cobalt Mining Co., Ottawa, $2,000,000; A. C. Ross, C. B. Ross, North Sydney, N. S.; A. W. Fraser, J. G. Gibson, J. Bain, E. Seybold, J. Gibson, H. H. Williams, Ottawa.

The Prince Rupert Cobalt Silver Mines, Cobalt, $1,000,000; M. McLeod, New Liskeard; D. Clark, Powassan; G. Ross, N. R. Macdonald, W. R. Lowery, Cobalt.

The Ahmic Telephone Co., Ahmic Harbor, Ont., $25,000; W. Robertson, Dunchurch, Ont.; E. C. Bennett, S. G. Ritter, W. J. Snaith, J. Brown, Ahmic Harbor; R. J. Watson, D. R. McLean, Burke's Falls.

The Meridian Bay Mining Co., Berlin, $1,000,000; J. Atkins, Montclair, N. J.; G. F. Ricker, J. E. Stanton, Brooklyn, N. Y.; W. Klein, New York, N. Y.; R. Sutherland, White Plains, N. Y.

Manitoba.—Pearsons, Limited, Winnipeg, $250,000; E. Brown, Portage la Prairie; W. Pearson, A. N. McPherson, G. H. Perkins, C. D. Corbould, Winnipeg.

Dominion.—The Eastern Construction Co., Ottawa, $1,000,000; J. Gillespie, H. H. Short, F. H. Honeywell, S. B. Johnson, J. B. Prendergast, Ottawa.

The Roxton Tool and Mill Co., Roxton Pond, Que., $100,000; W. S. Bullock, C. C. A. Bullock, F. Poirier, H. Rainaud, O. Pepin, Roxton Pond.

Starke-Seybold, Montreal, $400,000; W. Starke, G. R. Starke, Montreal; R. Starke, J. P. Seybold, G. C. Seybold, H. B. Seybold, Westmount, Que.

Warden-King, Montreal, $1,000,000; J. C. King, L. A. Payette, R. C. McMichael, Montreal; W. Greig, F. G. Bush, Westmount, Que.

The Crescent Machine Co., Montreal, $20,000; C. M. Gardiner, C. D. Drabble, W. A. Paterson, H. S. Williams, W. Bovey, Montreal.

Dominion Power and Transmision Co., Toronto, $25,000,000; J. S. Lovell, W. Bain, R. Gowans, T. W. McNeil, H. Chambers, C. H. Black, R. M. Coates, J. S. Bisgrove, S. G. Crowell, M. Moylan, E. L. Dolmage, Toronto.

Edmonton Standard Coal Co., Toronto, $300,000; J. S. Lovell, W. Bain, R. Gowans, E. W. McNeil, H. Chambers, Toronto.

The Peninsular Tug and Towing Co., Wiarton, $20,000; J. G. G. Simpson, F. Wood, D. J. Byers, C. E. Byers, Wiarton, Ont.

The Laurentian Granite Co., Montreal, $200,000; J. Brunet, Notre Dame des Neiges, Que.; R. Bickerdike, L. H. Henault, J. L. Decarie, W. H. Evans, Montreal.

Canadian Gold Car Heating and Lighting Co., Montreal, $300,000; R. C. Smith, F. H. Markey, K. G. Robertson, R. C. Grant, G. G. Hyde, Montreal.

The Crescent Machine Co., Montreal, $20,000; C. M. Gardiner, C. D. Drabble, W. A. Paterson, H. S. Wiliams, W. Bovey, Montreal.

The Eastern Construction Co., Ottawa, $1,000,000; J. Gillespie, H. H. Short, F. H. Honeywell, S. B. Johnson, J. B. Prendergast, Ottawa.

North Atlantic Dock and Shipbuilding Co., Montreal, $1,500,000; A. C. Ross, North Sydney, N. S.; W. H. Moore, Toronto; C. B. Ross, North Sydney; T. Brosseau, B. Brosseau, Montreal.

The M. McKenzie Co., Montreal, $75,000; W. D. Hamilton, A. A. Lunan, A. Dunn, L. Lahaye, Montreal; A. Lunan, Huntingdon.

Canadian Rand Co., Sherbrooke, $500,000; G. Doubleday, New York, N. Y.; E. W. Oilman, Montreal; S. W. Jenckes, W. Farewell, H. D. Lawrence, Sherbrooke.