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Ceylon Plumbago Supplies

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 AND INDUSTRIAL WORLD  
 DEVOTED TO THE MANUFACTURING INTEREST OF THE DOMINION

VOL. 52. TORONTO, FEBRUARY 2, 1906. No. 3.

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Specially designed for the **RAPID, ECONOMICAL and SAFE** Generation of Steam up to the highest pressures.

**Over 5,000,000. H.P. in use.**

If you are interested write for our book "Steam" mentioning this paper.

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**"REDSTONE" HIGH PRESSURE SHEET PACKING**

MAKES PERFECT JOINTS.  
 Does not blow out and requires no following up.  
 Try a sample lot and be convinced of its merits.

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HIGHEST GRADE SHAPES A SPECIALTY

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**Electric and Hand-Power Travelling Cranes**

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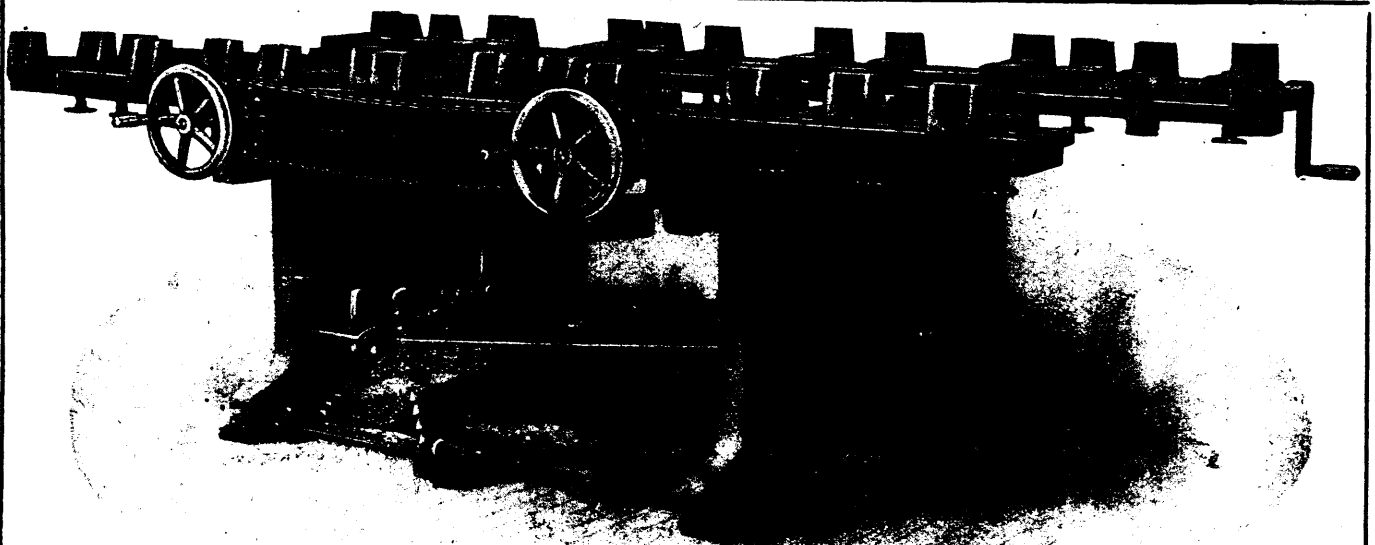
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The World's Standard for Quality

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**PATENTS** Fetherstonhaugh & Co.  
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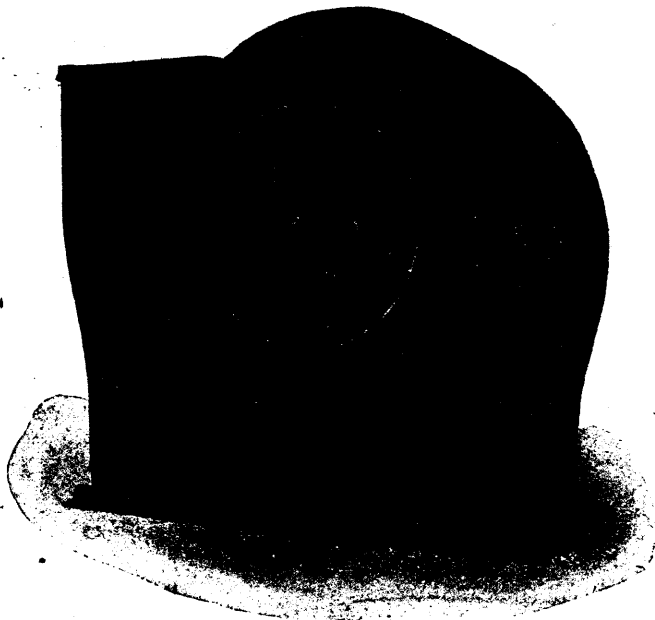
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We are the original inventors of some of the points of advantage on this machine. You are interested in the best machinery. You can procure from us machines for your furniture, piano and organ factory, planing mill, sash and door factory, or in fact, anything you require in the line of wood-working machinery. You may have all the superior points found in our goods fully explained to you by our representative. Drop us a line and it will bring the information you require.

**The WATEROUS ENGINE WORKS CO., LIMITED, Winnipeg, Man.**

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DRYING SYSTEMS OF ALL KINDS  
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Dry Kiln Trucks and Wheels, Lumber Dryers,  
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## SHELDON & SHELDON

Engineers and Manufacturers

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**WE MAKE** Wheelock Engines, Corliss Engines, Ideal Engines, Boilers, Pumps, Flour Mill Machinery, Oat Meal Mill Machinery, Oat Meal Steam Pan Kilns, Wood Working Machinery, Iron Pulleys, Wood Rim Split Pulleys, Shafting, Hangers, Gearing, Friction Clutch Pulleys, Friction Clutch Couplings, etc., Safes, Vaults and Vault Doors.



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THE MOST ECONOMICAL FORM OF SODA FOR MANUFACTURERS OF  
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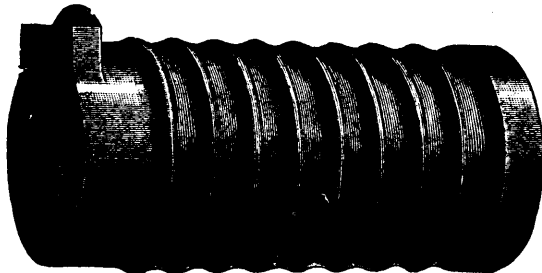
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ALSO CAUSTIC SODA, SALSODA, CONCENTRATED SALSODA  
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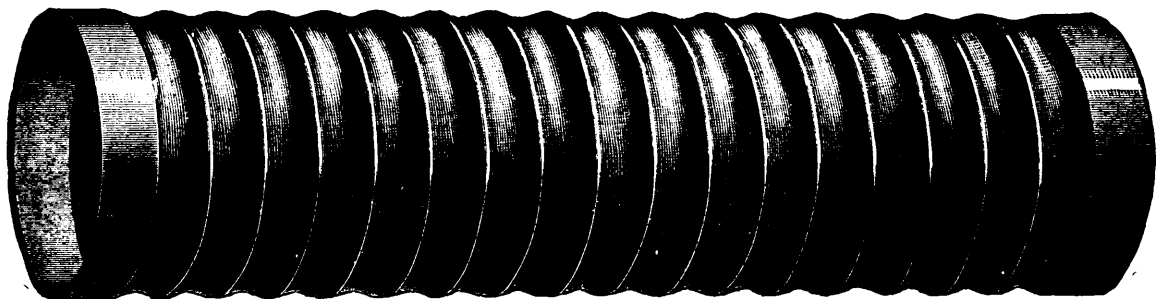


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With Plain Ends or Flanged to any required shape.

Uniform Thickness, Easily Cleaned, Unexcelled for  
Strength, Unsurpassed for Steaming Capacity.

*The universally satisfactory record of "THE MORISON" proclaims it the best furnace made.*



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WEST AND CALYER STS.,  
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Suitable for Car Wheels, Cylinders and Fine Castings, where the utmost strength is required.

UNSURPASSED IN STRENGTH BY SWEDISH, RUSSIAN OR AMERICAN CHARCOAL IRON.

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- \* You cannot hurt this steel by burning it.
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All sizes in stock.

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PIG IRON,  
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Spring, Reeled Machinery, Tire, Toe Caulk, Sleigh Shoe, Angles, Special Sections and all Merchant Bar Steel. Sheet Steel up to 48 inches wide.

RAILWAY AND ELECTRIC RAILWAY CAR AXLES

FISH PLATES, SPIKES AND TRACK BOLTS

Tee Rails, 12, 18, 24 and 28 lbs. per yard

**..HEAVY FORGINGS A SPECIALTY..**

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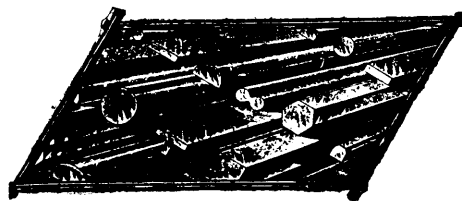
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**COLD DIE-ROLLED  
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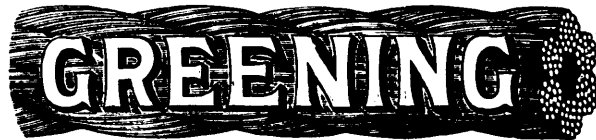
True to Size and Highly Polished.

**ROUNDS, SQUARES, FLATS AND HEXAGONS.**

**ASK US FOR PRICES.**

Office and Works: HAMILTON, CANADA.

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**"ACME"  
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Highest Grade of Hoisting Rope made. Extra Tensile Strength for Heavy Work.  
One Strand painted green, look for it.

USE GREENING'S ROPE GREASE FOR LUBRICATION.

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YOUR HANDS**

Never send your Orders  
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to any concern except the

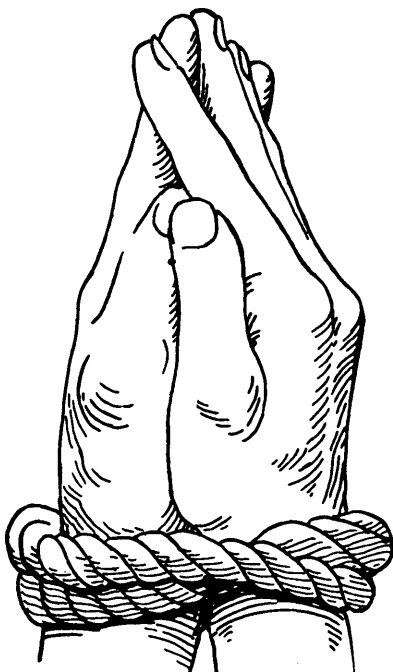
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**The Best on Earth**

MONTREAL,

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INGOTS—SHEETS—TUBING, ETC.

*Aluminum Stamped, Cast, Spun Articles of any Description to Order.*

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Correspondents in Ontario and Manitoba are requested to address themselves there and are cordially invited to call when in Toronto.

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TORONTO  
HALIFAX

Head Office: SHERBROOKE, QUE.  
Works: SHERBROOKE, QUE., ST. CATHARINES, ONT.

ROSSLAND  
VANCOUVER

During the fiscal year ending June 30, 1905, the imports of fuel into Canada and the value thereof were as follows:—Bituminous and Dust, **4,826,535** tons, value **\$8,346,352**; Anthracite and Dust, **2,604,137** tons, value **\$12,093,371**; Coke, **371,593** tons, value **\$807,842**; Charcoal, value **\$46,862**. Under the general tariff the duty on Bituminous Coal is 53 cents per net ton, and upon Bituminous Dust or Slack, and upon Charcoal, 20 per cent. There is no duty imposed upon Anthracite or Coke.

EVERY STEAM POWER PLANT IN CANADA USES COAL. EVERY FOUNDRY USES COKE.

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R. J. SINCLAIR, Sales Agent.

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## "Red Jacket" Coal

MINED IN WEST VIRGINIA.

The Best Bituminous Coal for Steam and Domestic Purposes.

Has a tough and blocky structure.  
Smallest percentage of fine coal.  
Low in ash and sulphur and no clinkers.  
Not subject to spontaneous combustion.  
Nothing better for malleable iron works.  
One of the strongest steam coals.

RED  
JACKET  
THE

### COMPARATIVE HEAT UNITS PER POUND OF COAL.

Anthracite—See "Steam," published by Babcock & Wilcock Co., 13,985.  
"RED JACKET"—Determined by 50 weeks' test at Cincinnati Edison Plant, in 1901-2, the daily use of the coal tested being two hundred tons, 13,600.

### BOILER TEST OF THE CINCINNATI EDISON CO., OF CINCINNATI.

Water apparently evaporated under actual conditions per pound of coal, 10 1/2 lbs.  
Equivalent evaporated from and at 212 degrees per pound of combustible pounds, 12:33.

We also handle Pocohontas Coke. Correspondence solicited.

<b>COAL</b>	<b>JAS. H. MILNES &amp; CO.</b>	<b>COKE</b>
WHOLESALE DEALERS IN Best Grades of STEAM COALS. Best Grades of BLACKSMITHS' COALS. Best Grades of FOUNDRY COKES. Shipments made direct from Mines to any point in Canada. Write for quotations.		

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Docks: Esplanade, Foot of Yonge

<b>COAL</b>	<u>Highest Quality</u>	EGG, - STOVE, - CHESTNUT,
Car Load Lots Direct from Mines. Prompt Shipment.	Close Prices for Cash.	Pittsburg Lump, Mine Run, Slack, Smithing Coal, American Gas House Coke, Prepared Coke,
<b>HAMILTON, ONT.</b>	<b>THOS. MYLES' SONS</b>	EGG, - STOVE, - CHESTNUT.

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Miners and Shippers

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GAS and PITTSBURGH  
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Manufacturers of

HIGH GRADE COKE

Loading and Fueling Docks at all Ports on the Great Lakes.

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(INCORPORATED)

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## Bituminous Coals

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Mercer & Butler County Coals.

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Leather  
Gums  
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Cements  
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Grease  
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Shafting  
Hangers  
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The highest type of modern fireproof construction is  
Concrete reinforced with EXPANDED METAL.

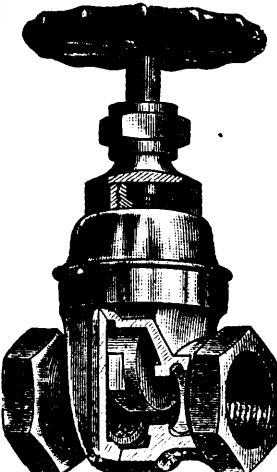
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FIREPROOFING CO., LIMITED**

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**IF YOU WOULD SAVE MONEY**

Pay a few cents more for a good Valve, and save Dollars in Steam-Fitter's bills.

**Buy "KERR" Valves**

and you will find a big saving during the year.

QUALITY COUNTS

**THE KERR ENGINE CO., LIMITED**  
Manufacturers  
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**Genuine Emery**

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**ECO MAGNETO WATCHMAN'S CLOCK!**



Which is and always has been entirely constructed for magneto operation

Similar devices, cheaply gotten up, operated by battery or generators, are liable to faults of construction. The superiority of the Eco Magneto is easily proved.

**It** is approved by the National Board and all Underwriters. is fully guaranteed for 5 years. is installed on trial and subject to moderate cost when accepted. Used by foremost Canadian firms and found entirely satisfactory.

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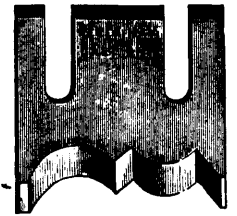
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MACHINES,



Quality Warranted.

Send for Price List.

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**ELK FIRE BRICK CO.**

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AND

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Manufacturers of High Grade FIRE CLAY and SILICA BRICK for Heating and Malleable Iron Furnaces, Glass Works, Cement Works—also Bee Hive and By-Product Coke Ovens, Brick and shapes of all kinds.

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**"Beech Creek" FIRE BRICK**

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Special Mixtures for use in Rolling Mills, Malleable Iron Works, Steel Works, Blast Furnaces, Glass Tanks, Cement Kilns, Locomotive Blocks, and all High Grade Uses.

*Difficult Shapes a Specialty.*

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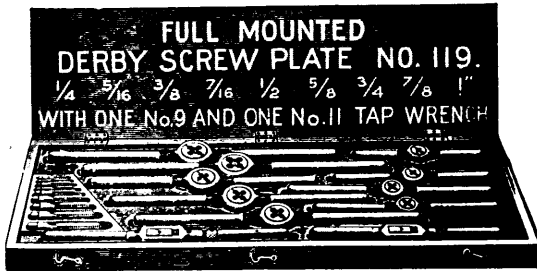
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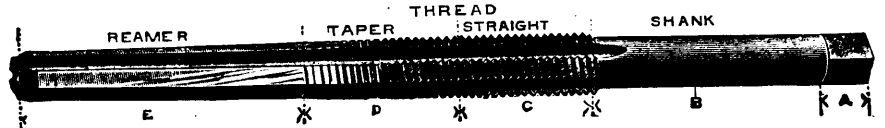
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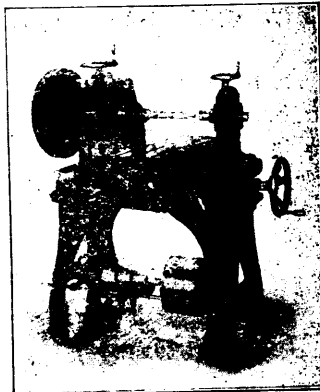
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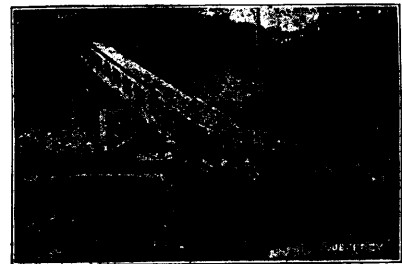
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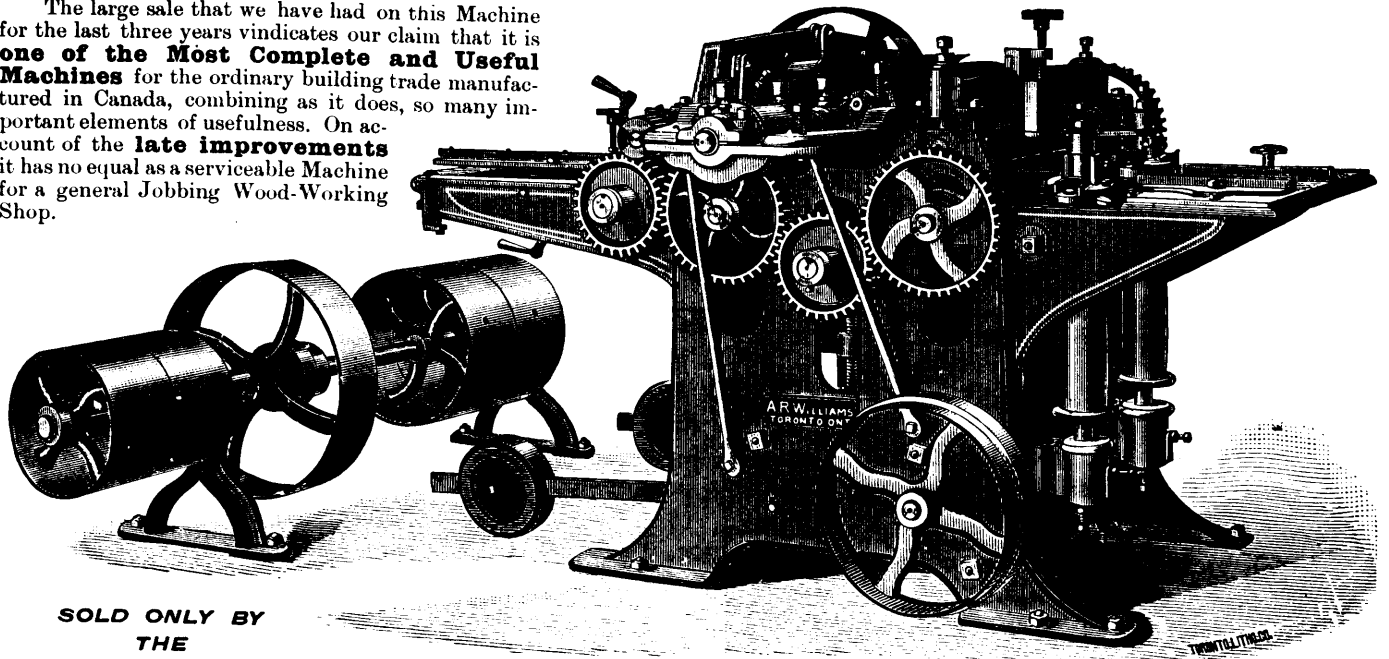
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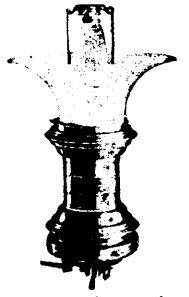
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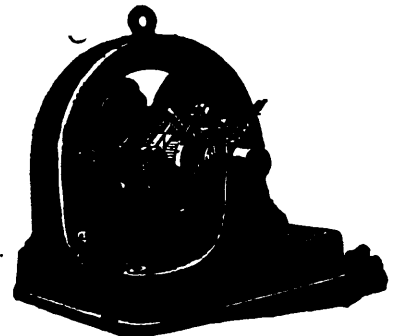
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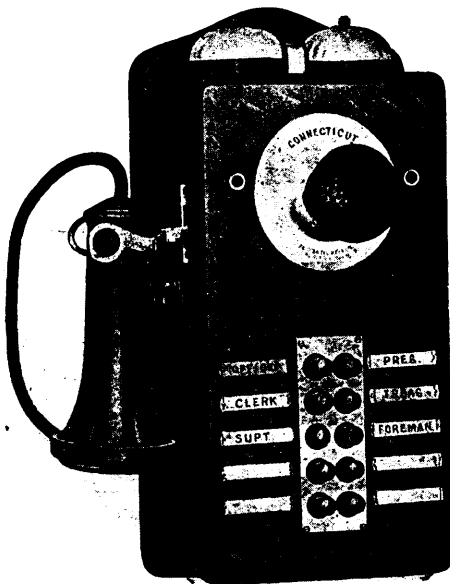


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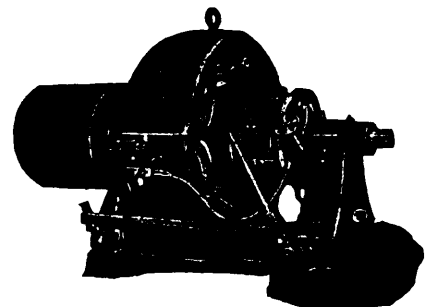
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1.....	400	157	39.2	7.....	40.4	20.7	51.2
2.....	74	57	77	8.....	74.3	40	53.8
3.....	38.6	25.3	65.6	9.....	47.2	24.5	51.8
4.....	59.2	47.9	80.7	10.....	190	108	56.9
5.....	112	64	57	11.....	107	74.5	69.7
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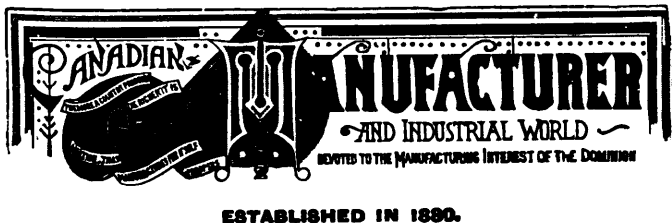
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J. J. CASSIDEY, Editor and Manager

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**THE NEED OF THE IRON INDUSTRY.**

[Republished by request from the THE CANADIAN MANUFACTURER of January 5, 1906.]

A few years ago both political parties of Canada came to the conclusion that the establishment of a great iron and steel industry would be so advantageous to the Canadian people that it would be worth while to pay liberally for it. Both parties were agreed that the encouragement given to the industry should be partly in the form of tariff protection, and partly in the form of bounties. There were some differences of opinion as to whether there should be a high tariff and small bounties, or a low tariff and large bounties. The view that prevailed was that bounties should be largely substituted for tariff protection, and when the liberal Minister of Finance reduced the tariff protection and proposed generous bounties, the conservative leaders, while not favoring the tariff reduction, fully endorsed the proposal for increased bounties. It thus became the settled policy irrespective of party to build up a great iron and steel industry. This decision was largely influenced by the following facts: (1) Iron and steel are used as materials in a great variety of industries, and it was realized that so long as our manufacturers were entirely dependent upon foreign sources for their supplies they must pay excessive prices at times, and run the risk of not securing sufficient supplies during any period of scarcity. The leading men of both political parties believed that the establishment of a home iron and steel industry would eventually have the effect of decreasing prices to Canadian consumers while ensuring a more certain supply of materials to manufacturers.

(2) It was recognized that the development of an iron and steel industry would, by creating a demand for iron ore, limestone, charcoal, coke, etc., give value to natural resources that must otherwise lie dormant.

(3) That it would give employment to a large number of men in taking the materials out of the ground as well as in turning them into finished products, and that these workmen and their families would all require to eat Canadian farm products.

(4) That it would keep in circulation within the Dominion a vast amount of money that would otherwise go to foreign countries, thus benefitting every branch of Canadian trade.

(5) That the initial difficulties of starting an iron industry were so great, owing to the great cost of the plant and the necessity for prolonged experiments with raw materials, that the industry had never been established in any country without Government assistance.

The bounties offered attracted many millions of capital for investment in the industry, but it requires very much longer time to construct large iron and steel works than the Government calculated, and consequently, as the bounties decreased from year to year, by the time the new works were in operation the Government's share of the cost of manufacturing was greatly reduced, and the national outlay was thus considerably less than was anticipated when the policy was adopted. The Government immediately received great additions to its revenues as a result of the establishment of these new works. Long before the government was called upon to pay a cent in bounties it derived a very large revenue directly from imports of machinery and various materials required in the construction of the works. The large number of men employed in construction work were all consumers of imported products upon which customs duties were paid. It is no exaggeration to say that the new iron and steel works, during the course of construction, added to the government revenues far more than sufficient to pay the bounties due for the output of the works that were already in operation before the bounties were increased. Since the completion of the works the government have derived a very large annual revenue from the towns that have grown up around them. The government practically became partners in this industry, and if the increased national revenues be regarded as interest on the amount invested, it must be admitted that up to the present time the country has received a larger return for its investment than the capitalists who put their money into the works, for it is a well known fact that most of the investors in Canadian iron and steel works have received absolutely no profits as yet.

The government have gone so far in the support of this industry that they cannot stop half way. They must complete their work. Various causes have served to keep the iron schedules of the tariff "a thing of shreds and patches" rather than a well thought out, scientific arrangement, permitting of the pig iron produced by Canadian furnaces being worked up into finished products used by the Canadian people.

The encouragement given up to the present time has brought about the establishment of blast furnaces that are producing on an average about 1,675 tons of iron per day from the following furnaces:

**COKE FURNACES.**

	Tons.
Dominion Iron & Steel Co., four furnaces, capacity 1,000 tons, two furnaces running, producing per day about.....	500
Algoma Steel Co., Sault Ste. Marie, two furnaces producing per day about.....	450



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North Sydney, one furnace producing per day about.....	250
Londonderry, N.S., one furnace, producing per day about.....	100
Hamilton, one furnace producing per day about.....	175
Midland, one furnace producing per day about.....	130
CHARCOAL FURNACES.	
Radnor Forges, Que., one furnace producing per day.....	25
Drummondville, Que., one furnace producing per day.....	10
Deseronto, one furnace producing per day about.....	35
Total.....	1,675

If the furnaces at present in blast (eleven in number) were run regularly throughout the year, say 325 days, they would produce about 540,000 tons. If the two additional furnaces at Sydney, now silent, were run, they would add a further 500 tons per day. We have in prospect the building of two new furnaces, one at the Soo and one at Midland, with combined capacity of say 500 tons per day. The product of these furnaces taken together with the output of those now in blast would give us about 865,000 tons per annum.

Now, to make it possible for these blast furnaces to continue in operation and find an outlet for their product, the government must extend their tariff logically to cover the lines of finished iron and steel that have not yet been manufactured in Canada. For that reason the tariff must be increased on steel billets, (for which there is an excellent and immediate market, as the blue books will show), on structural steel, boiler and tank plates, hoops, bands, sheets, boiler tubes and other forms of iron and steel. If the government cannot see its way to follow the American plan of immediately putting on the duty and thus bringing about at once the natural development of the industry, they should at least give to capital the assurance that the moment plants are erected for the manufacture and supply of any of these staple articles in iron and steel, the same degree of encouragement, in the form of bounties and duties will be given to them as is already given to established lines. That such a policy would soon result in the establishment of new industries for the manufacture of these lines must be evident to the government in view of the result of the duty of seven dollars per ton they now impose on steel rails, and the bounty of six dollars per ton they grant to wire rods. Although steel rails and wire rods were not manufactured in Canada at the time the government announced its intention of giving such encouragement, capital was immediately forthcoming, works were rapidly pushed to completion, and already the combined tonnage of steel rails at the Soo and Sydney is from 900 to 1,000 tons per day, or an aggregate of from 260,000 to 300,000 tons per annum, while the Dominion Iron & Steel Co. is turning out about 7,000

tons of wire rods per month, for which they have an excellent market.

To show what effect the tariff has on the production of these mills, it is easy to see that the reason why the Dominion Iron & Steel Co. are not making steel billets for sale to the trade is that they find a much more profitable market in steel rails and wire rods, because a fair degree of protection and encouragement is given on the two latter lines, whereas the duty on steel billets is merely nominal, and will never bring about the manufacture in Canada of this special line for sale to the trade.

When the tariff is revised it should grant higher protection to the basic product, pig iron, than it now enjoys, and the bounty system should be extended for a reasonable period. A reference to the blue books will show that on account of the British preference, and the yearly reduction that has taken place in the bounties on pig iron, this branch of Canadian industry has suffered a greater reduction in government support since 1897 than any other line of business, whereas, as a matter of fact, it requires, to establish a Canadian iron industry, more consistent protection, and for a longer period than perhaps any other industry and enterprise in operation in the country. This is because it requires a larger investment of capital to establish the industry, and the risk to investors is greater in case of failure than in any other line, inasmuch as the blast furnace cannot be sold for any other purpose than that of the production of iron. Then there is the difficulty of securing and operating mines, testing ores, and so forth, which involve great expense and long continued experiments.

With respect to the statement regarding the reduction in tariff and bounty encouragement since 1897, it may be pointed out that previous to the bounty act of 1897 Canadian manufacturers of pig iron were given a protection by Customs duty of four dollars per net ton, and a bounty of two dollars per net ton, a total encouragement of six dollars per ton. The Act of 1897 cancelled this and gave instead a Customs duty of \$2.50 per ton, and a bounty of three dollars per ton, when Canadian ore was used, or one-third less when foreign ore was used, a total encouragement of \$5.50 per ton when Canadian ore alone was used. This was subject to a reduction of 12½ per cent. by the British preference, which did not go into effect until sometime afterward, and this preference was subsequently increased to 25 per cent., and then to 33⅓ per cent., bringing down the minimum tariff protection to \$1.67 per ton. The reduction of course applied to other lines of industry as well, but there was this difference. The maximum tariff protection on pig iron had been reduced by 37½ per cent. with the understanding that increased bounties should offset the reduction, but the bounties decreased 10 per cent. per annum at the same time that the tariff protection was being also reduced. In some lines of manufacture the government carefully increased the general tariff in order to partially offset the preferential rate, but the opposite course was pursued regarding the iron industry. The preference was seemingly not taken into consideration when the government fixed the duty at

\$2.50 per ton, which was a reduction on what they themselves designed to be the minimum duty they intended to impose. Since 1897 the bounty has been gradually reduced, and the position to-day is that Canadian makers only enjoy a minimum tariff of \$1.67 per ton, and a bounty of \$1.65 per ton, or a total encouragement of \$3.32 per ton, as against \$6 per ton before the tariff revision of 1897, and \$5.50 per ton immediately after the tariff revision. Unless the bounties are revised and extended this will be further reduced on the thirtieth of next June, the expiration of the current fiscal year. It must be plain to anyone who looks into the question that it is impossible for the Canadian furnaces to go ahead to a successful development on the present rate of duty and bounty. These should be revised and made to approximate more closely to the encouragement given in 1897 before the British preference went into effect, and then the duties should be logically arranged on the higher finished articles so as to give an equivalent protection to labor employed all along the line, and ensure a home market for the output of Canadian blast furnaces.

We do not wish to be understood as advocating a reduction in the rate of the British preference. We are in favor of continuing to give British products a preference over foreign products, but the general tariff rate should be so increased that when this preference is granted the minimum encouragement to Canadian industry will be adequate.

The iron industry employs more labor in proportion to the value of the product than any other industrial enterprise. It is as much a natural industry, taking its wealth from the ground, as agriculture, but owing to the great cost of the plant and the difficulty in finding suitable ores during the early stages of development, it cannot get a foothold without special encouragement.

#### THE NEED OF THE IRON INDUSTRY— A SYMPOSIUM.

Believing that the subject of the preceding editorial, "The Need of the Iron Industry" was of such importance as to commend it strongly to every Canadian manufacturer who desires to see built up this most important industry, a number of them were requested to express their views in the matter for publication in these pages. In our issue of January 19 we gave synopses of some of the replies received, which are here reproduced, following which are other replies which will throw much more light upon what is perhaps the most important question before the people, soon to be acted upon by the Canadian Government.

Following are the expressions of some of the Captains of Canadian Industry:

C. C. Ballantyne, President the Canadian Manufacturers' Association, manager the Sherwin-Williams Co., Montreal, manufacturers of paints and varnishes.

J. J. Cassidey, Esq., Editor THE CANADIAN MANUFACTURER:

Dear Sir:—I have noted with much interest and satisfaction your very able editorial, entitled, "The Need of the Iron Industry."

It is evident that the iron and steel industry in all

its various branches cannot profitably exist unless the basic forms are securely established. I believe that the Dominion Government are fully alive to the great need of protecting and encouraging to the fullest extent the developments of the iron and steel industry in Canada. The future possibilities in Canada for developing this industry are great, and I feel sure that all Canadians, irrespective of politics, will welcome all the encouragement that our government can give in assisting the further advancement and building up of one of our greatest industries.

I heartily congratulate you on your very strong practical Canadian editorial, which will give all your readers a better understanding of the needs of this very important industry.

Edward Gurney, Past President the Canadian Manufacturers' Association, president the Gurney Foundry Co., Toronto, manufacturers of heating and cooking goods.

J. J. Cassidey, Esq., Editor THE CANADIAN MANUFACTURER:

Dear Sir:—I have read your article with great interest, and am astonished at the statement you make that the receipts growing out of the revenue derived from iron manufacture have been equal to the expenditures made by the government in the way of bounty, etc. I do not think that I can add anything to the strength of your very cogent reasoning on this subject, but I can say that I have been astonished by two facts which I have observed in this connection. One is the liberality of the users of iron, who are almost universally willing to concede that the pig iron which they use is a manufactured article, and therefore, should be encouraged by a protective tariff. The ordinary experience of men in business is that where a man's pocket is directly touched by a duty he is almost universally opposed to it, but in the large contracts which I have had with manufacturers of iron, the number of exceptions to the rule which I have stated, has been exceedingly small. On the other hand, I have been equally astonished at the general attitude of the government to this pig iron proposition, which is recognized to be the one thing more than any other which stands at the base of manufacturing industries of any country.

We are all able to see what has been accomplished in the United States, which country, within my lifetime, imported nearly all the iron that it used from Great Britain, while now its product is nearly 300 per cent. greater than that of the British Islands, the relative production being, as I remember, 7 million tons in one instance, and 21 million tons in the other. There is some satisfaction to be found in the fact that the government is looking into the matter, but I do not believe that we shall ever have anything really effective until we have a great protectionist party divorced largely, if not entirely, from the little questions which have separated the two parties now existing in Canada. We have learned many things from the people of the United States, and are the better for it, but this one thing we have yet to learn, and that is, that it is better to produce goods within our own borders than to import them, even though the imported goods for a time may be less expensive.

F. G. Butterfield, manager Butterfield & Co., manufacturers of stocks and dies, die plates, screw plates, etc., Rock Island, Que.

J. J. Cassidey, Esq., Editor THE CANADIAN MANUFACTURER:

Dear Sir:—We have read your article in THE CANADIAN

MANUFACTURER, entitled "The Need of the Iron Industry." And while we would not care to go into a discussion of the matter, we will frankly say, that we believe in a high tariff for the Iron Industry of Canada, believing that it will build up this industry more quickly and more thoroughly than any system of bounties or subsidies.

Bennett Rosamond, past president The Canadian Manufacturers' Association, president the Rosamond Woolen Co., Almonte, Ont.

J. J. Cassidey, Esq., Editor THE CANADIAN MANUFACTURER:

Dear Sir:—I regret to say that I know but little of the iron industry and therefore am not competent to give an intelligent opinion on the subject. There is always this to be said, however, that a successful and flourishing iron industry would be of very great advantage to Canada and worth considerable sacrifice to secure.

C. F. Wheaton, manager Dodge Manufacturing Co., engineers, founders and machinists, manufacturers of power transmission machinery, etc., Toronto.

J. J. Cassidey, Esq., Editor THE CANADIAN MANUFACTURER:

Dear Sir:—In answer to your letter calling attention to your editorial on, "The Need of the Iron Industry," would say that conditional upon his finished product having a reasonable measure of protection, over the protection afforded the raw material, whatever this latter may be, we are in favor of an adequate protection for all industries. We must not be misunderstood on this question, however, since in our opinion the tariff as it stands to-day is inconsistent, inasmuch as the raw material of the foundry and the machine shop is protected to a greater extent than is the finished product. Consequently the manufacturer is handicapped, and as a matter of fact cannot stand up against the conditions which actually exist, and must have either cheaper raw material or more protection for his finished product.

Following are replies from other prominent manufacturers:

H. Cockshutt, Vice-President the Canadian Manufacturers' Association, manager the Cockshutt Plow Co., Brantford, Ont., manufacturers of plows, etc.

J. J. Cassidey, Esq., Editor THE CANADIAN MANUFACTURER:

Dear Sir:—I have read the editorial in THE CANADIAN MANUFACTURER, re "The Need of the Iron Industry," and consider it a very well written article. Personally, I am strongly in favor of there being sufficient encouragement given to develop successfully the natural resources and manufacturing industries of Canada.

W. K. McNaught, Past-President the Canadian Manufacturers' Association, chairman of Tariff Committee of the Association, president the American Watch Case Co., Toronto.

J. J. Cassidey, Esq., Editor THE CANADIAN MANUFACTURER:

Dear Sir:—I am thoroughly of the opinion in view of the national necessity of building up a great iron and steel industry in this country, that the Government should afford it such a measure of protection, either by way of duty or bounty or a combination of both, as will absolutely insure its healthful growth and permanency.

Willard N. Sawyer, general manager the Algoma Steel Co., Sault Ste. Marie, Ont.

J. J. Cassidey, Esq., Editor THE CANADIAN MANUFACTURER:

Dear Sir:—We heartily approve of the stand you have taken in regard to the development of the iron and steel industry in Canada. There is no industry more essential to the progress and permanent upbuilding of a country than the manufacture of iron and its products; nothing that makes it more powerful and independent. Like agriculture it is basic, and yields results to labor from the ground up, but it goes farther than any agricultural product, and from stage to stage, from ore, coal and lime to the highest finished product, labor is benefitted, and through the hosts of workmen necessary in every branch, a stimulus is given to the trade of the country as a whole. To establish an industry of this kind is not a work of days, and anyone who has been connected with such pioneer work, whether in Great Britain, the United States, or Canada, has found it more than uphill work; and we do not know of any country in which an iron industry has been successfully established without government aid, through tariff or bounties, or both.

If it were difficult to attain success when the iron industries were being built up in Great Britain and the United States, how much more difficult is it now with higher wages, lower prices for the finished articles, and keener competition. To put iron and steel on a firm basis in Canada, the tariff should protect on every line, and encourage the iron workers to a full development, not merely to be makers of a few of the lesser products, but to manufacture every important requirement of the country. Former tariffs in Canada did not provide for many of the most important products. Recently steel rails have received protection, and to-day rails, at least equal to the best of other countries, are being made in Canada. The same can be said of wire rods, another important product, but, as your article points out, there are other products deserving attention, notably steel billets, structural steel, plates and sheets; and we hold that these lines should be given protection equal to that given to other products; and if nothing else is done at the next session of Parliament, provision should be made so that the Governor-in-Council could grant equal protection to these lines whenever mills are established in Canada.

While much progress has already been made, still the industry is not yet "out of the woods" and requires a strong support all along the line, and we believe this can best be done by an extension of the bounty system and tariff protection, and by increasing where necessary, and extending equivalent protection to the lines that so far have not been protected. The industry to-day would seem to be on the verge of success. Any weakness would mean disaster, while a strong support, strongly and boldly given, will, we believe, place the iron industry on solid ground.

We congratulate you on the stand you have taken and fully endorse your article of January 5th.

J. P. Edwards, manager the Londonderry Iron & Mining Co., Londonderry, N.S.

J. J. Cassidey, Esq., Editor THE CANADIAN MANUFACTURER:

Dear Sir:—I have carefully read your editorial on "The Need of the Iron Industry," and heartily endorse the views you express. That a change in the policy of the Government in its treatment of the iron manufacturers of Canada is necessary, no one at all acquainted with the business can deny. Practically all lines suffer. From the smelting process to the finished high grade casting,

complaints of the invaded markets and cutting of prices by foreign manufacturers are general. Dealing more specifically with the first process—the making of pig iron,—the tariff protection is most meagre, and the bounty—so essential towards laying deep and strong foundations for the perpetuity of the industry—is fast approaching the vanishing point. A duty of \$1.67 on pig iron from Great Britain, coupled with the almost nominal freight rates on that material, is practically no protection—to Maritime furnaces at any rate, as the rail freight on their output from eastern Nova Scotia to Montreal is about equal to the combined customs duty and ocean freight on British iron.

Then, as you point out, the bounty given to pig iron producers is very largely offset by the great increase to the revenue due to the import of machinery and material for the new works, and to the use by a vast number of workmen of articles which had perforce contributed liberally to the customs receipts of the Dominion. But there is another source of revenue which you may well include, and that is the enormous addition to the income of the government railways from the local manufacture of iron and steel. Very little Canadian pig is carried from maker to consumer by water;—practically all goes by rail. A furnace such as that at Londonderry—the smallest producer in the list you give of coke furnaces—involves daily direct freight of nearly 500 tons to the Intercolonial Railway, and thus constitutes a very imposing addition to the yearly traffic receipts. The indirect freight in food, supplies, clothing, etc., to the workmen and their families is also a large item.

In all fairness and as a matter of good business for the Government, the bounty of at least a year or two ago should be restored and kept in force for a stated period, long enough to firmly establish the industry. A graduated scale of payments would be most equitable and aid best in developing Canada's resources. Those who use either Canadian ores or fuel should receive a substantially higher bounty than the furnaces which are depending wholly on foreign supplies of material; while those who use nothing but Canadian materials—both ore and fuel—should receive a still more liberal measure of encouragement. A far spreading impetus would thus be given to the development of our minerals and to the steady employment of Canadians in their own country.

D. W. Robb, managing director Robb Engineering Co., Limited, manufacturers of engines, boilers, etc., Amherst, N.S.

J. J. Cassidey, Esq., Editor THE CANADIAN MANUFACTURER:

Dear Sir:—I have read your article in THE CANADIAN MANUFACTURER, entitled "The Need of the Iron Industry," with much interest.

As you probably know, I am, and always have been, strongly in favor of protection for Canadian industries of all kinds. I quite agree with the views expressed so well and strongly in your article, and have no doubt it will do much good. As the iron industry is the basis of nearly all manufacturing, I think it deserves all the support and assistance that can be given to it in every way, by government measures and otherwise, as it will do more towards the building up of this country than almost everything else. We have only to look at the history of the iron industry in the United States to be convinced of this fact, and also to see that its rapid growth was due largely to the stimulation it received by strongly protective duties. The country would receive the greatest benefit from protection of the more highly finished products of iron and steel, employing the greatest amount

of labor, but I also think that all the products of the blast furnace should be protected.

James Pender, managing director James Pender & Co., manufacturers of wire, wire nails, horse shoe nails, etc., Saint John, N.B.

J. J. Cassidey, Esq., Editor THE CANADIAN MANUFACTURER:

Dear Sir:—We might say that not being users of pig iron or steel billets, we are not in as good a position from actual experience to express an opinion on the need of the iron industry as people who operate large foundries or rolling mills, but from a general knowledge of the situation we think it very important that Canada should be placed in an independent position for a supply of raw materials in the iron and steel lines if such can be accomplished by any reasonable sacrifice for a limited period.

Canada is a country of very wide extent and for this reason the freight is a very important factor in the supply of pig iron or billets to foundries and rolling mills at present in operation for the supply of the Canadian trade in finished products. The coal for smelting iron is, so far as at present known, located on the Atlantic and Pacific seaboard and in the Rocky Mountains, whereas the bulk of the iron ores yet discovered are located in the central part of the country in the neighborhood of Lake Superior, with some in Nova Scotia. To take the coal to the iron or the iron to the coal means a very large expense for freight. Of course the Nova Scotia furnaces are favorably situated for a supply of foreign ore which they now secure principally from Newfoundland. This, with an abundant supply of coal in their immediate vicinity, enables them to produce at a reasonably low cost, but the freight on the finished product to consumers in the interior of the country is quite an item.

Without a technical knowledge of the various kinds of iron required for use in foundries, where a variety of castings are made, we understand it is necessary to have a variety of qualities of iron, and, with the limited number of furnaces producing pig iron in Canada, as compared with the United States, Great Britain or Germany, this variety cannot be so well secured, and for this reason we think a bounty of sufficient amount to encourage the industry, together with a moderate duty, would accomplish the purpose better than a high duty alone, as in the latter case the price of pig iron would be somewhat increased without the variety of qualities being furnished that is necessary.

We think the same to a certain degree would apply on billets. The steel mills at present have not sufficient capacity to supply billets for rolling mills except for their own use, and an increased duty could but enhance the cost of them to the consumer. We therefore think that a duty in combination with the bounty would be preferable until such time as sufficient billet mills are established to supply the market, when the competition between them would keep the price down.

We think the Government deserve considerable credit for the efforts put forward to develop the iron and steel industry through the bounties as originally arranged. Through over capitalization and mismanagement, the principal Canadian producers did not reach a point where they could supply the requirements of the home markets anything like as soon as was expected. The Government of course are not to blame for the optimistic and inflated ideas of certain over sanguine promoters, but, having committed themselves to the policy of developing the business, we think they should, to be consistent, make further reasonable provision for the successful completion of this development by extending the bounties for a few years more, and should also make dutiable all staple

lines of goods made from this raw material which has been stimulated into existence through these bounties, such as plain, galvanized and barbed wire, which are now free, and imported into Canada in quantities of 30,000 to 40,000 tons per year. This volume of merchandise, if made at home, would materially benefit the steel and wire industries of Canada, and, if conducted in a proper way would not appreciably enhance the cost to the consumer, but would make Canada independent of the United States Steel Corporation, who are now in possession of the Canadian market.

The statement that a duty on these galvanized and barbed wires, such as is imposed on other merchantable wires, "if deferred in its operation for six months after being announced," namely 20 per cent, would increase the price but little if any is confirmed by the results which have taken place in the nail business through the duty and dumping clause covering the last four or five years. And we might say that we believe the dumping clause, as applied to staple iron and steel goods, to be the best feature embodied in the tariff that has ever been devised, and serves its purpose admirably.

A comparative statement of American and Canadian prices for the five years beginning with 1901, when business had resumed its normal conditions after the extreme fluctuations of 1899 and 1900, would show that the average Canadian price charged the wholesale trade in St. John has not exceeded the average American price to the wholesale trade in Pittsburgh with carload freight added, by more than five cents to ten cents per keg. This result has been brought about by the competition among domestic makers which, when sufficient goods are made in the country to satisfy its entire requirements, always results in this way. This is the best reason we can possibly give for concluding that similar results would follow a moderate duty imposed on galvanized and barbed wire which are now free.

These wires are not exclusively used by farmers. Railroads are extensive users of them, and, as every railway in Canada has been in receipt of public assistance, either Federal, Provincial or Municipal, we see no good reason why the wires they use should not be dutiable.

In connection with the galvanized and barbed wire imports which aggregate, say 35,000 tons a year, we might mention the advantage which such an addition would be to our manufacturers if transferred to Canada. Last year's domestic production of wire nails, which in round figures was 800,000 kegs, and the largest in the history of the country, only amounts to 40,000 tons, or but a trifle more than the galvanized and barbed wire business, and the latter, which is extensively used on the prairies, will probably grow faster than the nail business.

It will be readily seen that many people now in the nail business would like very much to add this respectable amount to the volume of their output which would about double it. The average advance price for barbed wire over the base price of wire nails covering the last two years in United States, which would probably be a fair average of the past five years, is about 50 cents per 100 lbs. or \$10 per ton. This we would judge fairly represents a profitable price in the United States, and, without any knowledge based on actual experience, we would judge this price to be equally as profitable as making in Canada. This being so, if a duty with the dumping clause were arranged as suggested, so as to insure the market to the domestic makers, they could produce the goods at practically the same price as obtains to-day so long as raw material remains about as it is.

In this connection we might say that the present rod mill in Canada has been very considerate of the interests of the wire people inasmuch as they have at all times since starting furnished rods as low as they

could be bought abroad, and in many cases considerably lower. Of late they have furnished several months' supply to the different mills at fully \$4.00 per ton less than they could be imported, and this enables the domestic makers to supply the consumers with nails at very reasonable prices.

At present there is only one galvanized and barbed wire manufacturer in Canada, and the capacity of the plant would not be much, if any, more than 25 per cent. of the market requirements. They are only permitted to make this wire under an arrangement with an American concern, whereby they are obliged to buy the rods from them out of which this galvanized wire is made, the American company fixing the price for both the rods and the finished product. This is little better than living by sufferance, and this sufferance depending upon a foreign corporation, a position which, to say the least, is not a very enviable one. We do not think that Canadian manufacturers should be forced to occupy such a humiliating position indefinitely, and we trust that the Government will see their way clear to bring about an improvement in this direction.

In addition to the symposium above given we will, in our next and subsequent issues, give the opinions of other prominent manufacturers, some of whom are:

- C. A. Birge, Canada Screw Co., Hamilton, Ont.
- C. Birmingham, Canadian Locomotive Co., Kingston, Ont.
- C. R. Duncan, Montreal Pipe Foundry, Montreal.
- W. G. Smart, Smart-Turner Machine Co., Hamilton, Ont.
- W. C. Breckenridge, Norton Mfg. Co., Hamilton, Ont.
- James Davidson, The Thos. David Co., Hamilton, Ont.
- H. O. Kerr, The Kerr Engine Co., Walkerville, Ont.
- M. Kennedy, The Wm. Kennedy & Sons, Owen Sound, Ont.
- C. H. Waterous, The Waterous Engine Works Co., Brantford, Ont.
- C. J. Oliver, The R. McDougall Co., Galt, Ont.
- J. W. Cowan, The Cowan Co., Toronto.
- Wm. Chaplin, Welland Vale Mfg. Co., St. Catharines, Ont.
- Geo. Burch, Whitman & Barnes Mfg. Co., St. Catharines, Ont.
- J. C. Notman, McKinnon Dash & Metal Works Co., St. Catharines, Ont.
- Carl Riordan, Riordan Paper Mills, Merritton, Ont.
- D. R. Ker, Brackman-Ker Milling Co., Victoria, B.C.
- A. E. Cross, Calgary B. & M. Co., Calgary, Alberta.
- R. L. Innes, Canadian Cannery, Hamilton, Ont.
- P. H. Burton, Merchants' Dyeing & Finishing Co., Toronto.
- A. S. Rogers, Queen City Oil Co., Toronto.
- Alex. Saunders, Goderich Organ Co., Goderich, Ont.
- Jas. Maxwell, D. Maxwell & Sons, St. Mary's, Ont.
- J. P. Murray, Toronto Carpet Mfg. Co., Toronto.
- F. J. Campbell, Canada Paper Co., Windsor Mills, Que.
- G. F. Haworth, Sadler & Haworth, Toronto.
- J. O. Thorn, Metallic Roofing Co., Toronto.
- Phelps Johnson, Dominion Bridge Co., Montreal.

Statistics of Newfoundland's trade during the year ended June 30 last, just announced, show that the imports from the United States declined from \$2,991,000 in 1904 to \$2,750,000, while the imports from Canada increased from \$3,423,000 to \$4,105,000. There was an increase also from \$2,497,000 to \$2,694,000 in the imports from Great Britain. The customs authorities attribute the decline in American imports to the friction over the fishery question and to the failure of the United States Senate to ratify the Hay-Bond treaty.

# MACHINERY AND ENGINEERING.

## THE STURTEVANT HIGH PRESSURE BLOWER.

The Sturtevant high pressure blower is made in two types; in one, the shafts are in a horizontal plane, while in the other their axes are in a vertical plane. The blower consists of a cast-iron shell in which are two rotating members or "rotors." One of these, the impeller, is mounted on the driving shaft and revolves in the larger portion of the casing; it does the real work of compression. It is made up of three diamond-shaped bars or blades, and a central web keyed to the steel shaft. As it revolves three separate pockets are formed in the annular space between the shell and the core. Being symmetrical it is perfectly balanced at all speeds.

The other rotor, known as the idler, does no work but successively provides spaces of proper shape in order that the impeller

the cover plates. The small amount of compressed air that leaks backward cannot reach the inlet for it is caught in the next pocket, increasing slightly the pressure therein and resulting in gradual compression which contributes to a quiet-running, durable machine and a steady discharge.

Air or gas at suction pressure entering the blower is successively imprisoned in the three pockets formed by the three blades of the revolving impeller, and discharged at any desired pressure up to ten pounds per square inch. The volume of air delivered per revolution is constant; the pressure varying with the speed and resistance to passage of air.

On either side of the housing are openings for intake and discharge, flanged and drilled for standard gas-pipe fittings; the small blowers have openings at the sides and the larger sizes have openings at the top and bottom. In every respect the casing is

of material and proportion, and harmonious design. Such conditions are in striking contrast to cases in which the various parts are made in different places and then assembled; the engines or motors, having been built for other purposes and not especially designed for the work in hand. Sturtevant engines completely enclosed and with forced lubrication are particularly adapted for this work.

## MR. D. W. ROBB BEFORE THE TARIFF COMMISSION.

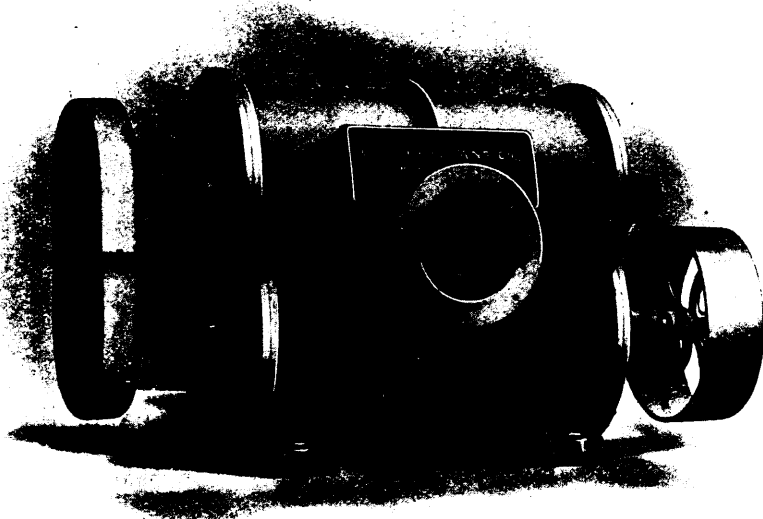
Mr. D. W. Robb, president of the Robb Engineering Co., Amherst, N.S., and vice-president of the Canadian Manufacturers' Association for Nova Scotia, addressed the Dominion Government Tariff Commission on their visit to Amherst in January. Mr. Robb said:

As vice-president for Nova Scotia of the Canadian Manufacturers' Association, I feel that I may have the privilege of extending to you a hearty welcome, and although I am not authorized especially to speak for the Nova Scotia manufacturers, I will venture to say a few words as the representative of that important body.

First of all, I wish to express our interest and approval of your effort to ascertain the requirements of the whole country in the way of a customs tariff, by giving an opportunity to all branches of industry to express their views and explain their needs.

While the manufacturers of Nova Scotia are bound to consider the tariff from their own standpoint and as it effects their own particular branches of industry, I think they are sufficiently broad in their views to recognize that whatever may be in the interest of the whole country, will benefit each individual directly or indirectly.

Referring to the benefits to be derived from manufacturing, I think you will agree with me that Amherst is one of the best examples to be found in Nova Scotia, or in the whole of Canada for that matter, of what prosperous factories can do for any locality. When the first industries were started here about 40 years ago, Amherst was a very small village, and apparently had no special advantages to recommend it for manufacturing, except that it was surrounded by a fertile country and settled by people of the energetic Anglo-Saxon races, and the French Acadians, who taught us how to reclaim our productive marshes or meadows around the Bay of Fundy, the descendants of whom are filling our workshops and working the farms that supply our markets to-day. Not being a seaport, and having less natural advantages than many other villages in Nova Scotia, Amherst has grown to be a large and prosperous town, having many flourishing industries, and surrounded by more well-to-do and wealthy farmers than can be found, perhaps, in the same radius surrounding any other town in the province. The demand for farm produce is as great, and the prices as high, if not higher than in any other of our towns or cities. I believe the farmers of this district will agree with



THE STURTEVANT HIGH PRESSURE BLOWER.

blades may return to the suction side of the blower without allowing the escape of any compressed air. It consists of three hollow blades or vanes cast in one piece with the shaft which is very rigid and, since the idler compresses no air, is of ample strength to transmit the little power necessary for rotation. The idler is turned at the same speed as the impeller by means of two spur gears running in oil and encased for protection against dirt and accident.

Ample clearance between the rotating members insures high mechanical efficiency. In other makes, if the clearances are very small to prevent air escaping backward to the inlet, great accuracy of finish and expensive adjustable journal boxes are necessary to render impossible the interference of the impellers. This bugbear of other types is an advantage in the Sturtevant blower; in fact the effect of clearance is intentionally increased by the leakage passages cast in

symmetrical, permitting the blower to run in either direction. Except in large sizes, the lower half of each journal box is cast in one piece with the cover plate, insuring rigidity, simplicity, and correct alignment. In all but very small blowers the boxes are of the ring-oiling type, lined with Sturtevant white metal, hammered in, and accurately bored.

For maintaining absolutely constant pressure a relief valve or automatic governor may be used. When transferring gases or air at high pressures, stuffing boxes are provided for the shafts; a drain in the bottom removes tar and other distilled liquids.

The Sturtevant high-pressure blower may be driven by a Sturtevant steam engine, or a Sturtevant motor, or may be belted to a line shaft. A complete line of motors and engines of suitable size and speed are built under the same roof with the blowers, thus combining the advantages of uniformity

me that this prosperity is due almost entirely to the manufacturing industries which have grown up here, and that this is so, and that they do believe in these industries, is proved by the facts that many of our leading farmers have spare capital, and that they have invested some of this capital in our factories. As a result of the growth and importance of our industries, Amherst will soon become one of the most important seaports at the head of the Bay of Fundy.

I might also point to the fact that the business passing through the Amherst station has grown to greater proportions than at any point on the Intercolonial Railway, except Montreal, St. John, Halifax and Sydney; and I believe you will agree with me that if you could, by any method, develop a business over the whole Intercolonial in proportion to that furnished by the town of Amherst and vicinity, the question of a deficit on the railway would be disposed of.

As the question you are here to consider is especially that of the tariff, you will very naturally enquire whether the tariff is responsible in any way for the prosperity and development of manufacturing in this section, and if so, whether it can be improved in such a way as to benefit other sections equally, or to a greater extent? I am not one of those who believe that the tariff, or any government measures, are the only factors in the success of manufacturing, farming or the other industries of the country. There are many other causes, such as the knowledge and confidence which grow in communities where manufacturing, farming or other lines of industry have been developed; but I do not claim that the protection and inducement offered by a reasonably protective tariff is a great incentive to men to put forth their energy and invest their money in these industries. I think this is well exemplified in our own province by the building and operation of the great iron and steel works at Sydney and Sydney Mines, which have undoubtedly been brought into existence by the present system of bonuses and protective duties instituted by the Canadian Government, and for which the Chairman and other members of your Honorable Commission are largely responsible. I am satisfied that so far as the province of Nova Scotia is concerned, which, by reason of its large deposits of coal, iron and other minerals, is especially adapted to manufacturing, a strongly protective tariff would tend to encourage still larger investment of capital and the development of many other large industries.

To come down to details, I would say that, as there are several other manufacturers here who are better qualified to present the requirements of their several industries than I am, and who will undoubtedly furnish much valuable information along their lines, I will refer to the engine and boiler branch, in which I am directly interested, and of which I can speak with some knowledge and experience, and in doing this, I wish to be understood as only presenting my own personal views as one of the manufacturers of Canada. I may say that I am entirely in sympathy with the representations made to the Commission by the Engine and Boiler Section of the Canadian Manufacturers' Association, which were presented to you at Peterboro, Ont., and I will not take up your

time in repeating statistics which are already before you, except that I would emphasize the importance of the fact that the present duty of 25 per cent. has not been sufficient to prevent manufacturers of other countries, especially the United States, from sending nearly a half a million dollars worth of engines and boilers into Canada each year during the last three or four years, and this in spite of the fact that business in the United States is in a most prosperous condition.

So far as Amherst industries are concerned, I am sure that except for the protection afforded by the present moderate tariff, it would have been impossible to develop our own industry to the extent it has been developed, and I feel sure that if the tariff had been sufficiently high to prohibit the importation of the nearly half million dollars in value of engines and boilers that have come into Canada each year for the past two or three years, Amherst alone would have been able to furnish from 20 to 25 per cent. of these engines and boilers; and I think it quite likely that other manufacturers who may address you will be able to add similar testimony in regard to cars, boots and shoes, stoves, enamelware, woollens and other products.

I may say further in this connection that having become interested in a boiler manufacturing business in the United States, I am prepared to speak to some extent from experience in both the United States and Canada, and say that while it has been my aim to equip our shops in Canada in as complete a manner as those in the United States, and while the methods of manufacturing are much the same in each country, I observe that the factories on the United States side of the line have a very decided advantage over Canadian factories, both in the cost of manufacturing and by reason of the lower tariff in Canada. Our reason for building workshops in the United States was that it is not possible to manufacture boilers or engines in Canada and ship them to the United States, on account of the high duties, while it is possible, under certain conditions, to ship such products from the United States to Canada.

The principal advantages which American manufacturers have over Canadians are as follows:

First, the requirements of the American market are so much greater than those of Canada that it pays to develop larger and more complete workshops, in which larger quantities of each class of goods may be turned out, with the result that the product is cheaper in such lines.

Second, United States manufacturers get boiler plates and other raw materials which are used in the construction of boilers and engines, which are produced in that country and not in Canada, at a lower price than they can be imported into this country.

Third, the fact that the United States has in close proximity a country such as Canada, requiring considerable quantities of the same class of goods as itself, enables its manufacturers, when a surplus is produced, to send that surplus into Canada by paying only a small part of the duty, the balance being made up by cheaper cost of manufacturing, and by the fact that the duty on some of the raw materials is saved.

In my experience in manufacturing engines

in Canada, I have found two principal factors which enable engine builders in the United States to obtain orders in Canada: First, there are certain lines of cheap engines and boilers which they make in very large quantities which they can produce cheaper than the smaller manufacturer in Canada; second, the equipment of new industries in Canada is frequently in charge of American engineers or architects, who quite naturally have a prejudice in favor of American-built machinery. In many cases, we have found these engineers were not aware and could not be convinced until too late, that machinery of an equally good class was being produced in this country. If the duty in such cases had been as high as the duty in the United States, the business would have been kept in Canada, as those responsible for the capitalization would not have been willing to pay the extra price.

As a member of several organizations composed of manufacturers and engineers in the United States, I have become quite conversant with the feeling there as regards the Canadian tariff and the United States tariff, and I may say frankly that American engineers and manufacturers are well satisfied with the present conditions, as they feel their own tariff is sufficiently high to hold their own market, with very little competition, and the low duties against them here is not sufficient to prevent them from doing a large amount of business in Canada. For these reasons, most of the American manufacturers with whom I have come in contact are opposed to anything in the nature of a reduction of the American tariff, or to reciprocity, as they feel they have everything to lose and nothing to gain.

Giving my own personal views in the matter, I feel that the changes recommended by the Canadian Manufacturers' Association, of an increase of duty on engines and machinery of that class to 35 per cent. is quite reasonable, and would be in the interest of the whole country.

#### CEMENT BONDING.

"Wire Bonding for Concrete Construction" is the title of a brochure sent us by the B. Greening Wire Co., Hamilton, Ont.

The progress made in the past few years by the use of concrete reinforced with steel, has been so rapid, and so many of the largest building operations of recent years have been carried to completion, in which this class of fireproofing has been adopted, that at the present time, a system that combines fire-resisting qualities, with load-carrying capacity, is readily admitted to the specifications of the most eminent architects and engineers.

Greening's wire bondings we are told, are made of all strengths of material and in any lengths desired. Long lengths forming a continuous bond are features of their reinforcement. For roofs and floors of great length, the superiority of this feature is no longer questioned.

The superiority of concrete construction, of stone, or cinder concrete reinforced with one or other form of steel embedded in the concrete, over other systems of fireproof arch is now readily conceded.

Other uses for reinforced concrete are floors of bridges, the construction of culverts, tunnels, shafts, sewers, retaining walls, footings, etc.

## CAPTAINS OF INDUSTRY.

The following items of information, which are classified under the title "Captains of Industry," relate to matters that are of special interest to every advertiser in these pages, and to every concern in Canada interested in any manufacturing industry whatever, this interest extending to supply houses also.

The Hurdman-Elmitt Lumber Co., Ottawa, have been incorporated with a capital of \$100,000, to manufacture lumber, timber, etc. The charter members include G. C. Hurdman, T. F. Elmitt and C. E. Stewart, Ottawa.

The chemical building of the Toronto Paper Co., Cornwall, Ont., was destroyed by fire January 16. Loss about \$1,800.

A synagogue will be erected on University Avenue, Toronto, by the Goel-Pzedec congregation, which will be 80 feet square, and with an auditorium capable of seating 1,000. The cost will be about \$40,000.

The American Cereal Co., Peterborough, Ont., have erected a five-story addition to their factory at that place, at a cost of about \$35,000.

The Imperial Bank of Canada have called for tenders for the construction of their new building to be erected in London, Ont.

The fly-paper shop of Messrs. Smith Bros., near Woodstock, Ont., was destroyed by fire January 16. Loss about \$3,000.

The Ontario Government is considering the advisability of disposing of the Toronto Asylum for the Insane and putting up a new institution within convenient distance of Toronto, where there would be sufficient room for open air treatment.

The Stewarton Presbyterian congregation, Ottawa, have decided to erect a new church building to accommodate 1,200 persons, at a cost of about \$25,000.

Seiling's lumber mill at Eagle Lake, near Sundridge, Ont., was destroyed by fire January 20. Loss about \$6,000.

The new plant of the Ogilvie Flour Mills Co., at Fort William, Ont., when completed will have a daily capacity of 5,000 barrels of flour. Adjoining is a large steel fireproof elevator with a storage capacity of 600,000 bushels of wheat, also a flour storage warehouse of 125,000 barrel capacity. The plant will be operated by electricity transmitted from the Kakabeka Falls, where extensive development work is now being carried on.

The Ontario timber cut for the season 1904-05 was somewhat less than in the previous season; 625,000,000 feet board measure, of saw logs, 1,066,989 cubic feet of square white pine timber, 73,000 cords of pulpwood, and 2,064,500 railway ties were cut during the season. Timber dues accrued total \$1,142,812.92.

J. T. Goldthorpe, Goderich, Ont., is one of the promoters of a company who are considering building a power dam costing \$250,000 to generate 2,575 h.p. on the Maitland River, a few miles from Goderich. It is estimated that 5,500 h.p. is available and though only 2,575 h.p. is all that is desired now this can be easily increased by the construction of storage reservoirs.

Messrs. Frankel Bros., Toronto, dealers in scrap iron, metals, rails, cotton waste, etc., have purchased property 500x334 feet, just

east of the Don, and will erect large warehouses and a factory thereon.

The Toronto Board of Control have recommended to the City Council the purchase of property on Adelaide Street near York Street, 208x142 feet, as a site for the new central fire hall.

The station, freight sheds and residence of station agent of the Grand Trunk Railway Co., at Aylmer, Ont., were destroyed by fire January 19.

The concrete foundations for the Atikokan Ore Co.'s blast furnaces at Port Arthur, Ont., have been completed, and contracts for the steel structural work and machinery have been let, the work being divided into fourteen contracts. The Canada Foundry Co., Toronto, have secured \$200,000 worth of the work; the Canadian Bridge Co., Walkerville, Ont., \$100,000, and the John McDougall Caledonian Iron Works, Montreal, \$20,000. The remainder of the contracts went to United States firms, and were for machinery not made in Canada. The company will start the furnaces going next August. A railway six miles long from the Canadian Northern main line to the mine will be constructed at once. The authorized capital stock of the Atikokan Ore Co. is \$2,000,000.

The foundry of Messrs. Kerr & Coombs, Hamilton, Ont., was destroyed by fire January 18. Loss about \$5,000.

The Abitibi Mining & Development Co., Finch, Ont., have been incorporated with a capital of \$100,000, to carry on a mining, milling and reduction business. The provisional directors include D. A. McNaughton, H. E. Bingham and James Currie, Finch, Ont.

Acton Burrows, Limited, Toronto, have been incorporated with a capital of \$40,000, to carry on a business of printers, publishers, engravers, etc. The provisional directors include Acton Burrows, E. E. Burrows and B. A. Burrows, Toronto.

The Elevator Specialty Co., Toronto, have been incorporated with a capital of \$40,000, to manufacture elevators, etc. The provisional directors include G. A. Matthews, W. J. Feeney and George Ritchie, Toronto.

The Canadian Lock Nut Co., Toronto, have been incorporated with a capital of \$300,000, to manufacture lock nuts, bolts, etc. The provisional directors include A. G. Slaght, T. L. Monahan and E. C. Spere-man, Toronto.

The Fletcher Mfg. Co., Toronto, have been incorporated with a capital of \$250,000, to manufacture hardware, woodenware, bakers' and confectioners' tools, etc. The provisional directors include Benjamin Fletcher, Eri Whaley and E. B. Fletcher, Toronto.

The South American Petroleum Co., Toronto, have been incorporated with a capital of \$1,000,000, to manufacture and refine oil, etc. The provisional directors include

J. R. L. Starr, J. H. Spence and G. W. Spence, Toronto.

Oriental Textiles, Limited, Toronto, have been incorporated with a capital of \$160,000, to manufacture textile fabrics, etc. The provisional directors include Daniel Urquhart, Alexander McGregor and H. W. Page, Toronto.

The corporate name of the Merchants Dyeing & Finishing Co., Toronto, has been changed to Messrs. Burton, Spence & Co., Toronto.

The Canadian Voting Machine Co., Niagara Falls, Ont., have been incorporated with a capital of \$100,000, to manufacture machinery, implements, tools, voting machines, etc. The provisional directors include C. F. Roland, St. Catharines, Ont.; J. T. James, Bridgeburg, Ont., and W. E. Curran, Buffalo, N.Y.

The London Rolling Mill Co., London, Ont., who manufacture merchant bar iron and steel, write:—"We have been established in this city for a little over three years and during that time have not lost a single day, owing to lack of business, nor have we lost a single dollar in bad debts. Our capacity is about 60 tons daily, running double turn. Our product has been going chiefly into the hands of hardware merchants and wagon and implement manufacturers, but lately we have taken up considerable railroad business and at the present time have more orders on our books than ever before in our existence and at a better average price, in fact our product is practically sold for four or five months to come. We consider the outlook for the future most encouraging; the material required for the many miles of railway under construction and planned to be constructed, together with the iron and steel required for the building of the immense amount of rolling stock needed for its equipment, will in our opinion tax the iron mills of Canada to their utmost for years to come. Added to this the population is rapidly increasing, especially in the West, and this in itself gives an assurance of healthy development of the business. Our chief concern for the future is to provide ways and means to take care of the trade, which we are confident will be offered."

There is every indication of the reawakening of the mining industry in the north-western portion of Ontario. The Northern Development Co., for example, who have quietly been doing hand work for several years in the Rainy River district are now preparing to operate with power on an extensive scale. They recently purchased from Allis-Chalmers-Bullock, Limited, Montreal, a complete mining plant including boilers, air compressors, rock drills, hoisting engine, pump and a large quantity of miscellaneous mining equipment.

The Canada Starch Co., Cardinal, Ont., have been incorporated with a capital of \$2,500,000, to manufacture flour, starch, glucose, syrup, etc. The incorporators include G. F. Benson, William Strachan, Montreal; J. J. Warren, Toronto, and Joseph Ruddy, Brantford, Ont.

The Algoma Steel Co., Sault Ste. Marie, Ont., will add an open-hearth steel plant to their works.

The congregation of Chalmers' Church



London, Ont., will erect a new church building at a cost of about \$10,000.

Messrs. H. S. Merrill, Edson Keating, J. D. E. Sheppard and others will form a company at Lansdowne, Ont., and erect a large factory for the manufacture of harness.

The John Inglis Co., Toronto, have completed the huge engine for the waterworks station, Woodstock, Ont. The engine will have a capacity of four million gallons, double that of the present engine. It will pump over 300 gallons to a pound of coal, as against 120 at present. When installed, with the reservoir to be built this summer, Woodstock will have a complete and efficient domestic and fire service. Two small relay engines have been removed and the contract has been let for the foundations, which will be twenty-eight feet four inches by thirteen feet, with depths of six feet ten and eight feet ten.

Mr. P. C. Graham was in Lindsay, Ont., recently in the interests of the Keystone Beet Sugar Co., who have an authorized capital of \$400,000. The machinery from the Wiarton, Ont., factory will be removed to Whitby in the spring so the factory may be ready to handle the fall supply of beets. The product of 5,000 acres will be required to keep the factory running at its fullest capacity.

The Town Council of Petrolea, Ont., have granted the public school board \$17,000 for the erection of a new central school building.

The Grand Trunk Railway Co., will, it is said, erect a new station, freight sheds, crossings, etc., at London, Ont., at a cost of about \$1,000,000.

The Durham Rubber Co., Bowmanville, Ont., are doing a large business in the manufacture of rubber bicycle tires.

Allan Hazen, C.E., filtering expert, of New York, has presented a report to the water commissioners of Peterborough, Ont., stating that, while the city water is very good, he would recommend the installation of a sand filter, costing \$80,000, the yearly expense of operation and maintenance being \$1,500. Before a filtering system could be properly put in the present wooden dam in the Otonabee River should, Mr. Hazen says, be replaced with a concrete structure, which will entail an additional outlay of \$100,000.

The City Engineer, Toronto, has been instructed by the Board of Control to advertise for tenders for the sewage disposal scheme east of the Woodbine. It is estimated that the cost of the work will be about \$80,000.

The Maybank Bronze Metal Co., Morrisburg, Ont., have been incorporated with a capital of \$80,000, to manufacture brass, bronze, babbitt, gun and bell metal, etc. The provisional directors include W. M. Maybank, Montreal; H. H. Bradfield and C. A. Myers, Morrisburg.

The Niagara Chemical Co., Toronto, have been incorporated with a capital of \$40,000, to manufacture lubricants, mill supplies, greases, soaps, etc. The provisional directors include T. H. Barton, F. D. Byers and O. F. Taylor, Toronto.

The Croesus Mining Co., Ottawa, have been incorporated with a capital of \$500,000, to carry on a mining, milling and reduction

business. The provisional directors include Shirley Ogilvie, D. L. McGibbon, Montreal, and Travers Lewis, Ottawa.

The Clarks Standard Developing Co., New Liskeard, Ont., have been incorporated with a capital of \$40,000, to carry on a mining, milling and reduction business. The provisional directors include J. J. Grills, R. B. Herron and J. L. Brown, New Liskeard, Ont.

The Canadian Cobalt & Silver Mining Co., Ottawa, have been incorporated with a capital of \$250,000, to carry on a mining, milling and reduction business. The provisional directors include Thomas Birkett, Thomas Lindsay and H. H. Lang, Ottawa.

The New System Brick Co., Brantford, Ont., have been incorporated with a capital of \$50,000, to manufacture bricks, stone, lime, etc. The provisional directors include C. W. Bush, J. L. Richardson and H. J. Wilson, Toronto.

The Canadian Aluminum Seal Co., Toronto, have been incorporated with a capital of \$200,000, to manufacture bottling materials, devices, etc. The provisional directors include Alfred Bicknell, G. B. Strathy and L. C. Todd, Toronto.

The Northern Ontario Copper Co., Sault Ste. Marie, Ont., have been incorporated with a capital of \$500,000, to carry on a mining, milling and reduction business. The provisional directors include J. A. Montague, O. B. Jury and A. C. Boyce, Sault Ste. Marie, Ont.

The Temagami Silver Mining Co., Sturgeon Falls, Ont., have been incorporated with a capital of \$150,000, to carry on a mining, milling and reduction business. The provisional directors include C. T. Kirby, Sturgeon Falls, Ont.; A. B. Gordon, Sudbury, Ont., and Thomas Urquhart, Toronto.

The Canadian Dredge & Construction Co., Midland, Ont., have been incorporated with a capital of \$150,000, to construct dredges, derricks, vessels, etc. The provisional directors include James Playfair, Peter Potvin, Midland, Ont., and W. J. Sheppard, Waubaushene, Ont.

The Ontario Sewer Pipe Co., Toronto, have been incorporated with a capital of \$300,000, to manufacture sewer pipe, land tile, etc. The provisional directors include J. J. Zimmerman, J. A. McIntosh and E. G. Morris, Toronto.

Messrs. Caulfeild, Burns & Gibson, Toronto, have been incorporated with a capital of \$50,000, to manufacture clothing, etc. The provisional directors include H. J. Caulfeild, R. E. Burns and W. J. Gibson, Toronto.

The Toronto Show Case Co., Toronto, have been incorporated with a capital of \$35,000, to manufacture show cases, etc. The provisional directors include J. G. Kent, W. M. Peterkin and Harry Chinn, Toronto.

The Egg-O-See Co., Quincy, Ill., manufacturers of cereals, will erect a branch establishment in Toronto.

The Cowan Co., Toronto, will increase their capital from \$100,000, to \$250,000.

The Tariff Commissioners, having conducted inquiries in many of the principal places in the various provinces of the Do-

minion, have determined to wind up their investigation by holding meetings in Ottawa on February 6 and 7, to serve the business and producing interests of Ottawa and district, and also to enable interested parties in any portion of the Dominion to present their views. The applications for hearing should be addressed to Mr. John Bain, Secretary of the Commission, Ottawa, who will make the necessary arrangements. These meetings will be held in the House of Commons committee rooms, and as they will be the last to be held, interested parties should govern themselves accordingly.

The superintendent of the Waterworks Department of Toronto Junction, Ont., has recommended the purchase of a new and up-to-date pump, to cost about \$10,000, and the extending of the intake pipe to the lake at a cost of about \$75,000.

The Grand Trunk Railway Co. will erect a boiler shop 225x210 feet and a plate shop 125x50 feet in Stratford, Ont., at a cost of about \$100,000.

The Canadian Rubber Co., Montreal, will manufacture solid rubber tires for vehicles.

McLaurin Bros., Limited, Montreal, have been incorporated with a capital of \$200,000, to manufacture timber, lumber, etc. The incorporators include A. L. McLaurin, Montreal; J. R. McLaurin, Ellsworth, Kansas, and L. K. McLaurin, Ottawa.

The building of the Seward Lubricating Co., Hull, Que., was destroyed by fire January 17. Loss about \$5,000.

A permit has been taken out by the James McCready estate, Montreal, for the erection of a four story solid brick clothing factory, to cost about \$17,000.

Messrs. Mark Fisher, Sons & Co., Montreal, dealers in woolens, etc., will erect a warehouse, eight stories high, to cost about \$130,000.

The National Drug & Chemical Co., Montreal, will erect a laboratory in that city, at a cost of about \$250,000.

The biscuit factory of Messrs. Gagnon Bros. & Co., Quebec, Que., was damaged by fire recently.

It is stated that interests allied with the American Steel Foundries Co., New York City, have organized a company to be known as the Dominion Steel Car Co., to manufacture steel cars for use on the Canadian railroads. The plant will be situated at Montreal West, and will cost about \$500,000. Construction work will be commenced in the spring and it is expected to have the works in operation with about 500 employes by the middle of the summer.

The Kidd Rutherford Co., Montreal, have been incorporated with a capital of \$50,000, to manufacture cotton, jute, woolens, etc. The charter members include T. C. Kidd, H. L. Rutherford, and G. W. MacDougall, Montreal.

The Consumers' Cotton Co., Shawinigan Falls, Que., have been incorporated with a capital of \$300,000, to manufacture cotton, woolens, etc. The charter members include W. O. H. Dodds, W. S. Hart and Howard Murray, Montreal.

The Grosvenor Electric Light & Heat Co., Montreal, have been incorporated with a capital of \$125,000, to carry on the business

of a light, heat and power company. The charter members include J. W. A. Hickson, H. B. Picken and T. P. Howard, Montreal.

The MacArthur Construction Co. of Canada, Montreal, have been incorporated with a capital of \$6,000,000, to carry on a general construction and contracting business. The charter members include A. F. MacArthur Chicago, Ill., J. R. MacArthur, New York City and W. J. Poupore, Montreal.

The Empire Construction Co., Montreal, have been incorporated with a capital of \$1,000,000, to carry on a business of general contractors, etc. The charter members include J. B. Tudhope, Orillia, Ont.; H. W. Fleury, Aurora, Ont., and Paul Galibert, Montreal.

The Central Heat, Light & Power Co., Montreal, have been incorporated with a capital of \$500,000, to carry on the business of a light, heat and power company. The charter members include Samuel Carsley, W. F. Carsley and Charles Morton, Montreal.

The E. A. Small Co., Montreal, have been incorporated with a capital of \$200,000, to manufacture clothing, etc. The charter members include Duncan McIntyre, E. A. Robert, Montreal, and C. J. Harrod, Longueuil, Que.

Messrs. Robert Gardner & Son, Montreal, have been incorporated with a capital of \$145,000, to manufacture machine tools, engines, boilers, etc. The charter members include Robert Gardner, James Gardner and William Gardner, Montreal.

The Robert Simpson Co., Toronto, have purchased property in Montreal, at a cost of about \$400,000 on which they will erect a mammoth department store.

The Abitibi Mining Co., Montreal, have been incorporated with a capital of \$10,000, to carry on a mining, milling and reduction business. The incorporators include J. U. Enard, J. M. Wilson and J. M. Fortier, Montreal.

Messrs. Hudon, Hebert & Cie, Montreal, have been incorporated with a capital of \$750,000, to manufacture tobacco, liquors, etc. The incorporators include Joseph Hudon, C. P. Hebert and Leandre Brault, Montreal.

The Cambridge Society of Canada, Montreal, have been incorporated with a capital of \$125,000, to carry on a business of printers, publishers, etc. The incorporators include C. A. Ross, Westmount, Que.; T. J. Brophy and H. S. Orr, Montreal.

The Reinforced Concrete Co., Montreal, have been incorporated with a capital of \$200,000, to manufacture cement, building stone, etc. The incorporators include Donald Loynachan, T. J. Donoghue, Montreal, and A. W. Powell, Ottawa.

The wholesale clothing establishment of Messrs. John Fisher, Son & Co., Montreal, was destroyed by fire January 25. Loss about \$100,000.

The Colonial Cigar Co., St. John, N.B., have applied for incorporation with a capital of \$50,000, to manufacture tobacco, etc. The applicants include A. H. Bell, W. E. McIntyre and W. H. Trueman, St. John.

The New Brunswick Gypsum Co., Hillsboro, N.B., have applied for incorporation with a capital of \$30,000, to manufacture

gypsum, plaster, limestone, etc. The applicants include Calvin Tomkins, New York City; R. J. Odell, Tomkin's Cove, N.Y., and C. J. Osman, Hillsboro, N.B.

The Upham Lumber Co., Woodstock, N.B., have applied for incorporation with a capital of \$20,000, to manufacture lumber, etc. The applicants include G. W. Upham, C. D. Johnston, Woodstock, N.B., and J. J. Johnston, Debec, N.B.

The acid room of the Dominion Pulp Mill, Chatham, N.B., was destroyed by fire recently.

The Dominion Coal Co., Sydney, N.S., have given the contract for an employees' hotel to be erected at Reserve Mines, N.S. The building will be 86x26 feet.

Stanfields, Limited, Truro, N.S., have been incorporated with a capital of \$750,000, to acquire the business of the Truro Knitting Mills Co., and to establish extensive worsted yarn mills. The new yarn mill will be of brick, and the Town Council are considering concessions in the way of exemptions.

The Anglo-Newfoundland Development Co. will erect mills for the manufacture of pulp and paper at Grand Falls, near St. John's, Newfoundland. Sir Alfred Harmsworth is one of the directors.

The Seaside Hotel at Rustico Beach, P.E.I., was destroyed by fire recently. Loss about \$14,000.

The Canada West Publishers, Winnipeg, Man., have been incorporated with a capital of \$20,000, to carry on a business of printers, publishers, etc. The incorporators include W. W. Irwin, Brandon, Man.; James Weir, Hamilton, Ont., and R. A. C. Manning, Winnipeg.

The Canadian Pacific Railway Co. will enlarge their hotels at Glacier and Lake Louise.

The freight sheds of the Canadian Pacific Railway Co. at Portage la Prairie, Man., were destroyed by fire January 18. Loss about \$10,000.

A Roman Catholic cathedral will be erected at St. Boniface, Man., at a cost of about \$225,000.

The plant of the Manitoba Lumber Co., Carman, Man., was destroyed by fire January 20. Loss about \$22,000.

The Leland Hotel and the implement warehouse of Dowsett Bros., Treherne, Man., were destroyed by fire January 23.

The Roberts Heating & Ventilating Co., Minneapolis, Minn., will erect a warehouse at Winnipeg, Man., at a cost of about \$20,000.

Mr. James Cowan of Kirkfield, Ont., a railway contractor, closely identified with Messrs. Mackenzie & Mann, holds, it is stated, a large contract at the present time on which he will be engaged during the entire season of 1906, and for some years following. The contract involves the building of a line, grading and laying of steel north from Erwood in the direction of Hudson's Bay, to which point the railway will be pushed through at as early a date as possible.

Tenders will be called for a new post office to be erected at Regina, Sask.

Fort Saskatchewan, Sask., is considering the advisability of offering bonuses to elevator companies to erect elevators in the old town

site instead of in the new Canadian Northern Railway subdivision.

Calgary, Alta., is now the possessor of its own electric plant which was installed last year, and commenced working in December. The City Council at their last meeting decided to put two by-laws to the people. The one was for \$10,000 for a crematory, and the other for \$6,000 for a steam roller and rock crusher.

The store of Messrs. Crawford & Co., Indian Head, Sask., was destroyed by fire recently. Loss about \$25,000.

The Loders Lime Co., Kananaskis, Alta., have been incorporated with a capital of \$100,000, to manufacture lime, cement, stone, etc. The incorporators include J. S. Irwin, Ottawa; J. S. Cape and C. H. Gore, Winnipeg, Man.

It is stated that the Canadian General Electric Co., Toronto, have purchased a site in Rossland, B.C., and will erect a plant for the manufacture of mining machinery.

The Moyie Lumber & Milling Co., Moyie, B.C., have sold out to J. D. McArthur, Winnipeg, Man.

The Standard Soap Co., Calgary, Alta., are said to be considering the erection of a branch in Vancouver, B.C.

The Vancouver Ice & Cold Storage Co., Vancouver, B.C., are planning to erect a four story building for cold storage purposes

Marked expansion is the great outstanding feature of the Canadian trade returns for the six months ended December 31, especially in agricultural lines. The aggregate foreign trade was \$278,541,345, a gain of \$29,692,811 when compared with the same period of the year previous. This is not bad when we bear in mind that the total for the whole of the previous fiscal year was \$465,242,426. The total imports for the six months were \$133,814,210, a gain of \$10,770,560. Domestic exports amounted to \$133,091,829, or over \$19,000,000 better than for the first half of the fiscal year 1904-05. The principal increases in the exports were:—Animals and their produce, \$4,376,945; fisheries, \$2,296,299; agricultural products, \$11,975,953; manufactures, \$1,143,733. For the month of December the imports were \$21,317,089, as against \$18,440,461, for the same month of 1904. The exports amounted to \$21,300,747, a gain of \$2,170,678. The following is a comparative statement of the imports and exports for the six months:—

	Imports, Six months.	
	1904.	1905.
Dutiable.....	\$73,599,847	\$82,718,764
Free goods.....	49,443,803	51,095,446
	\$123,043,650	\$133,814,210
Exports, Domestic, Six Months.		
	1904.	1905.
The mine.....	\$17,109,858	\$17,238,528
The Fisheries.....	6,670,469	8,966,768
The forest.....	20,169,170	20,095,654
Animals and their produce.....	40,094,123	44,471,068
Agriculture.....	18,894,954	30,870,907
Manufactures.....	10,268,610	11,412,343
Miscellaneous.....	22,032	36,561
	\$113,229,216	\$133,091,829

## ELECTRICITY.

Electrical machinery and appliances of all kinds, electrical power plants and other progress in the electrical industries will be noted here.

It is probable that the Temiskaming & Northern Railway Co. will shortly commence the work of constructing a complete power development plant on the Montreal River, close to the point where the railway crosses that important water course. The plant will be extensive enough to not only supply all the present needs of the road, but will provide for its future extension. In addition to the 123 miles under operation, another 100 miles are being constructed. In order to connect with the Grand Trunk Pacific a further extension of 50 or 60 miles will be necessary, leaving still another link to be constructed if it is decided to carry the road through to James Bay. As there will be a considerable quantity of surplus power developed, the commission will be prepared to dispose of it for industrial purposes, selling the power anywhere along the line, but leaving to private companies the work of transmission. Already a number of industrial concerns have evinced a willingness to buy power in large quantities as soon as it is available.

Because of the fact that the Westinghouse Electric & Mfg. Co., make the largest units required for the production and transmission of electricity, comparatively few people know that in the same works at East Pittsburg, Pa., are manufactured also the smallest units, to meet the needs of printing establishments and similar lines of industry. There have very recently been closed three contracts, aggregating in the neighborhood of 400 motors, and the company are in position to undertake the equipment of printing establishments from the smallest to the largest machines required in this industry. This company have perfected a new line of three-phase core-type transformers for 60-cycle circuits. One of these transformers may be used where three-phase transformation is to be made, instead of two or three of the single-phase type.

Dr. Haanel, Dominion Superintendent of Mines, went to Sault Ste. Marie last week to inspect the experimental plant erected there by Dr. Herault for the purpose of ascertaining whether it is economically feasible to smelt Canadian magnetite ores by electricity. The Canadian commission that studied electric smelting in Europe were satisfied with the results obtained in the case of hematite, but it remains to be seen whether magnetite ores, which so largely abound in Ontario and Quebec, can be smelted at an equally low cost. If the present experiments yield anything like the same results as were given when hematite was used, it will pave the way for a great investment of capital in iron industries. The experiments so far conducted at Sault Ste. Marie have been made with a small furnace, but the real test comes later when larger bodies of ore will be smelted in a furnace of special design, which is expected to revolutionize electric smelting. Already, however, it has been shown that nickel pig can be produced by treating nickelliferous pyrrhotite. This

is an incidental discovery, as the smelting of iron ores is the object aimed at. Nevertheless, the successful production of nickel pig by the aid of electricity is of great importance to the Sudbury district, where the ore exists in immense quantities. In the opinion of Mr. F. H. Clergue, this discovery alone justifies undertaking experimental work, but Dr. Herault hopes to prove beyond peradventure that our magnetite ores can be smelted in an electric furnace as cheaply as in a blast furnace, or even cheaper.

The York Radial Railway Co., Toronto, a few days ago began the operation of the recently installed system of telephonic despatch of trains and cars. A telephone has been placed in every car and these instruments can be connected with the wires at certain places and all switches and crossing places. This will preclude the possibility of any delays at crossing points and tend to simplicity in operating the line. This is the first radial system in Ontario to be equipped with telephones. Orders are given over the line verbally instead of telegraphing.

The Toronto Board of Control have voted \$500 towards the city's share of the cost of investigating the effect of electrolysis from the street railway rails on the water pipes and gas pipes. Mr. Rust said the Consumers Gas Co. had promised to bear half the expense. An electrical expert will be employed.

The superiority of the electric current as a thermal agent is generally recognized, and its convenience and effectiveness have led to its utilization in thawing water pipes, gas mains, telephone conduits, etc. It is necessary that the apparatus for such purposes shall have a range in capacity adequate to cover all ordinary requirements, shall be easy to connect, moderate in price, portable and light in weight so as to be easily handled, to withstand rough usage, and insure protection from injury to the operator. Two outfits which meet these requirements have recently been placed on the market by the Westinghouse Electric & Mfg. Co., Pittsburg, Pa. One of these is for heavy service, and comprises a specially-designed choke coil used in connection with the primaries of a standard transformer, and the other is for lighter service, such as thawing house piping, and consists of a transformer adapted for suitable secondary voltage adjustments, and is mounted in cast-iron top and bottom frames.

In connection with the proposal to electrify the first 120 odd miles of the Temiskaming & Northern Ontario Railway, it transpires that the plan embraces the sale of electrical energy to consumers along the line of the road. It is suggested that the power developed should be considerably more than necessary for the stretch of line mentioned so as to provide not only for extension of electrification in the future, but for the supply of light, power and heat to municipalities and industries along the line of railway. This surplus energy, it is proposed, should be sold to distributing companies at various points, so that the Temiskaming & Northern Ontario Railway Commission would not have to undertake the keeping of accounts and other work entailed in selling to private consumers. The rates, however, would be fixed by the commission, thus preventing the holding up of the industries, individuals

or municipalities buying from the distributing companies. A number of companies and individuals engaged in mining at Cobalt have already made application for the purchase of electricity should the Government authorize the Railway Commission to proceed with the project, and there is little reason to doubt that there would be a ready sale for all the railway could spare. The revenue thus derived would help considerably in meeting the cost of the project. The power to be used would be developed from the Montreal River, and it would of course be proportionately much cheaper to construct at the outset a plant capable of giving more power than the railway needs than to make additions afterwards. It is not thought that there would be any great difficulty in supplying power the year round, as the ice and other weather problems in regard to electricity do not offer the obstacles they once did.

### ANOTHER POWER LINE.

The Niagara-Welland Power Co. have filed plans at the York County Registry Office in Toronto showing the route of their proposed transmission line through the county of York to the terminus in the city of Toronto.

From the town line of the township of Peel the power line parallels the Grand Trunk Railway to the Humber River into the village of Weston, thence to a point north of Toronto Junction, where it diverges to St. Clair Avenue, Toronto.

The company received a charter from the Dominion Government in 1895 for the purpose of utilizing a portion of the water supply of the Niagara and Welland rivers for power purposes. The capital stock of the company is \$5,000,000, and their plans are for the development of 100,000 h.p. Surveys have been made and plans filed in the various county registry offices.

It is proposed to tap the Welland River at a point  $4\frac{1}{2}$  miles from the village of Chipewawa, and to construct a canal six miles in length to a point about three miles from the city of St. Catharines, where there is a drop of 225 feet. The surplus water will find its way into Lake Ontario through artificial raceways and the Eight Mile Creek.

### SMELTING BY ELECTRICITY.

For the first time in Canada steel has been made direct from sulphurous ores by electric furnace, and a sample of it has reached Mr. T. W. Gibson, Director of the Ontario Bureau of Mines. It was accompanied by samples of steel made from titanium ores by the same process. The samples are from Mr. J. W. Evans, a well-known mining engineer of Deseronto, and the ores used are Hastings county ores, the titanium from the Horton mine and the sulphurous from the Coe Hill mine, Ont. The experiments in the treatment of the ores were, of course, carried out only on a laboratory scale, but the results give every reason to hope that the effect on the iron mining industry of Ontario will be of beneficial importance. In his letter forwarded with the samples Mr. Evans says one sample was produced in fifteen and the other in twenty minutes.

The object of the electric smelting is to produce steel directly from iron ore by one

process, and this Mr. Evans has accomplished on a laboratory scale.

"Another feature in connection with these samples," said Mr. Gibson, "is that both are from varieties of iron ore which at the present time are of comparatively little value. The presence of titanium in iron ore is objectionable because of the difficulty which is experienced in reducing the ore in the blast furnaces, while sulphur, in excess, also renders the pig iron of inferior quality. Mr. Evans has made small samples of steel of apparently good quality, direct from these two classes of ores. There are considerable deposits of titanium and sulphurous ores in Ontario, and if the electrical method of producing pig iron or steel from them can be carried to commercial success it will enable large industries to be established, and those deposits instead of lying absolutely useless would become valuable additions to the wealth of the Province."

## FUEL.

For names of fuel dealers see "Coal and Coke" in Classified Index.

The fuel supply question is a most important one to Canadian manufacturers. The information published in this department will keep the readers posted on sources of production.

The shipments of coal from the principal Nova Scotia mines in 1904 and 1905 were as below:

Company.	1904.	1905.
Dominion Coal Co. . . . .	2,780,138	2,913,495
Nova Scotia Steel & Coal Co. . . . .	439,310	535,990
Cumberland Ry. & Coal Co. . . . .	433,858	417,821
Acadia Coal Co. . . . .	255,183	257,698
Intercolonial Coal Co. . . . .	242,144	208,349
Inverness Ry. & Coal Co. . . . .	162,904	132,804
Strathcona Coal Co. . . . .	17,500	23,500
Port Hood Coal Co. . . . .	62,335	11,052

Mr. Horace Mayhew, who is connected with a new coal mining company operating in Cape Breton, was in Montreal a few days ago and in an interview declared that there were 150,000,000 tons in the one seam of coal the company are now working. He looks forward to an early output of 1,000 tons per day, while in a few years the total yearly production should amount to 3,000,000 tons. Before the commencement of shipments the company have been anxious to have their screening plant ready. They contemplate building railways to Sydney, N.S., and Louisburg, N.S., but if property owners show a disposition to hold them up they will go elsewhere.

The West Canadian Collieries Co., have installed a coal-washing plant at their colliery at Lille, near Frank, Alta.

Contractor Joseph Morino has completed the cement foundation for the scales of the Canadian and American Coal & Coke Co., are putting in at the site of the new tippie at Frank, B.C.

Mr. E. C. Rhinehart, Blairmore, Alta., has been engaged to superintend the construction of the new tippie to be built by Breckenridge & Lund at their Lundbreck mine, Alberta.

## PUBLICATIONS.

The publishers of The Canadian Manufacturer solicit in advance, if possible, catalogues, circulars, and other industrial publications issued by manufacturers. We wish to review such literature, and bring the principal points to the attention of our readers.

"Tire News" is the name of a new advocate for public favor, particularly of those who are interested in motoring, bicycling, etc. Its aim, we are told, is to be a truthful record of all that takes place the world over relating to tires and tire accessories. It is intended for all users of rubber tires for automobilists, cyclists, etc. It is issued from the office of the India Rubber World, 150 Nassau Street, New York. Published monthly, \$1.00 per year.

"The Western Municipal News" is the title of a new monthly journal published in the interests of good citizenship and the progress of Western municipalities in all that pertains to good government and the comfort of the inhabitants" by the Willson Stationery Co., Winnipeg, Man. There is a breeziness about Vol. 1, No. 1 now before us indicative of the great and growing West that is entirely refreshing. Good luck to the new-comer.

The Economic Engineering & Construction Co., 1126 Monadnock Block, Chicago, Ill., have issued their 1905 catalogue, showing construction, operation and application of the Sharp shaking and dumping grate and steam blower to boiler furnaces and kilns. A table of the approximate composition and calorific value of principal bituminous coals is also given.

The National Electric Co., Milwaukee, Wis., have sent out Bulletin No. 359, illustrating and describing polyphase induction motors; bulletin No. 363, illustrating and describing stationary and portable motor-driven air compressors for continuous and intermittent service.

Messrs. Warren Webster & Co., Camden, N.J., have issued a pamphlet describing briefly the Webster specialties, including feed-water heaters and chemical purifiers, separators for steam and oil, vacuum governors, sight glasses, etc.

The Crosby Steam Gauge & Valve Co., Boston, Mass., have issued a booklet describing the Crosby new indicator. This contains examples of the freedom of piston movement, being reproductions of the original test cards of a variety of springs.

The Westinghouse Machine Co., East Pittsburg, Pa., are sending out a booklet containing a list of the users of Westinghouse Parsons steam turbines, showing the number and rated kilowatt capacity of units, together with the aggregated rated brake h.p. of turbines installed when present orders are completed, as follows: Number of turbines, 195; kilowatts (rated), 126,520; aggregate rated brake h.p., 339,280.

The Brantford Carriage Co., Brantford, Ont., manufacturers of carts, wagons, buggies, sleighs, etc., have sent us their calendar for 1906.

The issue of the Iron Age for January 4 is a remarkable number. It not only gives detailed reports from the leading trade centres

of the progress of the iron and steel industries in 1905 but it contains a detailed history of the Iron Age itself from its foundation in 1855 to the present time, accompanied by numerous illustrations and photographs. Like the iron trade itself it has made great progress since the early days of its history, always keeping up with the procession and always well serving the interests it represented.

Messrs. William C. Wilson & Co., Toronto, importers and dealers in lubricating oils and grease, engine packing, steamboat and dredge supplies, etc., have sent us a pocket diary, which contains information regarding the goods they handle, testimonials, etc.

The Westinghouse Electric & Mfg. Co., Pittsburg, Pa., have sent us an illustrated booklet having reference to the Sawyer-Man incandescent lamps, which they handle.

## PERSONALS.

The Canada Radiator Co., whose plant and head offices have been removed from Port Hope, Ont., to Lachine, Que., during the year, held their annual meeting a few days ago and elected the following board of directors:—Hon. Robt. Mackay, president; F. J. Travers, vice-president and general manager; A. R. Mackay, secretary-treasurer; directors, John Beattie, Montreal, Thomas Miller, Oshawa, Ont.; Dr. J. S. Hart, Toronto; M. B. Hoffman, Toronto.

Mr. E. E. Sheppard, Toronto, editor and manager of the Toronto Saturday Night, has sold the business to H. Gagnier, Esq., Toronto.

Mr. R. J. Younge, secretary of the Canadian Manufacturers' Association, Toronto, has resigned, having accepted the position of sales manager of the Canadian Rubber Co., Montreal.

The sixth annual meeting of the Canadian Association for the Prevention of Consumption and other forms of tuberculosis will be held in the Railway Committee room of the House of Commons at Ottawa on March 28 next. The Hon. Senator Edwards will preside in the afternoon. In the evening a public lecture will be delivered in the lecture hall of the Normal School by Dr. Arthur J. Richer of Montreal which will be illustrated with stereoptican plates showing the stages of consumption and some of the appliances now in use to check and cure the disease. The chair will be taken in the evening by His Excellency, Earl Grey.

Mr. T. H. Lennox, M.P.P., who returned a few days ago from a business visit to Cobalt, says that the owners of the famous Timmins mine informed him that they would not wait to see what the government proposed to do on the smelter question, that they have given a contract for a smelter to be erected at their mine at once. They intend to ask the government for a grant toward the cost of the smelter. If the grant is a substantial one they will treat ores from other mines.

Mr. R. W. Coulthardt has been appointed general sales agent for the Crow's Nest Pass Coal Co. His territory will include all the country between Winnipeg, Man., and the coast, also extending south a considerable distance into the States. Mr. Coulthardt's

headquarters will be in Fernie, East Kootenay, B.C.

Mr. J. D. Ramsay, of the Elk Fire Brick Co., St. Mary's, Pa., was in this office last week. Mr. Ramsay is a frequent visitor to Toronto, which is a chief distributing point in Canada for his products. In fact Canada is a consumer of a large portion of the fire brick made by his company.

Mr. F. Brian, consulting engineer for Messrs. Heyl & Patterson, Pittsburg, Pa., contractors for the steel trestle and tipple lately erected at the Crow's Nest Pass Coal Co.'s colliery at Coal Creek, East Kootenay, B.C., met with an accident while examining part of the plant. As a result of a fall he fractured three ribs.

The regular annual meeting of the Canadian Press Association will begin its sessions in the Temple Building, Toronto, February 1.

The Ontario Legislature will meet on February 15.

Mr. W. W. Leach, formerly of the Geological Survey Department of Canada, and for some time past with the Crow's Nest Pass Coal Co., at Fernie, B.C., has been appointed chief engineer for the West Canadian Collieries, Blairmore, Alta. This company is a British corporation, and owns some 20,000 acres of selected coal lands in the Blairmore-Frank district. Its coal properties are known respectively as Grassy Mountain, Lille, Bellevue, Blairmore and Byron Creek. The company are steadily enlarging their production of coal and coke.

#### PATENTS.

Messrs. Marion & Marion, patent attorneys, Montreal and Washington, D.C., have obtained the following Canadian patents:

W. A. Allan, Winnipeg, Man., rotary engine; Alfred Jobin, Inkster, Man., car fender; J. E. Pigeon, Lachine Locks, Que., wire fence machine; Napoleon DeLisle, St. Tite (Champlain) Que., wrench; Demers & Daignault, Montreal, excavator; Baker, Shevlin & Baker, Saratoga Springs, N.Y., centrifugal pulp screens; Leopold Lague, Ste. Anne de Bellevue, Que., fire alarm box; C. B. Smith, Dunedin, New Zealand, printing machinery; E. Renaud, Montreal, switch operating means; E. Renaud, Montreal, train stopping means; E. Renaud, Montreal, railway cab signalling device; E. Renaud, Montreal, train signalling apparatus; Messrs. Dutertre & Nodet, Paris, France, electric lamp for heating.

Messrs. Fetherstonhaugh & Co., patent solicitors, Toronto, Ottawa and Washington, D.C., send us the following list of patents recently granted Canadian inventors:

W. H. Beckett, Dunchurch, Ont., hoisting buckets; J. McNamara, Montreal, Monoline composing machines; I. Morin, Toronto, fire proof window frames; C. S. Harris, Otterville, Ont., fence posts; J. M. Tuller, Vancouver, B.C., axle cutting and threading machines; J. Murphy, Ottawa, racks or screens for water wheels; E. How, Hillsburg, Ont., draft equalizers; J. Filion, Montreal, car vestibule doors and traps; C. H. Bennett, Ottawa, water coolers; S. Golick, Montreal, building blocks; A. Leslie, Walkerville, Ont.,

A BUSINESS MAN of experience is prepared to take a substantial interest in a manufacturing business located in Toronto, or to remove to his town, where a bonus or other inducements will be offered.

Apply in first instance to

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Toronto.

vessels; G. Wettlaufer, Stratford, Ont., brick making machines; C. J. Mitchell, Toronto, system to be used in telegraphing and cabling; H. Barnard, Hamilton, Ont., machines for printing roller wrapping paper; J. Muir and C. H. Herod, Brantford, Ont., concrete mixers; E. A. Sullivan, Toronto, T. W. Pritchard, Germantown, Pa., R. W. C. Ellison, Bryn Mawr, Pa., non-refillable bottle attachments; J. Shearer, Waterloo, Ont., weighing apparatus; J. L. Strickland, Westport, N.S., rotary engines; J. B. P. Michaud, Eganville, Ont., sash holders; P. T. C. Dumais, Hull, Que., composite crib work.

One recent consolidation in the chemical trade may be said to be of international interest. On January 1, the Continental Color & Chemical Co. took over the business of Kutroff, Pickhardt & Co. and of Farbenfabriken Co. of Elberfeld, Germany. The Continental Color & Chemical Co. are now the sole importers in the United States and Canada of the products of the Badische Anilin and Sola-Fabrik of Ludwigshafen on-the-Rhine and of Farbenfabriken Vormals Friedr. Bayer & Co., Elberfeld. They are also the sole selling agents for the Hudson River Aniline Color Works.

## TO THE VARNISH BUYER

the most serious considerations are quality, reliability and uniformity, and these qualifications are of special importance to the dealer who is trying to build up a permanent varnish trade.

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Our Varnishes are the safest goods to handle and the surest and most reliable goods to use.

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VARNISH MANUFACTURERS

WALKERVILLE, ONT.

Write for our 100 page illustrated catalogue. Every dealer should have a copy for reference.

**THE SINGLE-PHASE ELECTRIC LOCOMOTIVES AND POWER EQUIPMENT OF THE ST. CLAIR TUNNEL COMPANY.**

(Prepared for THE CANADIAN MANUFACTURER by the Westinghouse Electric & Mfg. Co.)

The single-phase electric locomotive adopted by the St. Clair Tunnel Co. for the operation of the St. Clair tunnel, which connects the American and Canadian divisions of the Grand Trunk Railway System, will weigh approximately 62 tons and will develop a draw-bar pull of 25,000 pounds on a two per cent. grade at a speed of 10 miles per hour. It is of the rigid frame type with driving axle boxes held in the same frame that contains the draft gear. It will be mounted on three pairs of driving wheels which will sustain the entire weight, distributed by equalizer bars similar to those used in steam locomotive practice, will have an outside frame supported on semi-elliptical springs, and will be equipped with Westinghouse friction draft gear, M.C.B. automatic couplings, air sanding apparatus, and bumper steps, front and back. The cab will be of sheet steel mounted on a framework of iron which supports both walls and roof.

The principal dimensions will be approximately as follows:

Length over end sills, 27 feet 9 inches; rigid wheel base, 12 feet; width over all, 9 feet 6 inches; height from top of rail to top of cab, 12 feet 6 inches; diameter of driving wheels, 62 inches.

The operating apparatus will be arranged along the sides of the cab, leaving a free

passage-way 3½ feet wide the entire length. The cab will be lighted and heated by electricity, arrangement being made to screen the instrument lights while the locomotive is running.

Westinghouse combination automatic and straight air and American driver brakes will be used. The air supply will be provided by a two-cylinder motor-driven air compressor having, with a 5-inch stroke and speed of 190 r.p.m., a capacity of 45 cubic feet of air per minute. Air reservoirs, signal outfits, whistle, bell with pneumatic ringers, automatic pump governor, tools, instruments, gauges, headlights, push poles and other details complete the auxiliary equipment.

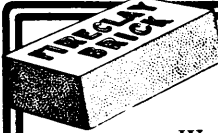
A motor will be geared to each axle, giving each unit an aggregate rated capacity of 750 h.p. They are of the Westinghouse single-phase alternating-current, series-wound compensating type, whose successful development was first publicly announced in the notable paper read by Mr. B. G. Lamme before the American Institute of Electrical Engineers in New York, September 26, 1902. They are of the same general character as the motors selected by the New York, New Haven & Hartford Railroad Co., for the operation of their line between New Haven and New York. Each motor will weigh complete approximately 14,500 pounds, the armature weighing approximately 5,600 pounds.

The motor frame consists of a steel cylinder cast in one piece and enclosed at the end by brackets of the same material, which carry the bearings and oil reservoirs. The sus-

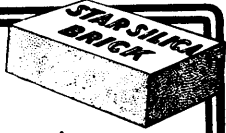
pension noses and safety lugs form a part of the main casting. Seats for the axle bearings are cast solid with the frame. All bearings are of phosphor-bronze lined with babbitt and are divided into two parts. They are of exceptionally large dimensions, are arranged for oil waste lubrication, and are provided with large openings on the low pressure side, giving a thorough lubrication to the entire bearing surface. Oil is fed into the reservoirs through openings separate from the waste pockets and therefore-reaches the waste from below and is thoroughly filtered before entering the bearing.

The motors are swung between the locomotive frame and the driving axles by a flexible nose suspension from two hangers supported by a truck transam and passing through heavy lugs with helical springs above and below the lug. The motors are held to the axle by means of caps which are split at an angle of 35 degrees with the perpendicular, so that the greater part of the weight is borne by solid projections from the motor frame which extend over the axle rather than by the cap bolts. Large openings above and below provide access to the commutator and brush holders.

Within the cylinder of the motor frame there is built up a core of soft steel punchings, forming a complete laminated field, the punchings dovetailed into the frame and clamped between end rings of cast steel. The field coils are wound with copper strap insulated between turns and about the coils by mica and finished by taping and dipping, and are impregnated in the best grade of



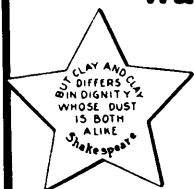
# CORNERS *in* QUALITY



We have "cornered" the brick market—so far as **quality** is concerned. It's an interesting story, but we have only space to outline it here:

The first chapter begins at the clay mines. It shows how particular we are about **good raw material**. The grading is very thorough. At every step—inspection—selection—rejection until our experts have the cream of the clay beds picked out.

The last chapter is a long way from the first, for it takes longer to wear out **Harbison-Walker Refractories** than any other fire-brick made.




This is a true story. You can see the proofs, any time, in this office—letters from users of refractories who have set down in black and white facts and figures which are the most valuable records of experience ever collected in the history of fire brick manufacturing.

1,100,000 Daily Capacity.      7,000 Regular Customers.

No order too small for our best attention; none too large for our capacity.

We have expert knowledge for your brick troubles.

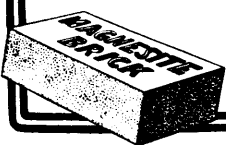
Always state for what purpose brick are to be used.




**Send for Catalogue "K"**

## Harbison-Walker Refractories Co.

**PITTSBURG, PA.**





When writing to Advertisers kindly mention THE CANADIAN MANUFACTURER.

varnishes, providing a sealed coil which can withstand the most severe internal heat and is practically indestructible under the usual conditions of heavy railway service.

In addition to the main coils the field carries a neutralizing winding which consists of copper bars placed in slots in the pole faces and joined at the ends by connectors of copper strap, so as to form one continuous winding which is connected in series with the main field winding and with the armature circuit. The magnetizing effect of this auxiliary winding is directly opposite to and neutralizes that of the armature winding, thus eliminating the effect of armature reaction and improving commutation and power factor. The main coils can be easily removed without disturbing the auxiliary winding.

The armature cores are formed of slotted soft steel punchings built up upon a spider and keyed in place. The spider is forced upon the shaft with heavy pressure and secured by a steel key. Coils of copper strap are embedded in the slots and joined to form a closed multi-circuit winding which is cross-connected, like the multi-circuit winding of a direct-current generator.

The basis of the insulation is mica. A preventive winding is connected between the commutator and the main coils, introducing a preventive action which is effective only when the coil is passing under the brush.

During operation a forced circulation of air supplied by motor-driven blowers enters at the rear, distributes itself thoroughly throughout the motor and escapes through the perforated cover over the commutator. This system of forced ventilation of both motors and auxiliary apparatus forms one of the most interesting innovations in electric railway construction. It secures a maximum output from a given weight of material, and a high ratio of continuous output to the one-hour motor rating common in railway practice. It also provides effective ventilation while the locomotive is not in operation as the blower may be driven while the locomotive is standing at the station or at the end of the line. Motors ventilated in this manner are enclosed and are thereby protected from internal damage by dirt and water and from mechanical injury.

These motors are wound for 240 volts

and 25 cycles per second and have a nominal rating of 250 h.p. each, on the basis of usual electric railway practice.

#### SYSTEM OF CONTROL.

The essential elements of the control equipment include the collecting devices, the auto-transformers, the unit switches, the preventive coils, the reverser and master controllers. A multi-unit system of control is provided with pneumatically operated switches and circuit breakers, low voltage control circuit, and other characteristics standard in Westinghouse practice. Any unit may be controlled from either end, and two or more units may be coupled together and operated from a single cab and by a single crew. The tractive effort which can be readily applied to a single train is therefore limited only by the number of units available, and the hauling power is limited only by the mechanical strength of the coupling between locomotive and cars. A control circuit is carried from one unit to the next by means of connecting sockets and jumpers in the usual manner.

Speed control of the driving motors is secured by variation of the voltage at the



You get more heats and metal out of McCullough-Dalzell Crucibles—economical points you should remember. Write for prices.

**MCCULLOUGH-DALZELL CRUCIBLE CO., Pittsburgh, Pa.**



WATCH FOR THE  
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**The Power & Gas Machine Company**

LIMITED

**GALT - - ONTARIO**

motors obtained by means of taps taken from the winding of the auto-transformer which receives current from the trolley at 3,000 volts and reduces it to 240 volts or lower, according to the tap employed. These taps are connected to unit switches from which current is led through the preventive coils to the motors. Four unit switches serve to reverse the field of each motor.

The unit switches are of standard Westinghouse design and are, in effect, pneumatically operated circuit breakers of great power and reliability. The mechanism is such that a rolling and sliding contact is obtained when the switch closes and opens. The arc is broken at the taps, leaving the contact surfaces smooth and unscarred. Each unit has a magnetic blow-out coil with laminated core. The switch cylinders are controlled by magnetically operated valves, current for which is obtained from a 50-volt tap from the auto-transformer. The sequence of operation is governed by the master controller in conjunction with a system of interlocks which prevents short circuit of the steps between taps from the auto-transformer or improper operation of the controlling mechanism. At any running point four controlling switches are closed. Through the preventive coils approximately the same amount of current is drawn from each of these switches and the leads to which they are connected. To change to a higher voltage on the motors, the master controller is moved to the next notch, opening the last switch of the group that is closed and closing

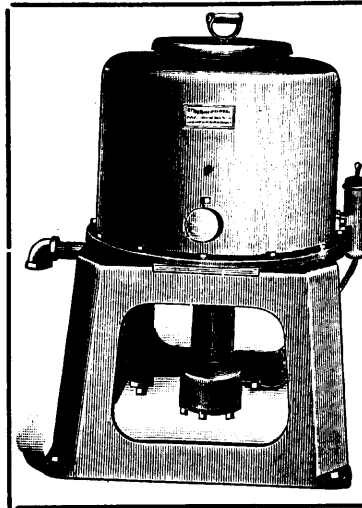
the switch next higher, with the result that the motor voltage is shifted up one step. By this arrangement the voltage at the motor will be completely under control of the locomotive driver and may be varied up and down at will without opening more than one-quarter of the load current. Small switches in the circuits to the magnets of the reversing switches will enable any motor or combination of motors to be cut out without disturbing the others.

Every one of the 17 controlling connections provides an efficient running point. This number is ample to prevent any slipping of the driving wheels due to increase of current

from one notch to another. Whether empty or heavily loaded, operated in single or multiple units, torque and draw-bar pull may be gradually applied and the locomotive started without jar.

COLLECTING DEVICES AND OVERHEAD CONSTRUCTION.

Each locomotive unit will be equipped with a pneumatically operated pantograph trolley to collect current from the overhead lines outside the tunnel and throughout the yards. The proportions of the pantograph will be such that, when extended, it will make contact with the trolley wire 22 feet



### Save the Oil

From Chips, Screws, Nuts, Bolts, or any other small parts which are finished in oil, and

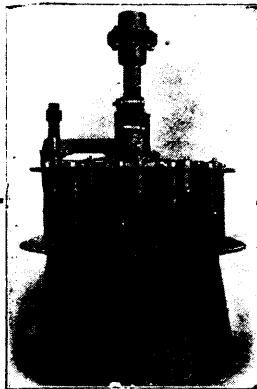
### Save the Waste

Get 90% of the oil returned and have waste perfectly clean for use again.

Ask for the Catalogue

**THE CANADIAN OIL AND WASTE SAVING MACHINE COMPANY**

BROCKVILLE, ONT.



## The Samson Turbine

If you use water power for any purpose you need the Samson wheel.

It will give the very best obtainable results under all conditions.

We guarantee an average efficiency of over 80%.

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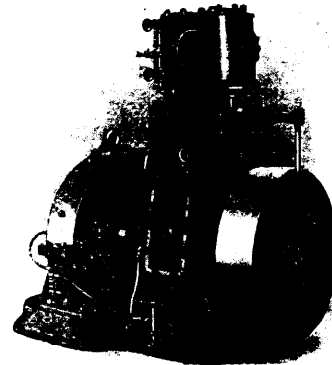
**The WM. HAMILTON MFG. CO., Limited**

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## Sturtevant Generating Sets

with high grade vertical engines are built in a line of 14 sizes from 3 to 50 K.W. We build 22 other sizes in horizontal and vertical compound types.

Bulletin 63 tells you all about them.



**B. F. STURTEVANT CO., Boston, Mass.**

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Designers and Builders of Heating, Ventilating, Drying and Mechanical Draft Apparatus; Fans, Blowers and Exhausters; Steam Engines, Electric Motors and Generating Sets; Fuel Economizers; Forges, Exhaust Heads, Steam Traps, etc.

488



above the rail, and, when closed down, the contact shoe will not extend more than 18 inches above the roof of the locomotive. The pantograph will have a broad base and will be constructed of light and stiff material.

A No. 0000 grooved overhead trolley wire will be suspended from a single 3/4-inch, high strength, double galvanized, steel strand, messenger cable, by hangers of varying length in such a manner that the trolley wire will be approximately horizontal. The messenger cable will be swung from structural iron bridges located throughout the yards and are of suitable length to span the proper number of tracks. There will also be a small section of track equipped with a trolley line swung by catenary suspension from bracket arms which are supported on lattice-work poles.

#### CURRENT-SUPPLY.

For the operation of the electric locomotives a complete power plant will be installed by the St. Clair Tunnel Co., including two 1,250 k.w., 3,300 volts, 3-phase, 25 cycle, 1,500 r.p.m., rotating field, Westinghouse steam turbine units, with the necessary complement of switch-boards, exciters, lightning protective apparatus, etc. This station will also supply current to light the buildings, yards and tunnel, to operate motor-driven centrifugal and triplex pumps which drain the tunnel and approaches and operate the

sewage system, to run motors in the round houses and for other purposes.

#### OPERATION.

The new equipment will handle that portion of the Grand Trunk Railway System which connects the divisions terminating at Port Huron, Mich., and Sarnia, Ont., on opposite sides of the St. Clair River. The tunnel proper is 6,032 feet long and the line to be electrically operated measures 19,348 feet from terminal to terminal.

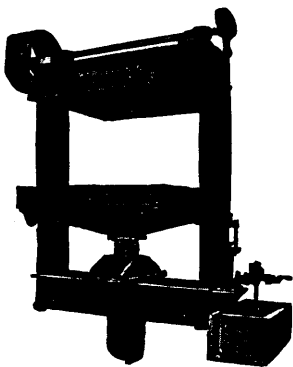
A pair of the new units will be capable of hauling a thousand-ton train through the tunnel without division. Mechanical considerations limit the advisable weight of train in the tunnel to these figures. Heavier trains can be divided or sent through together with locomotives in front and behind. The service requires that each unit shall take a train of 500 tons through the tunnel block from summit to summit in 15 minutes, under the following conditions:

It will be coupled to the train on a level track at a point 1,200 feet from the summit and must accelerate it up to a speed of 12 miles per hour in two minutes, at the end of which time it will have reached the summit of the grade leading down into the tunnel. It will then run down a grade of two per cent. to the level track in the tunnel at a speed not "exceeding" 25 miles per hour, continue on the practically level stretch

under the river, and then draw the train up a two per cent. grade at the rate of 10 miles per hour to the level track beyond the tunnel approach on the other side. It must then gradually accelerate the train until a speed of 18 miles per hour is reached. Each unit must be capable of exerting a tractive effort of 25,000 pounds for a period of five minutes in addition to the energy required to accelerate the train at the starting point and to run with it into the terminal yard, from which point it must immediately run back to a position 1,200 feet from the summit, couple to another train and be ready to start through the tunnel in the opposite direction. It must therefore make a run of the character described every 30 minutes. Six of these locomotives are to be furnished by the Westinghouse Co. It is expected that the electric equipment will greatly relieve the traffic congestion now existing and due in a large measure to the necessity of dividing trains at the terminal points, and to greatly simplify the operation of the road. Its opening will mark the progress of electrical methods in the railway field under conditions which seem peculiarly fitted to demonstrate its practical advantages in heavy service. That the single-phase system has been adopted for so important an undertaking makes evident the recognition accorded the alternating current by railway engineers, and indicates that its claims have been verified by the service already rendered.

The work of installation will be conducted under the supervision of Mr. Bion J. Arnold, of Chicago, consulting engineer for the Tunnel Co., by whom the plans and specifications were prepared. Mr. Arnold was one of the first engineers in America to advocate the employment of the single-phase, alternating-current system in railway service. He is also a past president of the American Institute of Electrical Engineers, a member of the Commission in charge of the electrification of the New York Central Railroad system in New York and has been closely identified with many electrical developments of great importance.

Contract for the entire equipment was taken by the Westinghouse Electric & Mfg. Co., Pittsburg, Pa., through the Canadian Westinghouse Co., Limited, Hamilton, Ont. A large part of the apparatus will be constructed in the works of the Canadian Co., at Hamilton, and the various Westinghouse interests will cooperate to complete the work.



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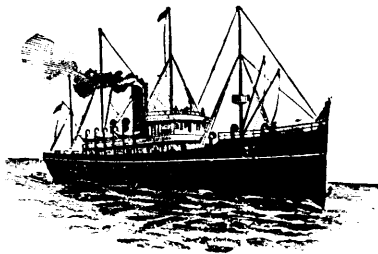
4. Chambers of Commerce in United Kingdom.

5. Chambers of Commerce in Colonies.

6. Customs Tariff of the United Kingdom.

7. Lloyds Signal Stations in the United Kingdom.

8. Lloyds Agents throughout the world (revised by the Secretary).



Date of Publication of 1906 Edition,  
FEBRUARY 28th.

London:

**THE CARTER PUBLISHING CO., 8, NEW BRIDGE STREET, E.C.**

9. Register of British and Foreign Shipping.

10. Shipping and Forwarding Agents, Export Packers, Steamship Lines.

11. Export Sections of London and Provinces (separate towns), giving names of exporters, places of shipment and class of goods shipped.

12. Index to class of Goods Shipped with names of Shippers.

13. Trade Mark Section.

14. Manufacturers Trade Directory (Buyers' Guide).

## THE SOUTHERN CALIFORNIA NEW TRAIN.—BEST ROUTE.

The Los Angeles Limited, electric lighted, new from the Pullman shops, with all latest innovations for travel comfort, leaves Chicago 10.05 p.m. daily, arrives Los Angeles 4.45 p.m. third day via Chicago, Union Pacific & North-Western Line and The Salt Lake Route. Pullman drawing room and tourist sleeping cars, composite observation car, dining cars, a la carte service. For rates, sleeping car reservations and full particulars, apply to your nearest agent or address, B. H. Bennett, 2 East King St., Toronto.

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Highest Awards at the World's Fair, Chicago, upon

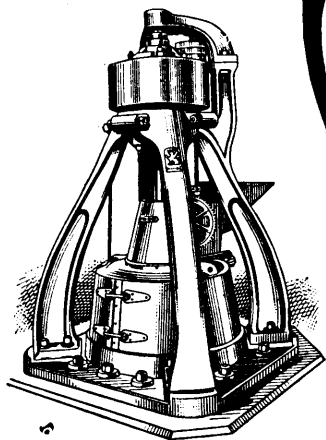
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Used Wherever Portland Cement is Made

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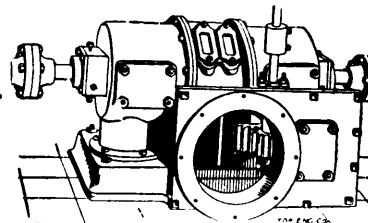
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See Bulletin No. 18

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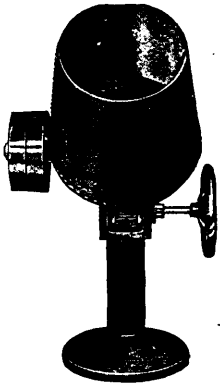
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STORM  
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FIRE-  
PROOF



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SIDES

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Canada Foundry Co., Toronto.  
Hopkins, F. H. & Co., Montreal.  
Nova Scotia Steel & Coal Co., New Glasgow, N.S.**Aniline Colors and Dyewood Extracts**Benson, W. T. & Co., Montreal.  
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Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio.**Antimony**

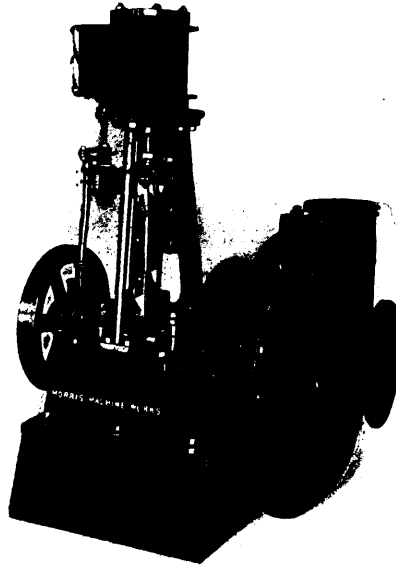
Syracuse Smelting Works, Montreal.

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Leslie, A. C. & Co., Montreal.**Architects**Parke, R. J., Toronto.  
Vogel, C. H., Ottawa.**Automatic Gear Cutting Machines**Becker-Brainard Milling Machine Co. Hyde Park  
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**FILE AND RASP MANUFACTURERS**  
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120 - G. E. 35 h.p. Railway Motors.  
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**R. B. Corbett,** 45-47 York Street, Brooklyn, N.Y., U.S.A.

## CLASSIFIED INDEX.

(CONTINUED).

### Belting (Rubber)

Gutta Percha & Rubber Mfg. Co., Toronto.  
McLaren, D. K., Montreal and Toronto.  
McLaren, J. C., Belting Co., Montreal  
Petrie, H. W., Toronto.  
Sadler & Haworth, Montreal and Toronto.

### Belting and Supplies

Bristol Co., Waterbury, Conn.  
Dominion Belting Co., Hamilton, Ont.  
Gutta Percha & Rubber Mfg. Co., Toronto.  
Jeffrey Mfg. Co., Columbus, Ohio.  
Montreal Belting Co., Montreal.  
McLaren, D. K., Montreal and Toronto.  
McLaren, J. C., Belting Co., Montreal and Toronto.  
Petrie, H. W., Toronto.  
Reddaway, F. & Co., Montreal.  
Sadler & Haworth, Montreal and Toronto.  
Williams, A. R. Machinery Co., Toronto.

### Blast Furnace Brick

Dunbar Fire Brick Co., Pittsburgh, Pa.  
Hamilton Facing Mill Co., Hamilton, Ont.  
Harbison-Walker Refractories Co., Pittsburgh, Pa.  
Pennsylvania Fire Brick Co., Lock Haven, Pa.  
Queen's Run Fire Brick Co., Lock Haven, Pa.  
Reese-Hammond Fire Brick Co., Bolivar, Pa.  
Stowe-Fuller Co., Cleveland, Ohio.

### Blowers

Sheldon & Sheldon, Galt, Ont.  
Sturtevant, B. F. Co., Boston, Mass.

### Boiler Compounds

Canada Chemical Mfg. Co., London, Ont.

### Boiler Inspection

Boiler Inspection & Insurance Co., Toronto.  
Canadian Casualty & Boiler Insurance Co., Toronto.

### BOILERS (See Engines and Boilers)

#### Bolts and Nuts

London Rolling Mills, London, Ont.  
Morrow John Machine Screw Co., Ingersoll Ont.

### Brass Founders

Hamilton Brass Mfg. Co., Hamilton, Ont.  
Penberthy Injector Co., Windsor, Ont.

### Building and Paving Brick

Dunbar Fire Brick Co., Pittsburgh, Pa.  
Hamilton Facing Mill Co., Hamilton, Ont.  
Harbison-Walker Refractories Co., Pittsburgh, Pa.  
Pennsylvania Fire Brick Co., Lock Haven, Pa.  
Queen's Run Fire Brick Co., Lock Haven, Pa.  
Reese-Hammond Fire Brick Co., Bolivar, Pa.  
Stowe-Fuller Co., Cleveland, Ohio.

### Building Iron and Steel

Bourne-Fuller Co., Cleveland, Ohio.  
Canada Foundry Co., Toronto.  
Expanded Metal & Fireproofing Co., Toronto.

### Builders' Materials

Albert Mfg. Co., Hillsboro, Ont.  
Canada Foundry Co., Toronto.  
Conduits Company, Limited, Toronto.  
Expanded Metal & Fireproofing Co., Toronto.  
Gartshore, John J., Toronto.  
Hopkins, F. H. & Co., Montreal.  
Sheldon & Sheldon, Galt, Ont.

### Cables

Dominion Wire Rope Co., Montreal.  
Greening, B. Wire Co., Hamilton, Ont.  
Phillips, Eugene F. Electrical Works, Montreal.]

### Canada Plates

Leslie, A. C. & Co., Montreal.  
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

### Canoes

Peterborough Canoe Co., Peterborough, Ont

### Caps

McCullough-Dalzell Crucible Co., Pittsburg, Pa.

### Card Clothing

McLaren, D. K., Montreal and Toronto.  
McLaren, J. C. Belting Co., Montreal and Toronto.

### Cast Iron Pipe

Canada Foundry Co., Toronto.  
Montreal Pipe Foundry Co., Montreal.  
McDougall, John, Caledonian Iron Works Co., Montreal.

### Castings (Grey Iron, Malleable Iron and Brass)

International Harvester Co., Hamilton, Ont.  
Jenckes Machine Co., Sherbrooke, Que.  
Kerr Engine Co., Walkerville, Ont.  
McDougall, John, Caledonian Iron Works Co., Montreal.

### Cement Machinery

Allis-Chalmers-Bullock, Limited, Montreal.  
Bradley Pulverizer Co., Boston, Mass.  
McDougall, John, Caledonian Iron Works Co., Montreal.

### Centrifugal Pumping Machinery

Morris Machine Works, Baldwinsville, N.Y.

### Chain Making Machinery

(Welded Coil Chain)  
Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio.

### Channels

Bourne-Fuller Co., Cleveland, Ohio.  
Canada Foundry Co., Toronto.  
Leslie, A. C. & Co., Montreal.  
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

### Charcoal Pig Iron

Canada Iron Furnace Co., Montreal.  
McDougall, John, Caledonian Iron Works Co. Montreal.

### Chemicals

Canada Chemical Co., London, Ont.  
Nichols Chemical Co. of Canada, Montreal

### Chemists

Archbold, Dr. Geo., Prescott, Ont.  
Heys, Thomas & Son, Toronto.

### Clay Working Machinery

Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio.

### Coal and Coke

Bourne-Fuller Co., Cleveland, Ohio.  
Milnes, James H. & Co., Toronto.  
Myles' Thos. Sons, Hamilton, Ont.  
Wick, H. K. & Co., Buffalo, N.Y.  
Wilson, H. T. Coal Co., Detroit, Mich.

### Coal Cutting Machines

Allis-Chalmers-Bullock, Limited, Montreal.  
Canadian Rand Drill Co., Sherbrooke, Que.  
Jeffrey Mfg. Co., Columbus, Ohio.

### Coal Tipples

Jeffrey Mfg. Co., Columbus, Ohio.  
Jenckes Machine Co., Sherbrooke, Que.

### Coil Chains

Greening, B. Wire Co., Hamilton, Ont.  
Leslie, A. C. & Co., Montreal.

### Coke Oven Brick

Dunbar Fire Brick Co., Pittsburgh Pa.  
Stowe-Fuller Co., Cleveland, Ohio.

### Collection Agency

Petrie, H. D., Hamilton, Ont.

### Concrete Mixers

Hopkins, F. H. & Co., Montreal.

### Conduits (Interior)

Conduits Company, Limited, Toronto.

### Contractors' Machinery

Allis-Chalmers-Bullock, Limited, Montreal.  
Gartshore, John J., Toronto.  
Hopkins, F. H. & Co., Montreal.  
Jenckes Machine Co., Sherbrooke, Que.  
McDougall, John, Caledonian Iron Works Co., Montreal.

### Contractors' Plants

Allis-Chalmers-Bullock, Limited, Montreal.  
Hopkins, F. H. & Co., Montreal.  
Jenckes Machine Co., Sherbrooke, Que.  
Petrie, H. W., Toronto.  
Von der Osten, E. & Co., Toronto.  
Williams A. R. Machinery Co., Toronto.

### Conveying Machinery

Allis-Chalmers-Bullock, Limited, Montreal.  
Babcock & Wilcox, Limited, Montreal.  
Canada Foundry Co., Toronto.  
Jeffrey Mfg. Co., Columbus, Ohio.  
Link-Belt Engineering Co., Philadelphia, Pa.  
McDougall John, Caledonian Iron Works Co., Montreal.  
Perrin, William R. & Co., Limited, Toronto.

### Copper Materials

Greening, B. Wire Co., Hamilton, Ont.  
Phillips, Eugene F. Electrical Works, Montreal.  
Syracuse Smelting Works, Montreal.

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## Cotton Banding and Rope

McLaren, J. C. Belting Co., Montreal.

## Covers

McCullough-Dalzell Crucible Co., Pittsburg, Pa.  
Pittsburg Crucible Works, Pittsburg, Pa.

## Crayons

Lowell Crayon Co., Lowell, Mass.  
McLaren, J. C. Belting Co., Montreal.

## Crucibles

Dixon, Joseph, Crucible Co., Jersey City, N.J.  
McCullough-Dalzell Crucible Co., Pittsburg, Pa.  
Pittsburg Crucible Works, Pittsburg, Pa.  
Syracuse Smelting Works, Montreal.

## Crucible Caps

McCullough-Dalzell Crucible Co., Pittsburg, Pa.  
Pittsburg Crucible Works, Pittsburg, Pa.

## Crucible Covers

McCullough-Dalzell Crucible Co., Pittsburg, Pa.  
Pittsburg Crucible Works, Pittsburg, Pa.

## Cutter Grinding Machines

Becker-Brainard Milling Machine Co., Hyde Park, Mass.

## Deep Well Engines

American Steam Pump Co., Battle Creek, Mich.

## Detective Agency

Dewar Detective Agency, St. Louis, Mo.

## Dies (Socket, Sewer Pipe and Tile)

Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio.

## Directories

Kelly's Directories, Limited, Toronto

## Draw Benches (Wire)

Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio.

## Dredges

Allis-Chalmers-Bullock, Limited, Montreal.

## Drills

Allis-Chalmers-Bullock, Limited, Montreal.  
Barnes, B. F. Co., Rockford, Ill.  
Canadian Westinghouse Co., Ltd., Hamilton, Ont.  
Petrie, H. W., Toronto.

## Drills (Pneumatic and Rock)

Allis-Chalmers-Bullock, Limited, Montreal.  
Canadian Rand Drill Co., Sherbrooke, Que.  
Jeffrey Mfg. Co., Columbus, Ohio.

## Drop Forgings

Globe Machine & Stamping Co., Cleveland, Ohio.

## Drop Forging Dies

Globe Machine & Stamping Co., Cleveland, Ohio.

## Dry Kiln Apparatus

Sheldon & Sheldon, Galt, Ont.  
Sturtevant, B. F. Co., Boston, Mass.

## Dust and Shavings Separators

Sheldon & Sheldon, Galt, Ont.  
Sturtevant, B. F. Co., Boston, Mass.

## Dye Stuffs and Chemicals

Benson, W. T. & Co., Montreal.  
Brunner, Mond & Co., Northwich, England.  
Canada Chemical Mfg. Co., London, Ont.  
Cassella Color Co., New York City.  
Geigy Aniline & Extract Co., New York City.  
McArthur, Cornelle & Co., Montreal.  
Nichols Chemical Co. of Canada, Montreal.  
Winn & Holland, Montreal.

## DYNAMOS (See Motors and Dynamos)

### Electric Meters and Transformers

Allis-Chalmers-Bullock, Limited, Montreal.  
Packard Electric Co., St. Catharines, Ont.

### Electric Mine Locomotives

Canadian General Electric Co., Toronto.  
Canadian Westinghouse Co., Ltd., Hamilton, Ont.  
Jeffrey Mfg. Co., Columbus, Ohio.

### Electrical Repairs

Keystone Engineering Co., Toronto.

### Electrical Supplies

Allis-Chalmers-Bullock, Limited, Montreal.  
Bristol Co., Waterbury, Conn.  
Canadian General Electric Co., Toronto.  
Canadian Westinghouse Co., Ltd., Hamilton, Ont.  
Electrical Construction Co., London, Ont.

Forman, John, Montreal.  
Jones & Moore Electric Co., Toronto.  
Keystone Engineering Co., Toronto.  
Packard Electric Co., St. Catharines, Ont.  
Toronto & Hamilton Electric Co., Hamilton, Ont.  
United Electric Co., Toronto.

## Elevators and Conveyors

Allis-Chalmers-Bullock, Limited, Montreal.  
Darling Bros., Montreal.  
Jeffrey Mfg. Co., Columbus, Ohio.  
Jenckes Machine Co., Sherbrooke, Que.  
Link-Belt Engineering Co., Philadelphia, Pa.

## Elevator Insurance

Canadian Casualty & Boiler Insurance Co., Toronto.

## Emery and Emery Wheels

Forman, John, Montreal.  
Petrie, H. W., Toronto.

## Engineers (Chemical)

Heys, Thomas & Son, Toronto.  
Hunt Robert W. & Co., Chicago, Ill.

## Engineers (Civil)

Parke, R. J., Toronto.  
Vogel, C. H., Ottawa.

## Engineers (Consulting)

Aitken, K. L., Toronto.  
Canadian White Co., Montreal.  
Electrical Construction Co., London, Ont.  
Fensom, C. J., Toronto.  
Hunt, Robert W. & Co., Chicago, Ill.  
Keystone Engineering Co., Toronto, Ont.  
Marion & Marion, Montreal.  
Parke, R. J., Toronto.  
Perrin, William R. & Co., Limited, Toronto  
Vogel C. H., Ottawa.  
Von der Osten, E. & Co., Toronto.

## Engineers (Contracting)

Babcock & Wilcox, Limited, Montreal.  
Canada Foundry Co., Toronto.  
Canadian White Co., Montreal.  
Darling Bros., Montreal.  
Electrical Construction Co., London, Ont.  
Fensom, C. J., Toronto.  
Keystone Engineering Co., Toronto.  
McDougall, John, Caledonian Iron Works Co., Montreal.  
Robb Engineering Co., Amherst, N.S.

## Engineers (Electrical)

Aitken, K. L., Toronto.  
Allis-Chalmers-Bullock, Limited, Montreal.  
Canadian General Electric Co., Ltd., Toronto.  
Canadian Westinghouse Co., Ltd., Hamilton, Ont.  
Canadian White Co., Montreal.  
Crocker-Wheeler Co., St. Catharines, Ont.  
Electrical Construction Co., London, Ont.  
Fensom, C. J., Toronto.  
Jones & Moore Electric Co., Toronto.  
Keystone Engineering Co., Toronto.  
Marion & Marion, Montreal.  
Toronto & Hamilton Electric Co., Hamilton Ont.  
United Electric Co., Toronto.

## Engineers (Mechanical)

Allis-Chalmers-Bullock, Limited, Montreal.  
Babcock & Wilcox, Limited, Montreal.  
Darling Bros., Montreal.  
Electrical Construction Co., London, Ont.  
Fensom, C. J., Toronto.  
Gearing, H., Toronto.  
McDougall, John, Caledonian Iron Works Co., Montreal.  
Hunt, Robert W. & Co., Chicago, Ill.  
Kerr Engine Co., Walkerville, Ont.  
Marion & Marion, Montreal.  
Robb Engineering Co., Amherst, N.S.  
Sheldon & Sheldon, Galt, Ont.

## Engineers (Mill and Hydraulic)

Fensom, C. J., Toronto.  
Hawksworth, Alfred, & Sons Co., Montreal.  
Vogel, C. H., Ottawa.

## Engineers (Mining)

Heys, Thomas & Son, Toronto.  
Mills, S. D., Toronto.

## Engineers (Municipal)

Von der Osten, E. & Co., Toronto.

## Engineers and Contractors

Canadian White Co., Montreal.  
Jeffrey Mfg. Co., Columbus, Ohio.  
Jenckes Machine Co., Sherbrooke, Que.

## Engines and Boilers

Allis-Chalmers-Bullock, Limited, Montreal.  
Babcock & Wilcox, Limited, Montreal.  
Canada Foundry Co., Toronto.  
Corbett, R. B., Brooklyn, N.Y.



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J. TURNBULL, General Manager.

HEAD OFFICE, - HAMILTON, ONT.

Capital.	Reserve.	Total Assets.
\$2,000,000	\$1,700,000	\$22,000,000

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Halifax, N.S.	Hamilton, Ont.
London, Ont.	Montreal, Que.
Ottawa, Ont.	Quebec, Que.
St. John, N.B.	Toronto, Ont.
Vancouver, B.C.	Winnipeg, Man.

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Goldie & McCulloch Co., Galt, Ont.  
Hamilton, Wm. Mfg. Co., Peterborough, Ont.  
Hopkins, F. H. & Co., Montreal.  
Jenckes Machine Co., Sherbrooke, Que.  
Morris Machine Works, Baldwinville, N.Y.  
McDougall, John, Caledonian Iron Works Co., Mont-  
real.  
Petrie, H. W., Toronto.  
Robb Engineering Co., Amherst, N.S.  
Sheldon & Sheldon, Galt, Ont.  
Sturtevant, B. F. Co., Boston, Mass.  
Williams, A. R. Machinery Co., Toronto.

### Engravers

Canadian Manufacturer, Toronto.  
Jones, J. L. Engraving Co., Toronto.

### Exhaust Fans

Sheldon & Sheldon, Galt, Ont.  
Sturtevant, B. F. Co., Boston, Mass.

### Exhaust Heads

Darling Bros., Montreal.  
Sheldon & Sheldon, Galt, Ont.  
Sturtevant, B. F. Co., Hyde Park Mass.

### Exhausters

Sheldon & Sheldon, Galt, Ont.  
Sturtevant, B. F. Co., Hyde Park, Mass.

### Explorer and Geologist

Evans, Horace F., Ashcroft, B.C.

### Factory Sites

(See Factory Locations, page 31.)  
Central Ontario Power Co., Peterboro Ont.  
Hutcheson, S. M., Paisley, Ont.

### Feed Water Heaters

Babcock & Wilcox, Limited, Montreal.  
Darling Bros., Montreal.  
McDougall, John, Caledonian Iron Works Co., Mont-  
real.  
Robb Engineering Co., Amherst, N.S.

### Files

Spence, R. & Co., Hamilton, Ont.

### Fillet (Pattern)

McLaren, J. C. Belting Co., Montreal.  
Sadler & Haworth, Montreal and Toronto.

### Filters (Oil)

Babcock & Wilcox, Limited, Montreal.  
Darling Bros., Montreal.  
McDougall, John, Caledonian Iron Works Co., Mont-  
real.  
Perrin, William R. & Co., Limited, Toronto.

### Filters and Filtering Systems (Water)

Babcock & Wilcox, Limited, Montreal.  
Jenckes Machine Co., Sherbrooke, Que.  
McDougall, John, Caledonian Iron Works Co., Mont-  
real.

### Financial

Bradstreet's, New York City.  
Dun, R. G. & Co., Toronto.  
Neff & Postlethwaite, Toronto.  
Petrie, H. D. Hamilton, Ont.

### Fire Brick and Clay

Dunbar Fire Brick Co., Pittsburgh, Pa.  
Elk Fire Brick Co., St. Mary's, Ont.  
Hamilton Facing Mill Co., Hamilton, Ont.  
Harbison-Walker Refractories Co., Pittsburgh, Pa.  
Pennsylvania Fire Brick Co., Lock Haven, Pa.  
Queen's Run Fire Brick Co., Lock Haven, Pa.  
Reese-Hammond Fire Brick Co., Boliver, Pa.  
Stowe-Fuller Co., Cleveland, Ohio.

### Fire Escapes

Darling Bros., Montreal.

### Fire Insurance

Inter-Insurers of America, New York City.

### Flour Mill Machinery

Allis-Chambers-Bullock, Limited, Montreal.  
Goldie & McCulloch Co., Galt, Ont.

### Forges and Blowers

Canada Foundry Co., Toronto.  
Sheldon & Sheldon, Galt, Ont.  
Sturtevant, B. F. Co., Boston, Mass.

### Founders

Canada Foundry Co., Toronto.  
Goldie & McCulloch Co., Galt, Ont.  
Hamilton, Wm. Mfg. Co., Peterborough, Ont.  
Jenckes Machine Co., Sherbrooke, Que.  
McDougall, John, Caledonian Iron Works Co., Mont-  
real.  
Robb Engineering Co., Amherst, N.S.

### Foundry Facings and Supplies

Hamilton Facing Mill Co., Hamilton, Ont.

### Fuel Economisers

Babcock & Wilcox, Limited, Montreal.  
Sturtevant, B. F. Co., Hyde Park, Mass.

### Furniture (Lodge, Opera and School)

Canadian Office & School Furniture Co., Preston, Ont.

### Galvanizing

Ontario Wind Engine & Pump Co., Toronto.

### Galvanizing and Tinning Machinery and Furnaces (Wire)

Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio

### Gas and Gasoline Engines

Morrison, T. A. & Co., Montreal.

### Gauges (Recording Pressure)

Bristol Co., Waterbury, Conn.

### Gauges (Steam)

Penberthy Injector Co., Windsor, Ont.  
Petrie, H. W., Toronto.  
Williams, A. R. Machinery Co., Toronto

### Gauges (Water)

Babcock & Wilcox, Limited, Montreal  
Penberthy Injector Co., Windsor, Ont.

### Generating Sets

Sturtevant, B. F. Co., Hyde Park, Mass

### Generators

Allis-Chalmers-Bullock, Limited, Montreal.  
Canadian General Electric Co., Toronto.  
Canadian Westinghouse Co., Ltd., Hamilton Ont.  
Electrical Construction Co., London, Ont.  
Forman, John, Montreal.  
Jeffrey Mfg. Co., Columbus, Ohio.  
Jones & Moore Electric Co., Toronto.  
Phillips, Eugene F., Electrical Works, Montreal.  
Toronto & Hamilton Electric Co., Hamilton, On

### Gloves, Mittens and Moccasins

Storey, W. H. & Son, Acton, Ont.

### Glue Heaters

Advance Machinery Co., Toledo, Ohio.

### Glue Room Equipment

Advance Machinery Co., Toledo, Ohio.

### Government Notices

Factory Inspectors.  
Minister of Agriculture.

### Graphite

Dixon, Jos. Crucible Co., Jersey City, N.J.  
McCullough-Dazell Crucible Co., Pittsburg, Pa  
Pittsburg Crucible Works, Pittsburg, Pa

### Grease Cups

Penberthy Injector Co., Windsor, Ont.

### Hardware

Butterfield & Co., Rock Island, Que.  
Gartshore, John J., Toronto.  
Globe Machine & Stamping Co., Cleveland, Ohio.  
Hopkins, F. H. & Co., Montreal.  
Morrow, John, Machine Screw Co., Ingersoll, Ont.

### Heating and Ventilating Apparatus

Darling Bros., Montreal.  
Sheldon & Sheldon, Galt, Ont.  
Sturtevant, B. F. Co., Boston, Mass.

### Hoisting Engines

Allis-Chambers-Bullock, Limited, Montreal  
Jenckes Machine Co., Sherbrooke, Que.

### Hoists (Chain and Pneumatic)

Allis-Chalmers-Bullock, Limited, Montreal.  
Canadian Rand Drill Co., Sherbrooke, Que.  
Hopkins, F. H. & Co., Montreal.

### Hose (Fire and Pneumatic)

Gutta Percha & Rubber Mfg. Co., Toronto.  
McLaren, J. C. Belting Co., Montreal and Toronto.  
Reddaway, F. & Co., Montreal.  
Sadler & Haworth, Montreal and Toronto.

### Hotel

Gallatin Hotel, New York City.

### Hydrants

Kerr Engine Co., Walkerville, Ont.  
Jenckes Machine Co., Sherbrooke, Que.  
McDougall, John, Caledonian Iron Works Co., Mont-  
real.

### Hydraulic Accumulators

Jenckes Machine Co., Sherbrooke, Que.  
McDougall, John, Caledonian Iron Works Co., Mont-  
real.

### Hydraulic Leather

McLaren, J. C., Belting Co., Montreal.  
Sadler & Haworth, Montreal and Toronto

### Hydraulic Machinery

Canada Foundry Co., Toronto.  
Darling Bros., Montreal.  
Hamilton, Wm. Mfg. Co., Peterborough, Ont.  
Jenckes Machine Co., Sherbrooke, Que.  
McDougall, John, Caledonian Iron Works Co., Mont-  
real.

Perrin, William R. & Co., Limited, Toronto.  
Petrie, H. W., Toronto.  
Wilson, J. C. & Co., Glenora, Ont.

### Industrial Plants

Von der Osten, E. & Co., Toronto.

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## Insulated Wires and Cables

Phillips, Eugene F., Electrical Works, Montreal.

## Insurance

Inter-Insurers of America, New York City.

## Iron and Steel Specialties

Armstrong Mfg. Co., Bridgeport, Conn.  
 Bourne-Fuller Co., Cleveland, Ohio.  
 Canada Foundry Co., Toronto.  
 Leslie, A. C. & Co., Montreal.  
 London Rolling Mill Co., London, Ont.  
 Lysaght, John, Limited, Bristol, England and Montreal.  
 Nova Scotia Steel & Coal Co., New Glasgow, N.S.  
 Petrie H. W. Toronto.  
 Union Drawn Steel Co., Hamilton, Ont.

## Injectors

Canada Foundry Co., Toronto.  
 Hamilton Brass Mfg. Co., Hamilton, Ont.  
 Penberthy Injector Co., Windsor, Ont.  
 Williams, A. R. Machinery Co., Toronto.

## Iron and Steel Inspection

Hunt, R. W. & Co., Chicago, Ill.

## Lamps—Electric

Allis-Chalmers-Bullock, Limited, Montreal.  
 Canadian General Electric Co., Toronto.  
 Canadian Westinghouse Co., Ltd., Hamilton, Ont.  
 Forman, John, Montreal.  
 Packard Electric Co., St. Catharines, Ont.

## Lathes

Barnes, B. F. Co., Rockford, Ill.  
 Petrie, H. W., Toronto.  
 Williams, A. R. Machinery Co. Toronto.

## Lathes (Wood-working)

Goldie & McCulloch Co., Galt, Ont.  
 Petrie, H. W., Toronto.  
 Williams, A. R. Machinery Co., Toronto.

## Loom Reeds

McLaren, J. C., Belting Co., Montreal.

## Lubricators

Penberthy Injector Co., Windsor, Ont.

## Machinists

Goldie & McCulloch Co., Galt, Ont.  
 Robb Engineering Co., Amherst, N.S.

## Machinists' Supplies

Armstrong Mfg. Co., Bridgeport, Conn.  
 Butterfield & Co., Rock Island, Que.  
 Goldie & McCulloch Co., Galt, Ont.  
 Gutta Percha & Rubber Mfg. Co., Toronto.  
 Hopkins, F. H. & Co., Montreal.  
 Jeffrey Mfg. Co., Columbus, Ohio.  
 Morrow, John, Machine Screw Co., Ingersoll, Ont.  
 Petrie, H. W., Toronto.

## Machine Tools

Barnes, B. F. Co., Rockford, Ill.  
 Becker-Brainard Milling Machine Co., Hyde Park, Mass.  
 Darling Bros., Montreal.  
 Petrie, H. W., Toronto.

## Malleable Castings

International Harvester Co., Hamilton, Ont.  
 Smith's Falls Malleable Castings Co., Smith's Falls, Ont.

## Marine and Stationary Engines and Boilers

Allis-Chalmers-Bullock, Limited, Montreal.  
 Jenckes Machine Co., Sherbrooke, Que.

## Mechanical Draft

Babcock & Wilcox, Limited, Montreal.  
 Sheldon & Sheldon, Galt, Ont.  
 Sturtevant, B. F. Co., Boston, Mass.

## Metal Stamping

Globe Machine & Stamping Co., Cleveland, Ohio.

## Metallurgists

Mills, S. D., Toronto.

## Mill Machinery and Supplies

Allis-Chalmers-Bullock, Limited, Montreal.  
 Armstrong Mfg. Co., Bridgeport, Conn.  
 Becker-Brainard Milling Machine Co., Hyde Park, Mass.  
 Darling Bros., Montreal.  
 Gartshore, John J., Toronto.  
 Goldie & McCulloch Co., Galt, Ont.  
 Gutta Percha & Rubber Mfg. Co., Toronto  
 Hamilton Brass Mfg. Co., Hamilton, Ont.  
 Hamilton, Wm., Mfg. Co., Peterborough, Ont.  
 Hawksworth, Alfred & Sons Co., Montreal.  
 Hay, Peter Knife Co., Galt, Ont.  
 Hopkins, F. H. & Co., Montreal.  
 Jeffrey Mfg. Co., Columbus, Ohio.  
 Jenckes Machine Co., Sherbrooke, Que.  
 Morrow, John, Machine Screw Co., Ingersoll, Ont.  
 McDougall, John, Caledonian Iron Works Co., Montreal.  
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 McLaren, J. C. Belting Co., Montreal.  
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 Petrie, H. W., Toronto.  
 Reddaway, F. & Co., Montreal.  
 Robb Engineering Co., Amherst, N.S.  
 Spence, R. & Co., Hamilton, Ont.  
 Wilson, J. C. & Co., Glenora, Ont.

## Milling Cutters and Machines

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 Hopkins, F. H. & Co., Montreal.  
 Jeffrey Mfg. Co., Columbus, Ohio.  
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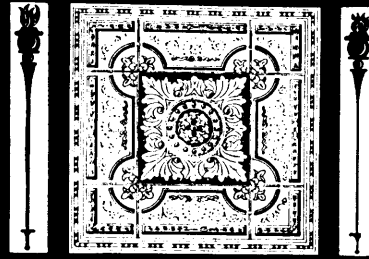
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Jeffrey Mfg. Co., Columbus, Ohio.  
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Keystone Engineering Co., Toronto.  
McDougall, John, Caledonian Iron Works Co., Montreal.

Packard Electric Co., St. Catharines, Ont.  
Perrin, Wm. R. & Co., Limited, Toronto.  
Petrie, H. W., Toronto.

Phillips, Eugene F., Electrical Works, Montreal.  
Robb Engineering Co., Amherst, N.S.  
Sturtevant, B. F. Co., Boston, Mass.  
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Harpers' Weekly	New York	Weekly	4 00	4 25					

**The Canadian Manufacturer Publishing Co., Limited,**  
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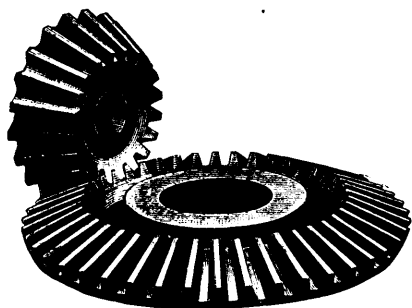
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THE JOHN McDOUGALL CALEDONIAN IRON WORKS CO., LIMITED  
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- GEARS -

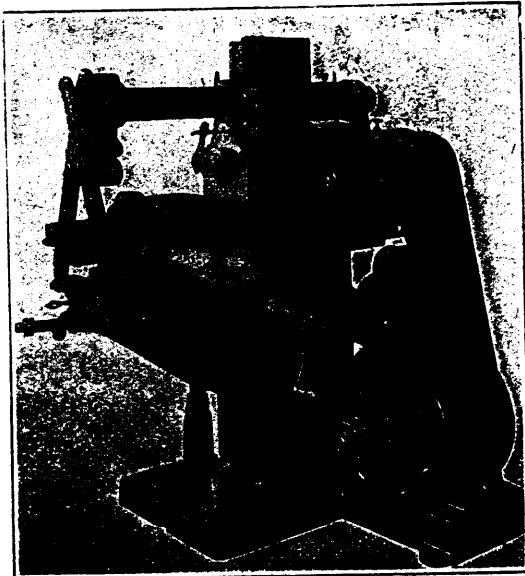
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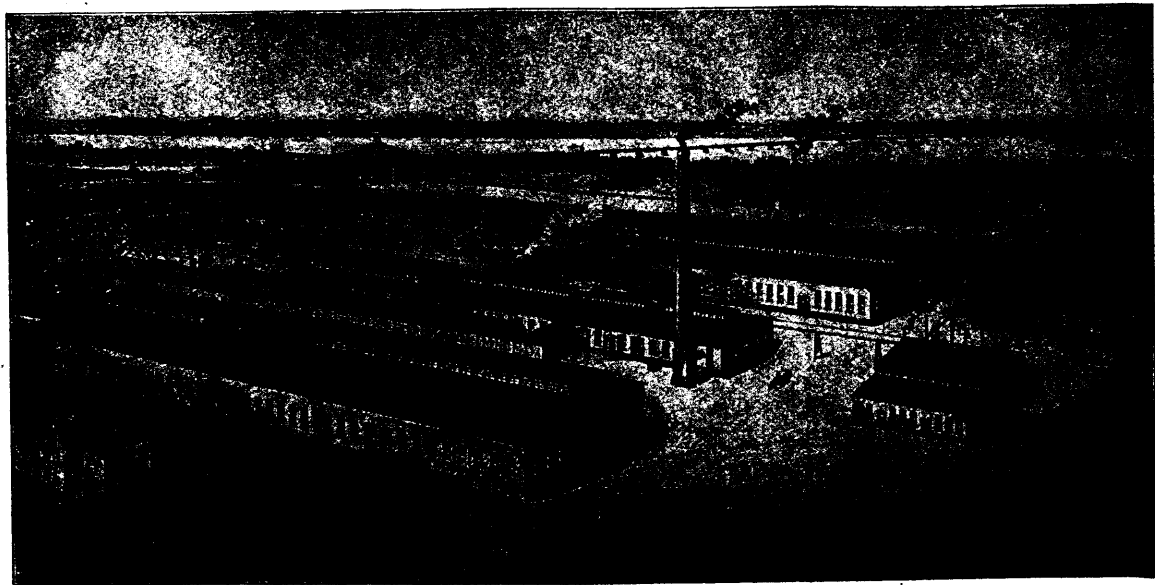
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 per Emil C. Boeckh, Pres't & Gen'l Manager.

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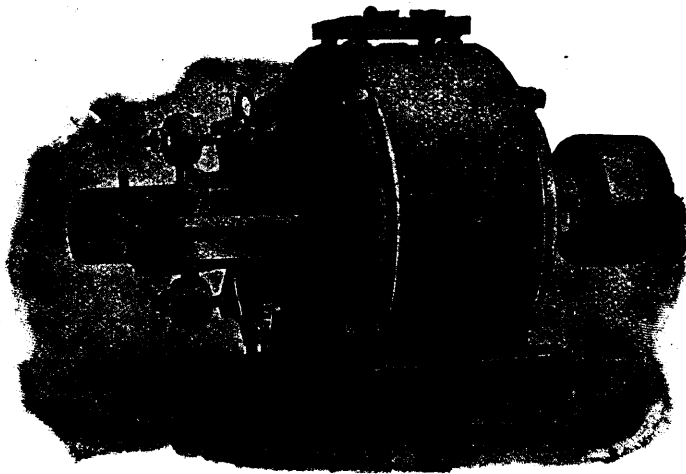
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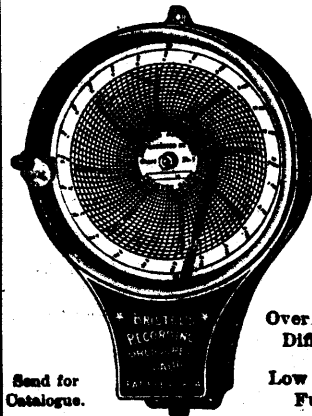
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