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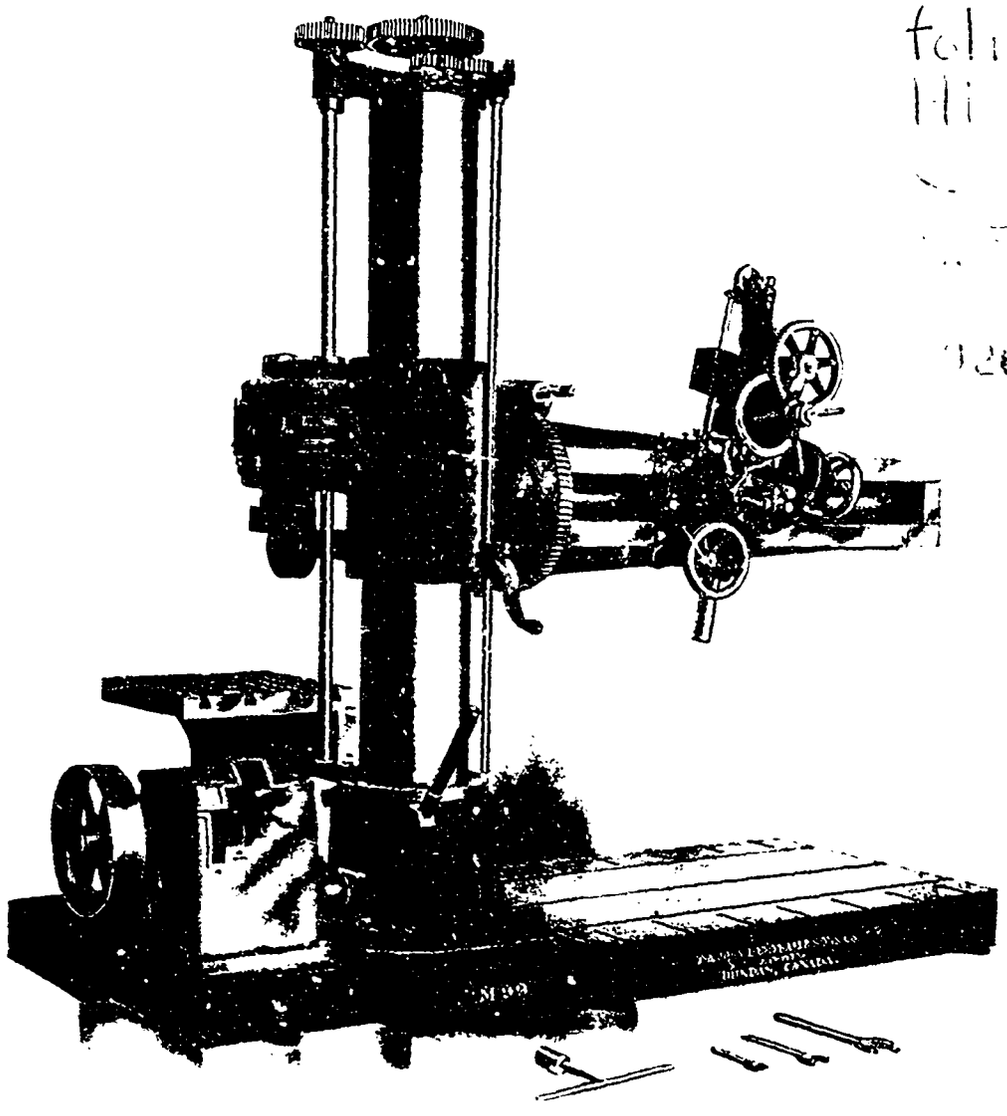

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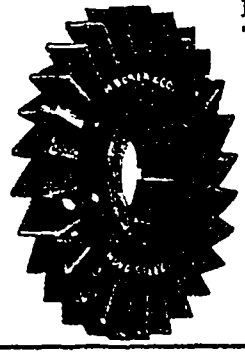

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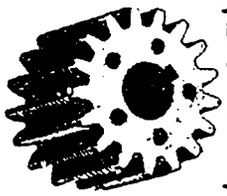

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THE IRON INDUSTRY IN CANADA

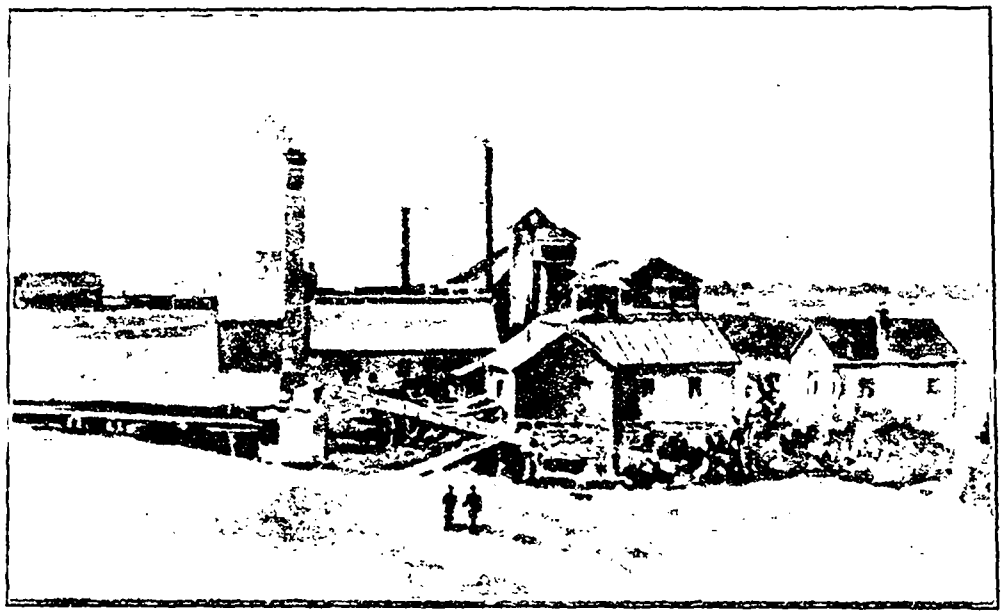
AN HISTORICAL REVIEW OF IRON MAKING IN CANADA FROM THE DAYS OF FRONTENAC IN THE FRENCH REGIME TO THE PRESENT

BY J. J. CASSIDEY

Tubal Cain, the first known manufacturer of iron, was of the seventh generation from Adam, as mentioned in the 4th Chapter of Genesis, where he is spoken of as "an instructor of every artifice in brass and iron." In the time of Moses the Egyptians seem to have been engaged in the manufacturing of iron, as referred to in the 4th Chapter of Deuteronomy, when the allusion to the industry says "But the Lord hath taken you and brought you forth out of the iron furnace, even out of Egypt." This expression again occurs in 1st Kings, 8th Chapter. It is probable that Tubal Cain had acquired his knowledge of metallurgy from the Egyptians who were, no doubt, well skilled and adept in the manufacture not only of iron but of other metals also, including precious metals. The Israelites had been in bondage to the Egyptians for perhaps a couple of hundred years,—a chief occupation being the manufacture of brick, but it is not recorded that they were taught, or allowed to be engaged in the production of any of the ornamental articles for which their task masters were so celebrated; but when the time of the stampede arrived, as we are told in the 12th Chapter of Exodus: "The children of Israel borrowed of the Egyptians jewels of silver, and jewels of gold, and raiment; and the Lord gave the people fame in the sight of the Egyptians, so that they lent unto them such things as they required, and they spoiled the Egyptians."

History, from the most remote times contains accounts of the uses of articles of iron and steel. Ages ago Damascus, the capital of Syria, was celebrated for its famous swords, made of steel from India and Persia, specimens of which are even now extant.

In 1893 the Society of American and Canadian Mining Engineers held a convention in the city of Montreal, during which occasion a visit was made to Radnor Forges, Que., the property of the Canada Iron Furnace Co, of which Mr. George E. Drummond was managing director; and to commemorate the visit, Mr. Drummond prepared and issued a souvenir in which was embodied a most interesting historical sketch of the Radnor Forges property, a copy of which is now before the writer, and from which much of the information regarding the early history of the iron industry in Canada is obtained.



THE RADNOR FORGES AT RADNOR, QUE., THE OLDEST IRON FURNACE IN CANADA.

THE FIRST REPORTS OF IRON ORE IN CANADA.

In the very earliest days of La Nouvelle France, says Mr. Drummond, specimens of the bog ore of the St. Maurice District were examined in Quebec by the Sieur la Pontardiere, and reports sent to the Imperial Government in France. At that time the affairs of the colony were under the control of the West India Company, who held monopoly of all the rights of the mines and minerals of La Nouvelle France, including those now owned by the Canada Iron Furnace Company.

Among the original manuscripts relating to the administration of Louis de Buade, Comte de Frontenac, allusion is frequently made to the great value of the St. Maurice iron mines. In a letter to the Imperial Government under date of November 2, 1672, Frontenac says:—

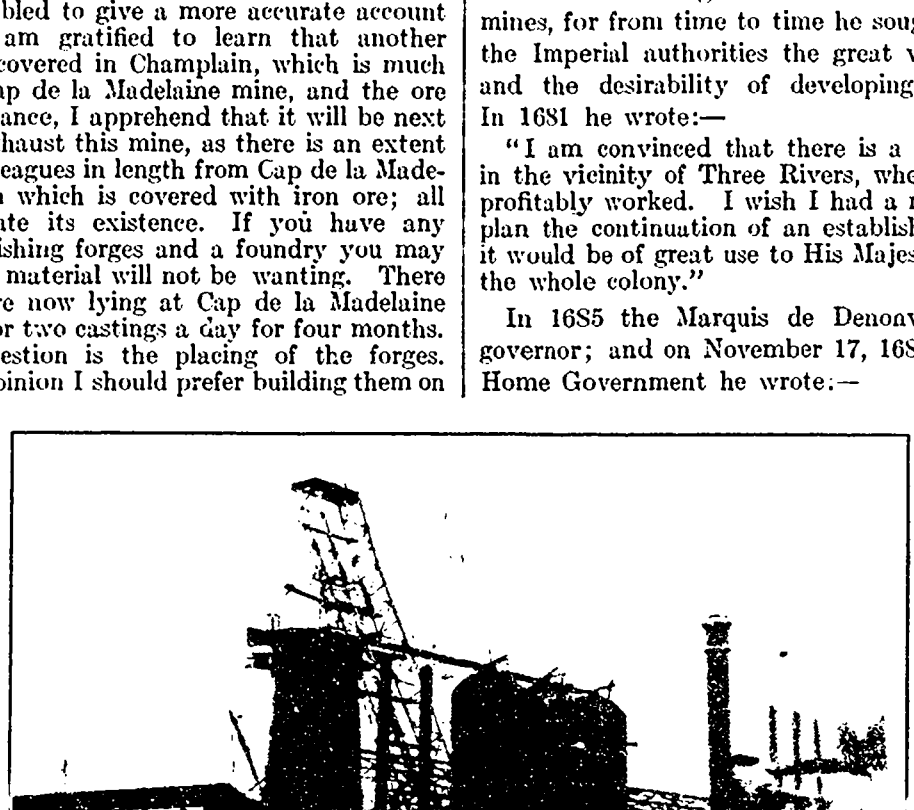
"The iron mine of which I have already spoken is of great consequence. I have visited it myself in order that I may be enabled to give a more accurate account of its nature. I am gratified to learn that another mine has been discovered in Champlain, which is much richer than the Cap de la Madelaine mine, and the ore is in greater abundance, I apprehend that it will be next to impossible to exhaust this mine, as there is an extent of country of four leagues in length from Cap de la Madelaine to Champlain which is covered with iron ore; all the streams indicate its existence. If you have any intention of establishing forges and a foundry you may be certain that the material will not be wanting. There are six piles of ore now lying at Cap de la Madelaine which would last for two castings a day for four months. The important question is the placing of the forges. According to my opinion I should prefer building them on Ruisseau Pepier, which is in Champlain, rather than at the Cape, where the Jesuit Fathers have a mill already in operation. By thus placing the forges they would be between the two mines, and the material could be more easily conveyed from both to the central establishment. When you have decided upon establishing the said forges, as the workmen you will send out will be competent men, they perhaps can decide whether there is enough water in the streams I have mentioned to work the wheel of the projected forges, also to judge whether it would be practicable to bring in other streams in the neighborhood, such as Ruisseau de Hertel, to increase the quantity of water. It is certain that if the forges are once established, many advantages will result to the colony, excellent iron will be manufactured there, and the consumption of fuel will help materially in clearing the forest land. Moreover many men will be employed at the work and a market will be afforded for the surplus provisions which we have at our disposal."

In 1675 the charter of the West India Company was surrendered; and the next official notice of the mines that appears was the issue of a deed in August 1670, in favor of Dame Jeanne Jalope, widow of Maur[illegible] Poulin, Sieur de la Fontaine, the King's Attorney [illegible] Three Rivers, who, by said deed, obtained concessi[illegible] of the Seigneurie of St. Maurice. This lady appears [illegible] turn to have deeded the property to her son, Mich[illegible] Poulin in 1683.

Frontenac had great confidence in the value of th[illegible] mines, for from time to time he sought to impress u[illegible] the Imperial authorities the great value of the dep[illegible] and the desirability of developing an iron indust[illegible] In 1681 he wrote:—

"I am convinced that there is a very fine iron m[illegible] in the vicinity of Three Rivers, where a forge could [illegible] profitably worked. I wish I had a man here who co[illegible] plan the continuation of an establishment of that k[illegible] it would be of great use to His Majesty the King, an[illegible] the whole colony."

In 1685 the Marquis de Denonville was appoi[illegible] governor; and on November 17, 1686, in advices to t[illegible] Home Government he wrote:—



Hamilton Steel and Iron Company's New Furnace in Course of Construction.

"I have this year again had the iron mine near Th[illegible] Rivers thoroughly examined. I am convinced that th[illegible] is a much larger quantity of that metal there than [illegible] colony requires."

La Compagnie des Forges.

The Poulin family seem to have controlled the ore [illegible] and lands, at least in part, until as late as 1736, a[illegible] isting documents show that on October 15, 1736, Po[illegible] and others sold the fief and seigneurie St. Maurice to Fra[illegible] Etienne Cugnet and others. The partnership a[illegible] these purchasers formed was known under the ti[illegible] Cugent et Cie, or "La Compagnie des Forges;" an[illegible] then king of France, Louis XV. by an order in [illegible] dated April 1737, empowered them to establish iron [illegible] and advanced them the sum of 100,000 livres, cla[illegible] neither rent nor taxes. The firm proceeded to ere[illegible] historical St. Maurice blast furnace which Mr. Drum[illegible] says, remains to this day, and over the arch of w[illegible] can yet be seen, on an iron plate, the insignia of F[illegible]

the Fleurs de Lys, together with the date, 1752. The lack of capital led to the failure of the company: and in 1743 the Crown took possession of the furnace, and carried on the work in the name of the king and on his account. Skilled workmen were brought over from France and Sweden to improve the furnace, rebuilding it in part (this in about 1752), and producing the blast furnace as it now stands, with Walloon hearth, in use until as late as 1883.

The next official notice of the forges is mentioned in the articles of capitulation between Major-General Amherst Commander-in-chief of His Britannic Majesty's troops in North America, on the one part, and the Marquis de Vaudreuil, Governor for the king in Canada, or the other side. These articles were dated September 8, 1760. One article says:—

Forges Ceded To British Crown.

"The papers of the Intendancy of the offices of Comptroller of the Marine, of the ancient and new treasures of the king's magazines, of the office of the revenue and forges of St. Maurice, shall remain in the power of Mr. Bigot, the Intendant."

Mr Bigot soon sailed for France, when St. Maurice forges, and all accessories passed into the hands of the British Crown, and belonged thereto until as late as 1846.

Casting Shot And Shell For Seige Of Quebec.

Amongst other matters of historical interest connected with the St Maurice forges, may be mentioned the fact that in 1775 during the American invasion, Pellisier, one of the lessees of the forges aided and abetted the Amer-

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ase

until [illegible] Messrs. George Davidson, David Munro and Matthew Bell. The Hon. Matthew Bell, Seigneur of St. Maurice, renewed the lease with the Government from time to time down to 1846. During his regime the St. Maurice forges were known far and wide throughout the country, not alone as an iron producing centre of first importance to the colony, but also for the princely hospitality extended to visitors by the seigneur.

An Industry Of Supreme Importance.

At this time the iron industry was without doubt the most important of all enterprises in the country, and there was a considerable export of articles of cast iron, principally of stoves. The trade of the St. Maurice forges was evidently of large proportions during Mr. Bell's time. He had, in addition to the furnace, extensive forges, foundries and work shops. From 250 to 300 men were employed, mostly Canadians, the superintendents being mostly English and Scotch. Stoves were the principal articles manufactured; and many of them in many parts of Canada, are in use until this day. Mill machinery, potash kettles and many other articles were also made in large quantities; and beside these bar iron was manufactured both for home consumption and also for export.

On the death of Mr. Bell the crown sold the property, and it was bought at auction by Mr. Henry Stuart, of Montreal, in August, 1846, and was leased by him to Mr. James Ferrier (afterwards Senator Ferrier), who operated the works with much success for four years from 1847 to 1851. Later on the property passed through the hands of Messrs. Stuart and Porter, of Quebec, and thence to the Messrs. McDougall, of Three Rivers, who operated the furnace until as late as 1883 in the production of car

Mr. Robert Hobson, President and Manager of the Hamilton Steel and Iron Co., and Vice-President of the Canadian Manufacturers' Association.

wheels. In 1860 Radnor Forges became the chief seat of the car wheel industry in Canada.

Radnor Forges Constructed.

About 1860 Messrs. Larue & Co., consisting of Messrs. Larue, Turcotte and G B. Hall & Co., after careful investigation made with a view to locating the best point in the St. Maurice district for the erection of a blast furnace and other works, decided upon the site of the present Radnor Forges at the very site foreshadowed by Louis de Buade, Comte de Frontenac, in 1672, as a most desirable location in all that country for the erection of a blast furnace. Messrs. Larue & Co. carried out what, for that time, was a most elaborate plan, and established not only the blast furnace, but forges, rolling mills and a car wheel foundry, the latter at Three Rivers. From 200

to 400 men were employed, the furnace having an output of four tons of charcoal pig iron per day. Some of the car wheels produced at these works are known to have been run 150,000 miles; but better results have been obtained in later years from the same iron. The wrought iron produced at the establishment was used largely for the manufacture of scythes and nail rod iron. Many consumers considered it equal if not superior to the best Swedish iron.

In the establishment of these works over one million of dollars was expended, the greater part of which was lost through disastrous fires.

In 1889 the Radnor Forges property passed into the *possession of the Canada Iron Furnace Co., of Montreal.*

Few persons not intimately connected with the manufacture of iron in Canada have any adequate idea of the extent of the industry, particularly in its primative form. Indeed there is no one in Canada outside of the offices of the Government Statistican at Ottawa who make any pretence to collect and publish such information. It is, however, a task that is most graciously undertaken, and most successfully and acceptably performed by Mr. James M. Swank, manager of the American Iron and Steel Association, Philadelphia, an acknowledged authority on such subjects throughout the world. Mr. Swank informs us that the latest publication he has made of the Canadian iron industry is contained in the following:—

The production of all kinds of pig iron in Canada in 1905 amounted to 468,003 gross tons, against 270,942 tons in 1904, an increase of 197,061 tons, or over 72 per cent. The production in 1905 was much the largest in the history of the Dominion, and exceeded that of 1902, the year of the next largest production, by 148,446 tons, or over 46 per cent.

Statistics Of Production.

The production of basic pig iron in Canada in 1905 amounted to 172,102 tons, against 70,133 tons in 1904, and the production of Bessemer pig iron to 149,203 tons, against 26,016 tons in 1904. Basic iron was made in 1905 by three companies owning six furnaces, and Bessemer iron by two companies owning three furnaces. The basic pig iron was all made with coke for fuel, but the Bessemer pig iron was made with coke alone, charcoal alone, and mixed charcoal and coke. Canada has not made spiegeleism or ferro-manganese since 1899, when small quantities of both metals were produced at Bridgeville, Nova Scotia, by a furnace which has since been abandoned.

The production of malleable Bessemer pig iron in Canada in 1905 amounted to 3,300 tons; foundry pig iron 139,528 tons; forge pig iron, 3,500 tons; and white and mottled and miscellaneous grades of pig iron, including castings made direct from the furnace, 370 tons. Neither ferro-silicon nor ferro-phosphorus was made. The quantity of limestone consumed for fluxing purposes by blast furnaces in Canada in 1905 amounted to 290,310 tons.

The following table gives the total production of all kinds of pig iron in Canada, including spiegeleism ferro-manganese, from 1894 to 1905, in gross tons.

Years	Gross Tons	Years	Gross Tons	Years	Gross Tons
1894...	44,791	1898....	68,755	1902....	319,[illegible]
1895...	37,829	1899....	94,077	1903....	265,[illegible]
1896..	60,030	1900.....	86,090	1904....	270,[illegible]
1897...	53,796	1901....	244,976	1905....	468,[illegible]

On December 31, 1905, Canada had fourteen comple furnaces, of which nine were in blast and five were Of the total ten usually use coke for fuel and four charcoal. In addition, one furnace, to use coke, being built and three coke furnaces were partly erect Work on the latter was suspended some time ago.

The production of all kinds of steel ingots and casti in Canada in 1905 was much the largest in the hist of the Dominion, and exceeded by 221,412 tons that 1902, the year of next largest production, when 1 037 tons were made. As compared with 1904 the incr amounted to 254,665 tons, or over 171 per cent. F semer and open hearth steel ingots and castings w made in both 1904 and 1905, the production of Bess steel amounting to 164,488 tons in 1905, against 42 tons in 1904, and open-hearth steel to 238,681 tons 1905, against 106,046 tons in 1904. Almost all the o hearth steel reported in 1904 and 1905 was made by basic process. The Bessemer steel was all made by acid process. A few hundred tons of steel castings made in 1905 by minor processes. All the steel cast made in 1905 by various processes amounted to 9 tons, against 6,505 tons in 1904. Canada does not m crucible steel ingots or castings.

The following table gives the production of all k of steel ingots and castings in Canada from 1894 to 1 in gross tons:—

Years	Gross Tons	Years	Gross Tons	Years	Gross Tons
1894...	25,685	1898....	21,540	1902....	180,[illegible]
1895...	17,000	1899....	22,000	1903....	181,[illegible]
1896...	16,000	1900....	23,577	1904....	118,[illegible]
1897...	18,400	1901....	26,084	1905....	403,[illegible]

The production of finished rolled iron and s Canada in 1905 was also much larger than in any p year and amounted to 385,826 tons, as compared 180,038 tons in 1904, the year of next largest prod an increase of 205,788 tons, or over 114 per cent.

The following table gives the production of all of finished rolled iron and steel in Canada from 18 1905, in gross tons. Rolled forging blooms and billets are included for 1905.

Years	Gross Tons	Years	Gross Tons	Years	[illegible] Tons
1895....	66,402	1899....	110,642	1903....	2[illegible]
1896....	75,043	1900....	100,690	1904....	[illegible]
1897....	77,021	1901....	112,007	1905....	[illegible]
1898....	90,303	1902....	161,485	.....	

The production of Bessemer steel rails in 1905 a ed to 133,690 gross tons, as compared with 35,1

in 1904; open hearth steel rails, 45,195 tons, against 1,061 tons in 1904.

The production of structural shapes in 1905 was 885 tons, against 447 tons in 1904; nail and spike plate, [illegible]0 tons, against 503 tons in 1904; plates and sheets, 4,944 tons, against 3,102 tons in 1904; all other finished rolled products, excluding muck and scrap bars, blooms, billets, sheet bars, and other unfinished forms, but including for 1905 1,120 tons of forging blooms or billets, 197,002 tons, against 135,243 tons in 1904; total, 385,826 tons, against 180,038 tons in 1904. Of the 385,826 tons of finished iron and steel reported for 1905, about 318,405 tons were rolled from steel and 67,421 tons from iron, as compared with about 126,850 tons rolled from steel and about 53,188 tons rolled from iron in 1904.

In 1905 the rolling mills and steel works in Canada which operated cut nail or wire nail factories produced 366,800 kegs of cut nails and wire nails of 100 pounds each, as compared with 324,000 kegs in 1904.

On December 31, 1905 there were 21 completed rolling mills and steel works in Canada. In addition one plant was being built and two plants were projected. Of the completed plants three were equipped for the manufacture of steel castings only, one for the manufacture of open hearth steel ingots only, five for the manufacture of Bessemer or open hearth ingots and rolled products, and 12 for the manufacture of rolled products only. The building plant was being equipped for the manufacture of black plates and tinplates and terne plates.

Of the 21 completed rolling mills and steel works in Canada on December 31, 1905, four were located in Nova Scotia, five in Quebec, ten in Ontario, one in New Brunswick, and one in Manitoba. The building plant and the two projected plants were also in Ontario.

The production of iron ore in Canada in 1905 amounted to 259,908 gross tons, against 195,577 tons in 1904. The production of coal in 1905 amounted to 7,822,125 gross tons, against 7,370,174 tons in 1904. The coal figures for 1905 are provisional.

Disposition of Bounties.

The following statement shows the disposition of bounties paid by the Dominion Government to the manufacturers of iron and steel during the first nine months of the fiscal year ending March 31, 1907:—

	Pig Iron	Puddled Bars	Steel Ingots	Mfs. of Steel	Totals
Algoma Steel Co., Sault Ste. Marie, Ont....	$104,655.94		$243,636.54		$348,292.48
Dominion Iron and Steel Co., Sydney, N.S..	135,631.23		234,844.28	$298,567.05	699,042.56
Nova Scotia Steel & Coal Co., Sydney Mines, N.S.....	29,006.52		46,557.84	18,146.51	93,710.89
Hamilton Steel & Iron Co., Hamilton, Ont..	53,741.90	$311.66	50,220.47	21,404.22	125,678.25
Canada Iron Furnace Co., Midland, Ont....	23,353.24				23,353.24
Canada Iron Furnace Co., Radnor Forges, Que.....	5,440.11				5,440.11
John McDougall & Co., Drummondville, Que	2,062.58				2,062.58
Deseronto Iron Co., Deseronto, Ont.....	2,598.75				2,598.75
Londonderry Iron & Mining Co., Londonderry, N.S.....	28,505.79				28,505.79
Montreal Rolling Mills, Montreal.....				$81.19	$81.19
Electric Reduction Co., Buckingham, Que...	235.20				235.20
	$385,231.28	$311.66	$575,259.13	$338,998.97	$1,299,801.04

Iron Smelting By Electro-Thermic Process.

The smelting of iron by electricity has been successfully demonstrated, but up to the present time it has not been made a successful commercial venture.

The experiments which had been carried on at Sault Ste. Marie on the electric smelting of iron ore, under the direction of Dr. Heroult, appear to have been more successful than iron and steel metallurgists in general would have anticipated, but it is probable that if commercial results follow they will likely be in the direction of producing material other than ordinary pig iron, and from other than ordinary ores.

The final report to the Canadian Government has not been made. Meanwhile, the authoritative information available regarding the experiments is contained in an address before the Canadian Club by Dr. Eugene Haanel, who, as Dominion Superintendent of Mines, presided over the experiments as the representative of the Canadian government, and Dr. Haanel's preliminary report to the Minister of the Interior.

In the statements thus made there is only a bare reference to the probable cost, this placing it at $10.69 per ton of pig iron. Even the full data, which are not given, could not be relied upon to give an accurate forecast, because the largest single item of expense outside of the ore is the electrical power, amounting to several dollars a ton, and the cost of electrical power cannot be predetermined where, as in this case, very extensive plants must be erected to utilize water power in a comparatively untried region. The experiments of the Soo seem to have indicated a production of 12 tons of pig iron per 1,000 h.p. days. The experiments witnessed in France by the Canadian Commission on Electric Smelting showed for

one set of experiments 5.76 tons per 1,000 h.p. days; for another set, making white iron, however, the showing was 12.12 tons. On the Soo experiments the favorable unit indicated was one of 1,500 h.p., producing about 18 tons per day. If $15.00 per h.p., producing therefor about 18 tons per day. If $15.00 per h.p. year can be done at the Soo, and the Hydro-Electric Power Commission's estimate for Niagara Falls is not much more than half as much, while contracts in Canada have been made at $12.00, the cost per day for 1,500 h.p. would be $61.6?, equal to $3.42 per ton of pig iron if 18 tons are produced per day.

The most important commercial results, however, do not lie in the direction of producing ordinary pig iron from ordinary ores. In the present course of manufacture, pig iron is only an intermediate stage, made necessary by the processes of smelting and subsequent refining which have been adopted. The smelting operation by the blast furnace leaves the pig iron with impurities which must be removed in the steel making. Hopes have been entertained that electric smelting could be so conducted that the intermediate form of pig iron would not be necessary; that, on the contrary, the electric smelting operation would produce steel directly. To ascertain to what extent, if any, such hopes have been borne out by the experiments at the Soo, the final official report must be awaited.

On other important points the information available is more explicit. It was proved that Canadian magnetites can be successfully treated by the electro-thermic process. Doubts have been entertained regarding magnetites, as compared with hematites, on account of the electrical conductivity of the former. It was proved also that ores high in sulphur can be made into pig iron, if not into a higher form of iron, containing only an exceedingly small quantity of sulphur, and that titaniferous iron ores, perhaps up to 5 per cent titanic acid, can be used, as shown by an ore containing 35 per cent. titanic acid producing a pig iron of passable quality as judged by fracture.

Perhaps the most interesting conclusion of all is that roasted nickel-ferro-pyrrhotite can be made into a nickel iron pig practically free from sulphur.

The experiments showed that silicon could be varied at will, and when charcoal made from refuse and peat coke made from peat can be utilized without briquetting with the ore.

"Substantial progress is being made in the manufacture of steel by the various electrical processes," says the Iron Trade Review. "A plant is in operation at Voelklingen, Germany, using a modified Kjellin induction furnace. An interesting feature of this plant is that it uses steel from a basic Bessemer converter. As electric steel making has been prosecuted in the United States, steel from the basic open-hearth furnace has been employed. The principle is the same, the primary operation of melting and partly purifying the material being performed by whatever facilities are most readily available. A list compiled several months ago and probably incomplete showed nineteen electric steel plants in operation or being built in various countries, France leading with six plants. The friends of the different electric steel furnaces claim that a product can be made equal to the best crucible steel, and there is no question that the cost of production is less, with current at a favorable price, as crucible steel making is very expensive."

THE BEGINNINGS OF THE INDUSTRY IN ONTARIO.

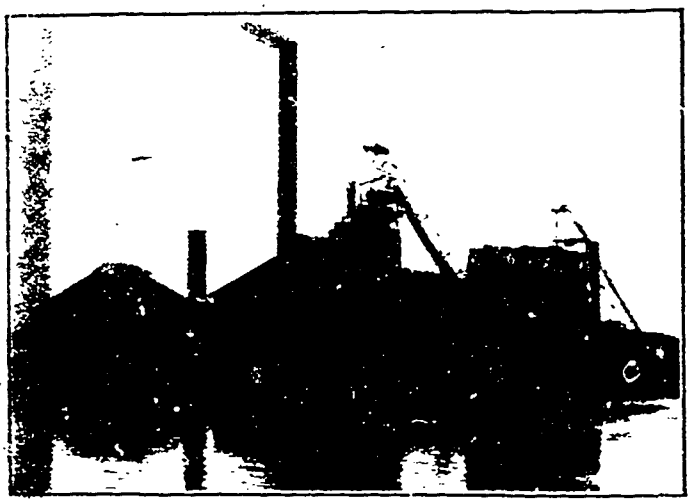
On April 24, 1893, a delegation composed of members of the Canadian Manufacturers' Association waited upon Sir Oliver Mowat, premier, and other members of the Ontario Government, and memoralized him with reference to the granting of some provincial encouragement towards the establishment of the blast furnace industry in Ontario. The delegation was introduced by Mr. J. J. Cassidey, secretary of the Association. The memorial was as follows:—

The Canadian Manufacturers' Association beg to represent to you that the membership of their Association is composed of persons engaged in a great diversity of manufacturing industries carried on in all parts of Canada. Those of them doing business in Ontario are particularly desirous of seeing the province enjoying the very highest degree of prosperity. They feel that the prosperity of the industries in which the people may be engaged, both agricultural and mechanical, is dependent in a greater or less degree upon the prosperity of all the other industries; that if prosperity attends the efforts of any class or section of the community, it will certainly favorably affect all classes; and they believe that the greater the number of industries in which the people may be employed, the greater the prospects for the general prosperity.

The Association observe with very much pleasure the interest that has been awakened, and the efforts that are being made, looking to the establishment of an iron furnace industry in Ontario. Many of the members of this Association, are workers in iron. They are manufacturers of machines and machinery composed wholly or in part of iron; and whatever may in any manner relate to the iron question affects them. They believe that in all our manufacturing industries it is desirable that wherever possible the raw materials which they consume should be produced in the country. And this applies specially to pig iron. This article is the foundation of an almost endless variety of articles which enter into the every day use of the people, or is essential in the production of them. It may be that our manufacturers have not yet undertaken the production of some special forms of iron, such as fine cutlery, surgical instruments, steel rails, etc., but in many other lines, such as agricultural implements, steam engines and boilers, iron-working machinery, wood-working machinery, etc., they have achieved most gratifying success. But there is a drawback in conducting these manufacturing enterprises, which consists in the fact that not one pound of the iron that enters into the manufacture of these products is made in Ontario and but a very small proportion in Canada. With practically inexhaustible supplies of rich ore within our borders; and with surroundings eminently calculated to conduce to the success of the enterprise, no pig iron has ever been smelted in this Province. The object of this delegation waiting upon you at this time is to ask that whatever the Ontario Government can do towards encouraging the establishment of a blast furnace industry be done.

It is well to bear in mind that although for many years the Dominion Government have imposed a duty of $4 per ton on imported pig iron, and have also been

a bonus of $2 per ton upon such iron as has been made in the country, yet the stimulus has failed to induce capitalists to erect and operate any blast furnaces in Ontario. Since the adoption of this policy sufficient time has elapsed in which to thoroughly investigate the possibilities; and it is well known that such investigation has been made repeatedly; and the conclusion is forced that if Ontario is ever to have a blast furnace industry, it can only be made to materialize under different circumstances than those which now prevail.



ATIKOKAN IRON CO. AT PORT ARTHUR, ONT.—POWER HOUSE AND BLAST FURNACE.

And here it may be proper to enquire why the inducements offered by the Dominion Government have not been sufficient to establish a large pig iron industry in Canada—in Ontario; what else may be done to affect it, and who shall do it. We know that Ontario possesses vast stores of valuable ores; that they are easily worked; and some of them are now quite accessible, and that others of them could be cheaply and easily marketed by the expenditure of certain sums of money in extending our railroad facilities; that material for charcoal is abundant and contiguous to the most desirable locations for blast furnaces; that unlimited supplies of limestone are also in close proximity to such locations, and that there is a steady and reliable demand for all the charcoal pig iron that is likely to be produced for a number of years under the most advantageous circumstances. We also know that our existing railroad facilities are such that where it is desired to manufacture coke iron, the fuel can be laid down at the furnace quite as cheaply as at many of the most successful furnaces in the United States, and cheaper in some instances.

We are confronted with the fact that the tariff imposes a duty of $4 per ton on pig iron; that there is a Dominion bounty of $2 per ton; that ores, fuel and fluxes are accessible and cheap, that there is a demand for iron, and that, notwithstanding these, we have no blast furnace industry. On the other hand, we know that capital is conservative and timid, and we cannot hope to see it invested in blast furnaces and steel plants in Canada without a certainty that the circumstances under which it is invested will not be unfavorably unchanged, at least for a time sufficiently long to give a guarantee of the remuneration to which it is entitled.

It is the uncertainty that has always surrounded the question that has been a salient factor in preventing the investment of capital in the blast furnace industry in Ontario. Many students of the question are of the opinion that an additional bonus should be offered as an inducement to capitalists to embark in the business; but an equally important consideration with them is the continuance of the time during which these inducements will be continued. It will not be satisfactory to them to remain in darkness on this most important point. They must know not only how much inducement is offered, but also how long it will be continued. Unlike banking, and similar monetary transactions, where capital can be called in and quickly transferred to another country if necessary; or unlike merchandising, where goods may be disposed of and the proceeds thereof under immediate control, when capital is invested in such an enterprise as a blast furnace it will be an almost total loss unless the works can be operated vigorously and continuously for a number of years. If, then, any encouragement is offered for the establishment of such an enterprise if a bonus is promised on the production of pig iron, it should be accompanied with a guarantee that it will be continued for a definite term of years. A consensus of opinion shows that if the Ontario Government should deem it wise to aid in the establishment of this industry the bonus should be $2 per ton upon the production of pig iron, and it should be continued for the term of ten years.

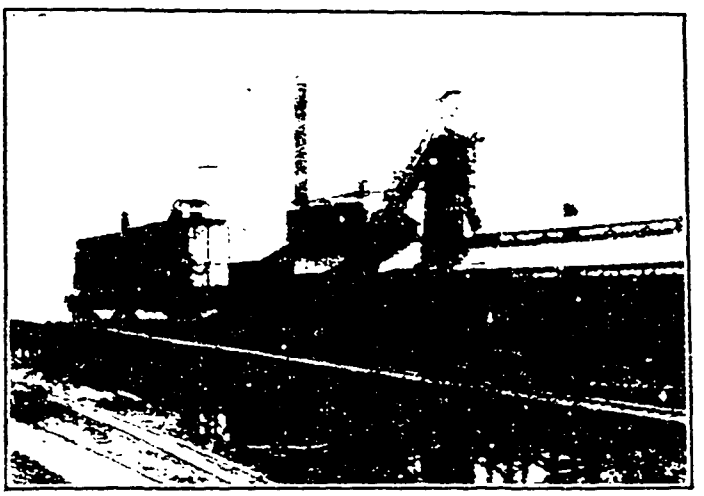
ONTARIO GOVERNMENT OFFERS A BONUS.

The Ontario Government took very prompt action in the matter, offered the bonus requested, with the result of the establishing of the blast furnaces that have since been built in Ontario.

Previous efforts had been made to establish the industry in the province. The second annual report of the Ontario Bureau of Mines contains allusions to the earlier efforts of making pig iron in the province.

THE FIRST FURNACE IN ONTARIO.

The first blast furnace in Ontario was constructed about the year 1800 at the falls of the Gananoque river, where a forge was also started up for the manufacture of bar iron. Owing to the poor ores used, and high cost of assembling materials, the works were abandoned after running two years.



ATIKOKAN IRON CO.—ROASTING KILNS WITH FURNACE IN BACKGROUND.

Twenty years later, in Charlotteville Township, Norfolk County, a furnace was constructed and was successfully operated for some twenty-five years until the immediate supply of bog ore became exhausted.

Mr. Van Norman, one of the promoters of the Charlotteville works started another furnace in Houghton town-

ship in 1854, the main object being to supply the Great Western Railway with iron for car wheels, but the product proving unsuitable, the furnace was blown out.

In 1820 a furnace plant was erected at Marmora to smelt the magnetite ores of that district. During the course of some forty years, although lying idle for most of the time, it ruined or crippled three or four successive owners. In 1837 the plant which consisted of two stacks with a common cast house, forge for making wrought iron, stock house, saw and grist mill, blacksmith shop, store, dwellings, etc., was offered for sale to the Government for the sum of £25,000, including lands, the idea being to remove the penitentiary from Kingston to Marmora, and to employ convict labor at the work. The scheme fell through and nothing further was done until 1847, when Mr. Van Norman, of the Charlotte furnace, purchased the property, but want of experience in smelting the magnetite ores again resulted in failure.

THE DOMINION IRON AND [illegible]

At Olinda, in Essex county, a furnace was started up in 1831 to smelt the bog ores of Colchester and Gosfield townships. It was operated about six years, and was closed down for want of funds.

In 1836-37 a furnace was built at Madoc which was operated for some nine years.

THE FIRST ONTARIO FURNACE ON A LARGE SCALE.

During the past forty or more years sundry attempts have been made to start blast furnaces and smelting iron in Ontario, but no satisfactory result was ever arrived at until the starting up of the furnaces of the Hamilton Steel and Iron Co. at Hamilton.

In 1864 the old Western Railway Co erected a mill at Hamilton for the purpose of re-rolling iron rails. This mill was in operation until 1871, when in consequence of the introduction of steel rails, the re-rolling of iron rails was discontinued. The mill remained idle until 1879 when Aaron Wilcox, Richard Brown, Peter Hitchcock and Augustus Fuller, of Cleveland, Ohio, under the name of the Ontario Rolling Mills Co., leased the plant from the Great Western Railway Co. and started it up as a merchant bar mill. The Ontario Rolling Mill Co. was one of the first enterprises brought about by the National Policy. Some years later Mr. James Walker, and others, under the name of the Hamilton Iron Forging Co., started a forge plant and small rolling mill alongside of the Ontario Rolling Mill Co.'s works. When the Iron Forging Co. got into financial difficulties in 1890, the Ontario Rolling Mill Co. bought them out.

In 1896 the Hamilton Blast Furnace Co. blew in the first blast furnace in the province of Ontario. The prime movers in the establishment of this furnace were a number of Americans whose attention was attracted to Hamilton by John Patterson, the father of the Hamilton Cataract Power Co. Shortly before the construction of the furnace was completed the Americans ran short of money, and a few Hamilton gentlemen, headed by the late Senator Wood, Mr. John Milne and Mr. John Tilden came to the rescue and carried the project through.

In the spring of 1899 the Hamilton Blast Furnace Co. and the Ontario Rolling Mill Co. amalgamated under the name of the Hamilton Steel and Iron Co., Limited. At the time of the fusion, the plant consisted of:—

(a) One blast furnace with a capacity of 150 tons per day.

(b) Two mills with 5 trains of rolls (14 inch muck and 10 inch guide, 20 inch bar and 20 inch plate), 2 busheling furnaces, 4 double puddling furnaces and 9 coal heating furnaces.

(c) Forge plant with four steam hammers with necessary lathes for rough turning forgings.

Immediately the new company took control, changes were made in the blast furnace so as to increase its capacity to 200 tons per day. An open hearth steel plant with two 15 ton furnaces was built, and another rolling mill with two trains of rolls (10 inch and 14 inch) was erected, and since that time the two 15 ton open hearth furnaces have been enlarged and two 30 ton furnaces have been added, and a second blast furnace with a capacity of 300 tons of foundry iron per day has been put into operation. The company has now a producing

pacity of about 180,000 gross tons of pig iron per year, 100,000 net tons of steel ingots and 90,000 to 100,000 tons of rolled iron and steel bars; besides washers, forgings, steam and electric railway car axles and track spikes.

The First Steel Rail Made In Canada.

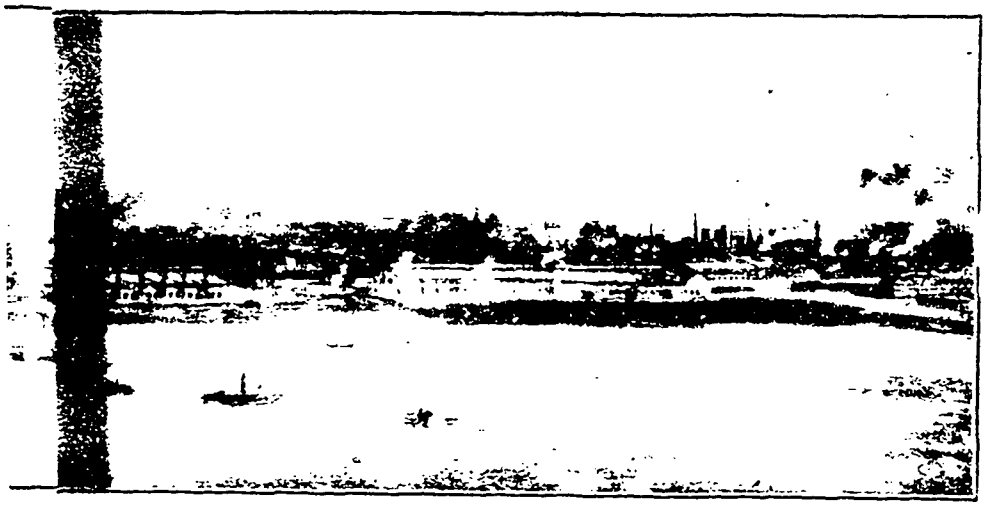
For many long years The Canadian Manufacturer has done all it could to create sentiment and circumstances which would result in the manufacture of steel rails in Canada; and it had pleasure in announcing in its issue of March 21, 1902, that the Algoma Steel Co., of Sault Ste. Marie, Ont., had begun the manufacture of Bessemer steel rails. This was the first time in the history of Canada that steel rails had been produced in the country, and this was the first journal that ever contained an advertisement to that effect. The first steel rail ever made in Canada was rolled at the mills of the Algoma Steel Co., at Sault Ste. Marie, Ontario, in March 1902. Soon after this event the manufacturing of steel

Year ended June 30	Pig Iron	Puddled Bars	Steel	Mfrs. of Steel	Total
1902..	693,108	20,550	77,431		791,639
1903..	619,949	6,702	775,154		1,401,805
1904..	533,982	11,669	347,990	15,321	908,962
1905..	624,667	7,895	614,433	293,209	1,540,204
1906	687,632	51,875	941,000	369,832	2,050,339
March 31					
1907 (9 mos.)	385,231	312	575,259	338,999	1,299,801
	$4,721,730	$113,674	$3,714,648	$1,017,361	

Rates of Bounties.

Following are the rates of bounties payable by the Dominion Government under statute upon various forms of iron and steel for the calendar years as under:—

	1907	1908	1909	1910
Pig iron, Canadian, per ton....	$2.10	$2.10	$1.70	$0.90
Pig iron, foreign.....	1 10	1.10	0.70	0.40
Puddled bars.....	1.65	1.65	1.05	0.60
Steel ingots.....	1.65	1.65	1.05	0.60
Steel Wire Rods.....	6.00	6.00	6.00	6.00
*Pig iron by Electric Process..			2.10	2.10
*Steel by Electric Process....			1.65	1.65



...at Sydney, N. S.

rails was begun at the works of the Dominion Iron & Steel Co., at Sydney, N.S., they also began the rolling of steel rails; and both these works have been in successful operation ever since.

Hon. W. S. Fielding, Minister of Finance, in introducing his tariff resolutions in the Dominion House of Commons on April 16, 1903, announced that steel rails, until that time free, would be subject to a duty of $7 per ton.

Bounties.

The following statement shows the bounties paid by the Dominion Government on pig iron, puddled iron bars, steel and manufactures of steel during each of the fiscal years as under:—

Year ended June 30	Pig Iron	Puddled Bars	Steel	Mfrs. of Steel	Total
1895..	$63,384				$63,384
1896..	104,105	$5,611	$59,499		169,215
1897..	66,509	3,019	17,366		86,894
1898..	165,654	7,706	67,454		240,814
1899..	187,951	17,511	74,644		280,109
1900..	238,296	10,121	64,360		312,777
1901..	351,259	16,703	100,058		467,920

...ar ended to December 31, 1902.

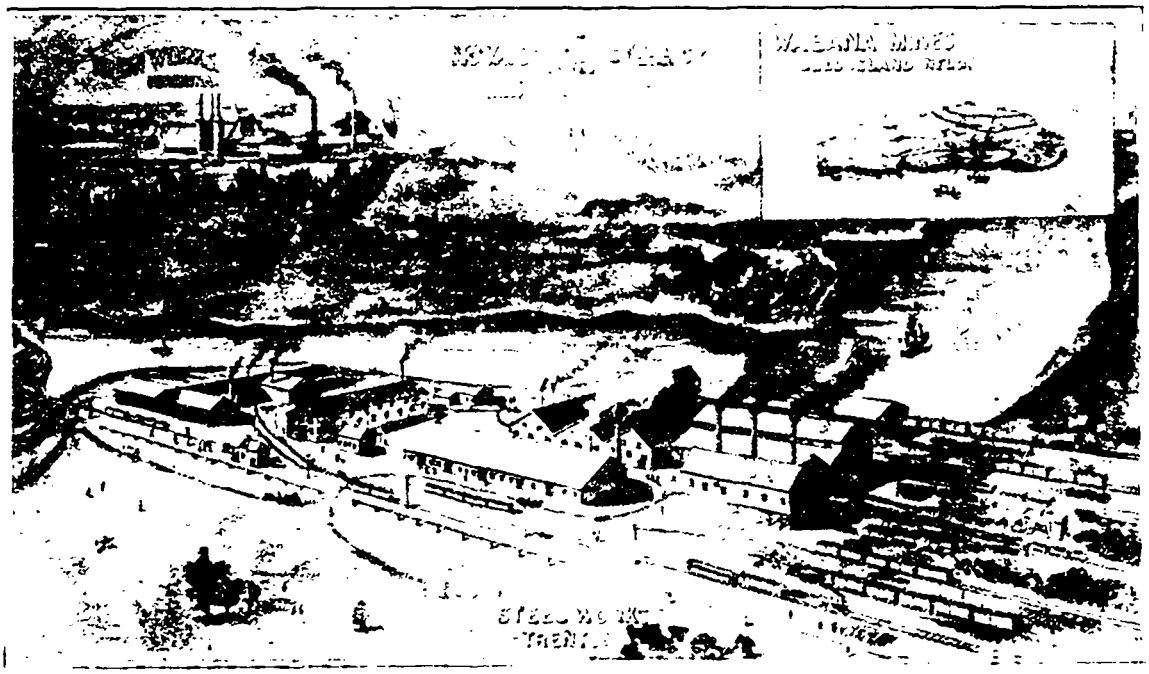
The Industry Firmly Established In Canada.

Canadian Manufacturer, January 3, 1896, published the following from Iron and Coal Trade Review:

Under the lee of a big demand which keeps up in the United States, the manufacturers of Canadian iron are doing a good business. Beyond question the present season is the best one the Nova Scotia furnace men have ever had. In their early days they were kept back by the competition of British iron which was often carried as ballast across the Atlantic. When at last the British iron began to gain ground in the interior, especially in Ontario, it was not before the Nova Scotia brands they retreated. A new competitor of the latter, United States iron, was capturing the Ontario market. With American iron in Ontario and British iron to struggle against in Quebec and the Maritime Provinces, the Nova Scotia iron industry found the problem of existence hard enough. Finally British iron practically withdrew. Then a more spirited contest was made with American iron by New Glasgow, Londonderry and Fernie furnaces, which having captured the Montreal trade from the British-

were in a better position to dispute that of Ontario with the United States. But the extraordinary depression at that time in American iron prices told against the Nova Scotians. At last prices went up in the United States. All iron made there was wanted at home at good prices. The American iron withdrew, and though stocks in Ontario were full when the advance came these stocks were soon run down and made room for the absorption of thousands of tons of the home article.

Writing on the general subject of iron ore, the Iron Trade Review says:—"In the proportion of iron ore production to production of pig iron in 1906 there is no evidence of any material decrease in the average iron content of the ores mined, as compared with immediately preceding years. Dividing the iron-ore production in 1906 by the pig-iron production gives a quotient of 1.887, approximately the number of tons of iron ore per ton of pig iron; the quotient in 1905 was 1.850, while taking the production of the five years 1900-04, inclusive, the quotient comes out 1.886, substantially the same as that for 1906. In 1890 it was 1.742 and in 1895 it was 1.689. There was a decrease, as in 1895 the richer Lake Superior ores were making their way to the relative exclusion of lower grade ores in various parts of the country. The increase in ore per ton of pig iron from 1895 to the years of the present century shows the increase in the mining of Lake Superior ores in the direction of lower grade ores. Much has been said lately about the decreasing content of Lake Superior ores and it is interesting to note that statistics for as late a year as 1906 do not tell any story upon this subject."



Works of Nova Scotia Steel and Coal Company, New Glasgow, N. S.

Output of Iron Ore, Pig Iron and Steel in Certain Countries.

The following particulars of the output of iron ore, pig iron and steel in the principal producing countries of the world are extracted from a return relating to iron and steel recently issued by the British Board of Trade.

The total output of iron ore in the world probably amounted in 1905 to about 114 million tons, the principal producers being the United States, Germany, the United Kingdom, and Spain, in the order given, these countries accounting for about 78 per cent. of the total output of the world. From the figures available for 1906 it is estimated that the world's output amounted to about 12[illegible] million tons.

The following statement shows the total output of iron ore in the principal countries in which it is mined, or in which the smelting of iron is an important industry in the years 1904 and 1905, figures for 1906 being added where such are available:—

Production of Iron Ore.

Country	1904	1905	1906
	Tons	Tons	Tons
United States	27,644,000	42,526,000	49,670,000
Germany	21,693,000	23,067,000	26,305,000
United Kingdom	13,774,000	14,591,000	15,500,000
Spain	7,837,000	8,931,000	9,982,000
France	6,910,000	7,276,000	not
Russia	5,187,000	6,400,000	availa[illegible]
Sweden	4,019,000	4,295,000	4,429,000
Austria-Hungary	5,191,000	3,518,000	4,085,000
Belgium	204,000	175,000	197,000

Over three million tons of iron ore are produced in countries other than those given above, the greater part of which is destined for exportation. The following statement shows the quantity produced in a few of the more important of these countries in each of the years 1903-5:

Country	1903	1904	1905
	Tons	Tons	Tons
Newfoundland	589,000	590,000	640
Canada	236,000	196,000	250
Italy	373,000	403,000	361
Greece	523,000	415,000	458

The total quantity of pig iron produced in the world in 1905 probably amounted to about 53½ million tons, the principal producers being the United States, Germany, and the United Kingdom in the order named, the three countries together accounting for about four-fifths of the total output of the world. Preliminary figures so far available for 1906 indicate a production not far short of 58½ million tons.

The following statement shows the total output of pig iron in the principal producing countries in the years 1904-1906. The figures given include in some cases a small quantity of castings obtained directly from the blast furnaces:—

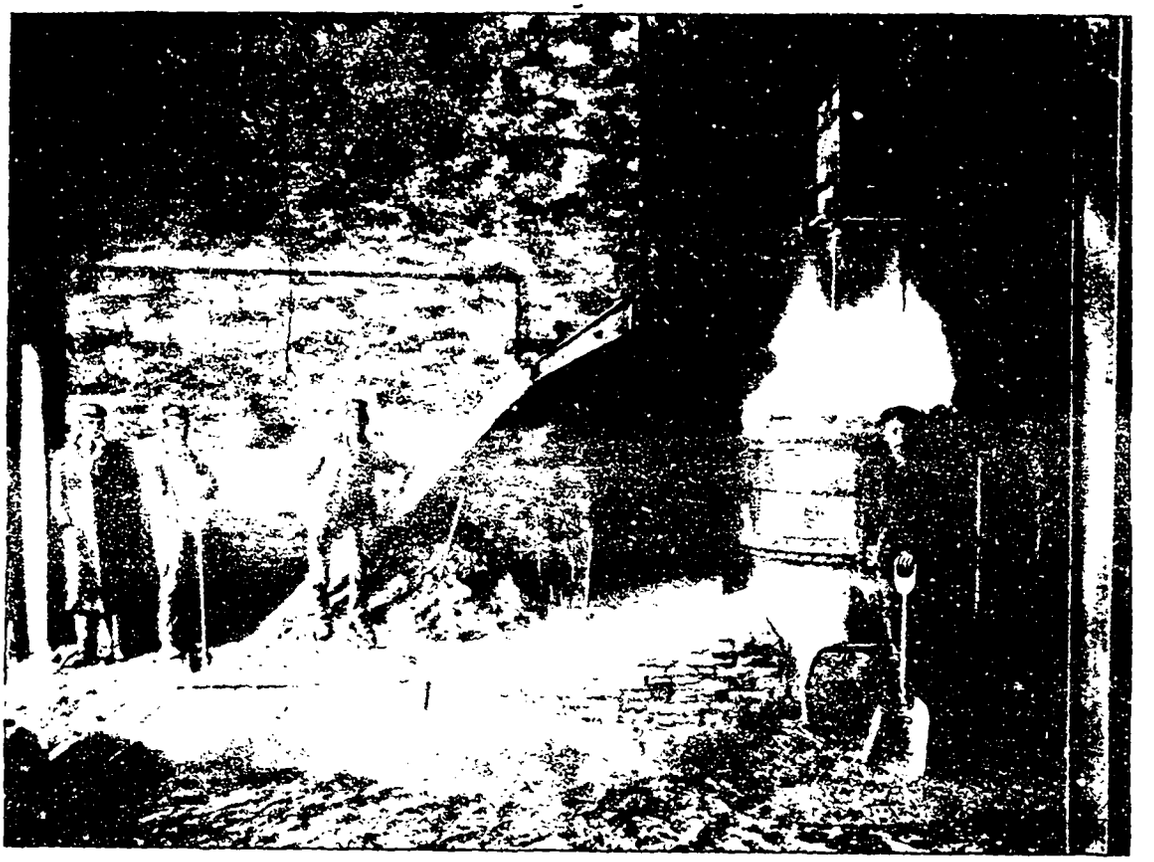
PRODUCTION OF PIG-IRON.

Country	1904	1905	1906
	Tons	Tons	Tons
United States	16,497,000	22,992,000	25,307,000*
Germany	9,896,000	10,700,000	12,096,000*
United Kingdom	8,694,000	9,608,000	10,149,000*
France	2,926,000	3,028,000	3,266,000*
Russia	2,930,000	2,660,000	2,619,000*
Austria-Hungary	1,354,000	1,516,000	1,650,000*
Belgium	1,262,090	1,289,000	1,408,000*
Sweden	520,000	531,000	595,000
Spain	380,000	387,000	373,000*

Very little pig iron is produced in any of the countries not included in the tables. Some reference may be made however, to the production in Canada, which has increased considerably in the last decade. The figures for the three last years were 271,000 tons in 1904, 471,000 tons in 1905, and 534,000 tons in 1906.

At the present time the greater proportion of the pig iron consumed is utilized in the production of steel, the use of steel having increased very markedly in recent years. The total steel production of the world in 1905 may be put at about 43,000,000 tons, and that for 1906 at nearly 49,500,000 tons.

The following statement shows the quantity of steel produced in the years 1904-5, figures for 1906 being given where such are available, in the countries for which similar information is given with regard to pig iron:—



ELECTRIC FURNACE JUST AFTER METAL HAS BEEN TAPPED—FROM OFFICIAL REPORT OF EXPERIMENTS MADE BY DR. EUGENE HAANEL, SUPERINTENDENT OF MINES, CANADIAN GOVERNMENT.

PRODUCTION OF STEEL.

Country	1904	1905	1906
	Tons	Tons	Tons
United States	13,860,000	20,024,000	23,365,000*
Germany	8,786,000	9,905,000	10,956,000*
United Kingdom	5,027,000	5,812,000	6,462,000
France	2,054,000	2,204,000	2,333,000*
Russia	2,711,000	1,623,000*	1,735,000*
Belgium	1,502,000	1,638,000	Not available
Austria-Hungary	1,176,000	1,169,000	1,176,000*
Sweden	327,000	362,000	391,000
Spain	191,000	234,000	254,000

*Provisional figures.

Ever since the United States adopted the policy of tariff protection to the manufacturing industries, the production of pig iron, in common with all the other forms of iron and steel has been phenomenal. In 1854 the production of pig iron there amounted to only 736,218

net tons. In 1864 the output was 1,135,996 net tons. In 1874 it was 2,689,413 net tons. In 1884 it was 4,589,813 net tons, and in 1890 the production was 10,307,028 net tons. In 1904 it amounted to 16,497,033 gross tons and which was increased in 1905 to 22,922,380 gross tons: and in regard to all other forms of iron and steel, the advance in production was in similar proportion.

The total production of pig iron in Great Britain in 1905 amounted to 9,592,737 tons, which was the largest in the history of the United Kingdom, exceeding by 171,302 tons that of 1899, when, according to the British Blue Book, 9,421,435 tons were made.

In 1905 the production of pig iron in Germany and Luxemburg amounted to 10,987,623 metric tons, as compared with 10,103,941 tons in 1904, an increase of 883,682 tons.

In France in 1905 the production of pig iron amounted to 3,076,550 metric tons, against 2,974,042 tons in 1904, an increase of 102,508 tons.

The production of pig iron in Italy in 1904 amounted to 89,340 metric tons, as compared with 75,279 tons in 1903, an increase of 14,061 tons.

The production of pig iron in Belgium in 1905 amounted to 1,310,290 metric tons, as compared with 1,283,190 tons in 1904, an increase of 27,100 tons.

The production of pig iron in Russia and Finland in 1904 amounted to 2,978,325 tons against 2,486,610 tons in 1903, an increase of 491,715 tons.

The Industry In Great Britain.

The history of the British iron industry dates back to the days of the Roman occupation. From those days down to the middle of the 17th century the furnaces and forge of England were operated altogether with charcoal as fuel. Aided by the protection of the industry inaugurated by Edward III. during his reign from 1327 to 1377 it made good progress, and in the 14th century the ironsmiths of England had brought the trade to a fine art, laying the foundation of the present industrial pre-eminence which that country yet retains.

In 1740 the production of pig iron in Great Britain amounted to only 17,350 tons, the industry having been badly injured by the decreasing supply of charcoal. About 1750 mineral coal came into use as a substitute for charcoal, and the event marked the revival of the trade in England and Wales, while that of Scotland was actually created by the new fuel.

In 1787 the British Government adopted a strong protective tariff for her iron industries, the duty on pig iron being placed in that year at 67s2d per ton, with higher rates for other manufactures of iron. These duties were increased in 1819, and again in 1825, and the protection was maintained down to the year 1845.

Under protection the production of pig iron in Great Britain in 1820 amounted to 400,000 tons; in 1825 to 581,367 tons; in 1840 to 1,396,400 tons, and in 1854 to 3,069,838 tons. This quantity being then estimated at fully one half of the world's production of pig iron. In 1889 the production had reached 9,321,563 tons, which, with a population estimated at 38,000,000 people, gave a per capita production of 495 pounds, 250 pounds of which went into consumption in the manufacturing of the country, while the balance went into the export trade.

In considering the progress made in the iron industry during this period of protection, it is well to remember the various Acts of the British Parliament to protect her iron industry in all its branches by preventing the emigration of her skilled artisans to other countries, by legislating against the sale of inventions to competitors, and by the imposition of custom duties upon foreign products.

For instance, while the growing scarcity of wood for the supply of charcoal convinced the Government and people of England, as early as 1750 (before mineral fuel had come into use), that it would be to their advantage to allow the free admission of iron in its rudest form from the American Colonies, and that as a matter of fact they passed an Act, in that year, setting forth that it would be of great advantage not only to the colonies, but also to the kingdom, that the manufacturers of England should be supplied with pig and bar iron from the colonies free of duty, yet they so fully believed in protecting their own home industries, that the same Act that made the rudest forms of iron free of duty (because England was unable to produce the material herself), contained the following clause:—

"That pig and bar iron made in His Majesty's colonies in America may be further manufactured in this kingdom, be it further enacted . . . . that from and after the twenty-fourth day of June, one thousand seven hundred and fifty, no mill or other engine for slitting or rolling of iron, or any plating forge to work with a tilt hammer, or any furnace for making steel, shall be erected, or after such erection continued in any of His Majesty's colonies in America; and if any person or persons shall erect, or cause to be erected, or after such erection continue, or cause to be continued, in any of the said colonies, any such mill, engine, forge or furnace, shall forfeit the sum of two hundred pounds of lawful money of Great Britain, and it is hereby further enacted . . . . . that every such mill, engine, forge or furnace, so erected, or continued contrary to the directions of this Act shall be deemed a common nuisance, etc., etc."

By the Act in question Great Britain undoubtedly encouraged the production of pig and bar iron in America by exempting them from duties to which like commodities were subject when imported from any other country, but she did this simply because she had not until that date found a fuel substitute for charcoal. A glance at the Act will moreover show that she imposed an absolute prohibition upon the erection of steel furnaces and slitting mills in any of her American colonies.

Various other restrictive Acts of Parliament were passed in 1781, 1782, 1785 and 1795 to prevent the exportation to foreign countries of machinery and tools used in the manufacture of iron and steel, and to prevent skilled mechanics from leaving England.

Ingenious Penalties To Protect Iron Industry In Great Britain.

For example, an Act in 1785, 25 Geo. III., c. 67: To prevent, under severe penalties, the enticing of artificers

or workmen in the iron and steel manufactures out of the kingdom, and the exportation of any tools used in these branches to any place beyond the seas."

The penalty provided in this Act reads:

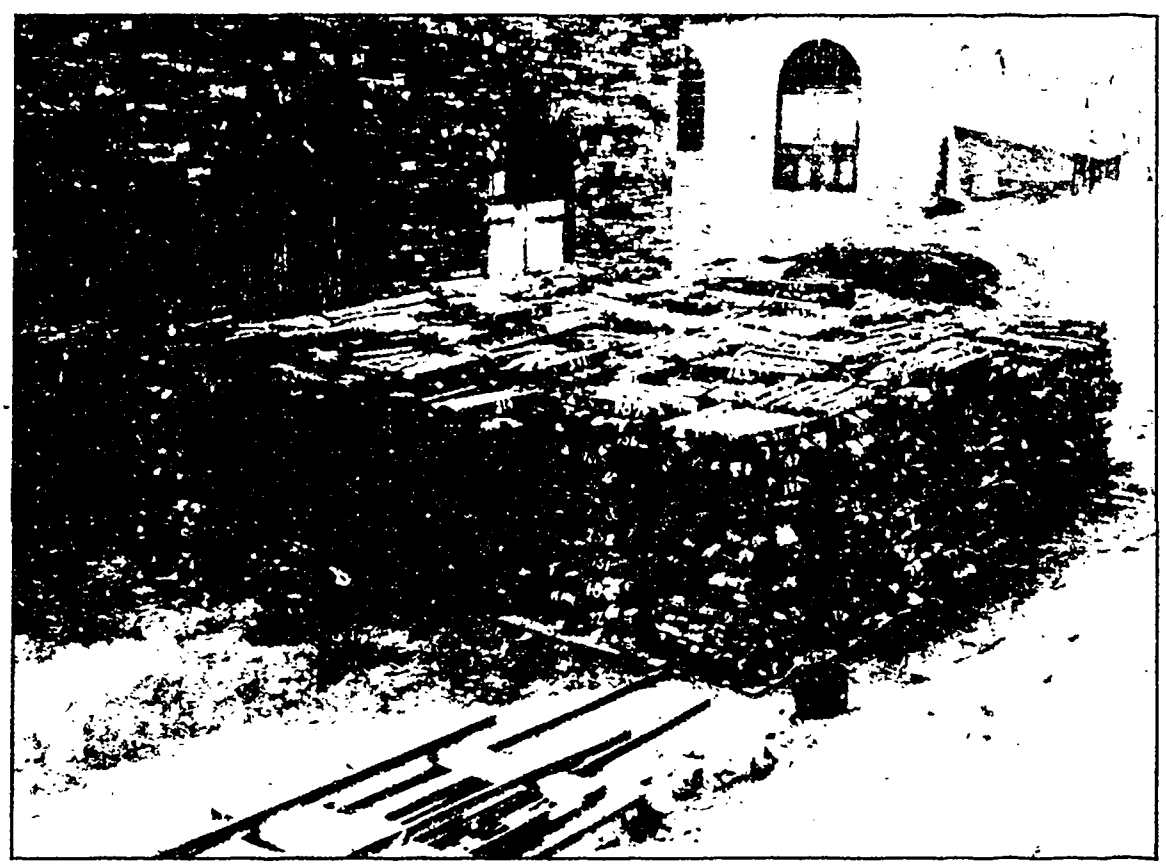
"If any person or persons shall contract with, entice, persuade, or endeavor to seduce, or encourage, any artificer or workman concerned or employed, or who shall have worked at, or been employed in the iron or steel manufactures in this kingdom, or in making or preparing any tools or utensils for such manufactory, to go out of Great Britain to any parts beyond the seas (except to Ireland), and shall be convicted thereof . . . . shall for every artificer so contracted with, enticed, persuaded, encouraged or seduced, or attempted so to be, forfeit and pay the sum of five thousand pounds of lawful money of Great Britain, and shall be committed to the common gaol . . . there to remain without bail or mainprize for the space of twelve calendar months, and until such forfeiture shall be paid; and in case of a subsequent offence shall upon a like conviction, forfeit and pay for every person so contracted with, enticed, persuaded, encouraged or seduced, or attempted so to be, the sum of one thousand pounds . . . . and shall be committed to the common gaol, as aforesaid, there to remain without bail or mainprize for and during the term of two years, and until such forfeiture shall be paid."

In addition to these restrictive measures, a glance at the protection afforded to the British manufacturers of iron from 1782 to the close of 1825, will demonstrate to Canadians the fact that England owes her greatness in the iron industry very largely indeed to the protection granted to her native industries in the early years of the trade.

Quoting from Scrivenor's History of the Iron Trade:—

"From 1782 to 1795 the duty on foreign bars was £2 16 2 per ton. It rose to £3 4 7 in 1797. From 1798 to 1802 it was £3 15 5. In two years it had got to £4 17 1, and from 1806 to 1808 it stood at £5 7 5¾. In the three years between 1809 and 1812 it was £5 9 10, and in the five years ending with 1818 it had been £6 9s. 10d.

"At this date a distinction was made in the interests of British shipping, for whilst thenceforward till the close of 1825, the duty on foreign bars was £6 10s if imported in British ships, it was £7 18 6 if imported in foreign ships. Nor was this all: iron slit, or hammered into rods, or iron drawn down, or hammered, less than three-quarters of an inch square, was made to pay a duty of the rate of £20 per ton; wrought iron, not otherwise enumerated, was taxed with a payment of £50 for every £100 worth imported; and steel, or manufactures of steel, were similarly loaded with a fifty per cent. duty."



FERRO-NICKEL PIG PRODUCED BY THE LAKE SUPERIOR CORPORATION DURING APRIL-JULY, 1906 (163 TONS)—FROM OFFICIAL REPORT OF EXPERIMENTS MADE BY DR. EUGENE HAANEL, SUPERINTENDENT OF MINES, CANADIAN GOVERNMENT.

Prof. James Mavor of the University of Toronto, quoting from Conrad's Handworterbuch der Staats Wissenschafter, and also from various other authorities, gives the following data in regard to the duties imposed at various times by Great Britain, in the interest of her iron industry. He says.—

"The duty imposed on pig iron in 1787 was 67s. 2d per ton. Duty increased 1819 to 130s. per ton on pig iron. Duty raised 1825 by 10s per ton. Duty altered 1842 25% ad valorem on pig iron. Duty abolished 1845

"Duty on manufactured iron altered 1845, 15% on manufactured iron and steel, this subsequently reduced to 10%. Duty on iron wholly abolished 1860."

Among other measures quoted by this authority are special rates for carrying coals to iron works, embodied in the earlier railway acts.

The period of protection by high customs duties extended from 1787 until 1860, giving to the iron industry protection of a permanent character for upwards of 73 years.

The restrictive measures cited, although they were in many cases harsh, undoubtedly resulted in building up an industry of great value not only to Great Britain, but to the world at large.

EDITORIAL NOTES.

In a recent discussion in the German Reichstag, Herr Bobel, the Socialist leader, called attention to the condition in the country, and declared this indicated that a crisis was at hand. He said the unemployed in Berlin already numbered between 30,000 and 40,000, and that official enquiry made among the teachers in the public schools of Berlin showed that the number of children who never got a dinner had risen to 4,841, while a large number of children have only bread and coffee for dinner.

Steps were taken at a recent meeting of the engine and boiler section of the Canadian Manufacturers' Association to have a uniform boiler construction act passed for all the provinces of the Dominion. For this purpose the association will obtain all the copies possible of legislation on this matter in vogue in all the countries of the world and draft a measure for submission to the Dominion Parliament in the near future. At present the different provinces have their own acts, which in some regards vary considerably. This causes difficulties for the manufacturer, as well as the purchaser. The lack of uniformity in the laws necessitates the building of boilers according to different specifications, causing sometimes delay in the delivery of orders, and possibly making it more expensive to construct them.

The proper handling of the situation by the Canadian Government should result in transferring the entire paper industry to Canada, for, as we have a monopoly of the raw material, we can command a monopoly of its manufacture. Thus, we will get work for Canadian workingmen and profits for Canadian capital and prestige for the Canadian name, and all by the perfectly legitimate use of our natural advantages. Other industries depending upon the forest for their raw material should be in much the same position. We ought gradually to get the bulk of them. It will pay them better to manufacture near the "mine" and ship only the finished products to the American cities than to carry the bulky raw material, with all its waste, to their "plants," scattered throughout the Union. This is a problem that calls for long-headed and clear sighted and thoroughly courageous statesmanship at Ottawa.—Montreal Star.

Mr. W. H. Rowley, president of the E. B. Eddy Co. at Hull, made a strong plea for the imposition of the export duty on pulpwood. He said that Canada had an area of 2,600,000 square miles of pulpwood. Nine years ag Canada had twenty-four pulp mills and forty pa mills, producing 327 tons a day. To-day there wer fifty-eight pulp mills and forty-six paper mills, produc 3,400 tons a day. The imposition of a substantial ex port duty on pulpwood would give Canada contro the world's industry. Instead of selling $6,000,00 worth of pulp annually, an export duty would compe the manufacture in this country of pulp, $25,000,00 of fibre, $30,000,000, and of paper, $45,000,000 to $60 000,000.

The American iron industry broke all records in 190 in the output of ore. The quantity of ore produced wa 47,749,728 long tons, valued at $100,597,106. Thes figures show an increase of 12.28 per cent. in tonnage a of 33.83 per cent in value over those for 1905.

Canada has paid out for steamship subsidies and bou ties during the last fiscal period of nine months endi March 31, the sum of $2,508,840. Of this amou $1,128,876 was for steamship subsidies as compared wi $1,227,560 for twelve months of the preceding ye Steamship services to Great Britain cost $460,666, a the services to France, China, Japan, Australia, Sou Africa, New Zealand, Mexico, San Francisco, Alaska a South America cost $517,905.

An order-in-council has been passed transferri to the free list, under section 286 of the Customs A coal tar base or salt for use in the manufacture of c tar dyes; crude bromides for the production of bromi iron tubing, lacquered or brass covered, not over t inches in diameter, in the rough, for use only in t manufacture of extension rods for windows when import by the manufacturers of such rods; lenses and shutte for use only in the manufacture of kodaks; special pa of brass and aluminum in the rough, for use in the ma facture of cameras or kodaks are to be dutiable as follo British preferential tariff, 5 per cent., intermediate a general 7½ per cent. Crude acetic acid is to be admitt free of excise duty for use as a raw material in the ma facture of acetate of lead, white lead and acetate of chro when it contains not more than 56 per cent. of real ace acid by weight.

The Canadian commercial agent at Sydney gives gr ifying assurance that the new Australian ta w not hurt Canada. There can be no assura that it will not hurt Australia. A country has unlimi power to injure itself, but little power to hurt its co mercial neighbors.—The Globe.

If Australia is hurt by the remodelling of her own ta with a view to encouraging her own industries, it i A tralia's affair, and The Globe need not worry about A country like Great Britain has unlimited pow er injure itself, as it does in the matter of free trade, bu has but little power to hurt Australia or any othe p tective country.

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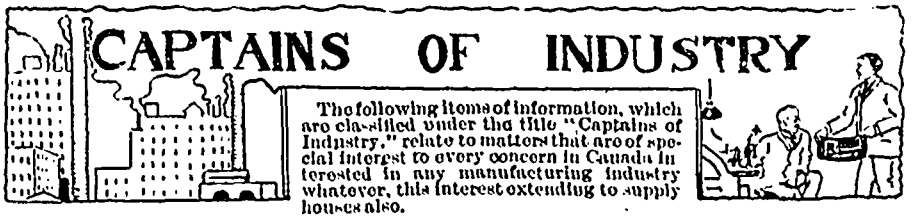

J. E. Le Grand, Guelph, Ont., has been awarded the contract for the erection of septic tanks in connection with the sewage system. The cost will be about $4,435.

T. E. Ferris has secured the contract for the stone foundations, and W. S. Holman, the contract for the superstructure for the proposed factory for C. S. Peaslee & Son, Niagara Falls, Ont.

Messrs. Taylor & Lackay have been awarded the contract for the erection of the Collegiate Institute at Ottawa, at a cost of about $225,000.

The station of the Grand Trunk Railway Co., Harrisburg, Ont., was destroyed by fire recently.

The hydro-electric power plant at Wingham, Ont., will be repaired at a cost of about $25,000.

The Hamilton Radial Electric Railway Co. are seeking permission from the Government to build and operate a line from Brantford, Ont., to a point on the Detroit River at or near Windsor, Ont. In connection with the branch the company may construct and operate ferries across the Detroit River.

C. W. Bongard Co., Limited, Toronto, have issued writ for $320 against the Blind River Light, Heat & Power Co.

The R. E. T. Pringle Co., Montreal, have secured judgment against the Rogers Mfg. Co., Limited, Goderich, Ont., for $259.

The Windsor Belt Dressing Co., Limited, have started manufacturing belt dressings and boiler compounds at Windsor, Ont.

J. B. Northcote & Co. are now manufacturing jig tools and dies at 42 Church Street, Toronto.

The shareholders of the Waggoner Ladder Co., London, Ont., have decided to wind up the business of the company. It is stated that there are ample assets to pay all creditors in full.

The organization of the Fort William Car Co. seems assured. The financial end of the undertaking has been entrusted to Mr. C. E. W. Smith, of the Carnegie Trust Co., of New York, and it is understood that over a million dollars of the company's bond issue has already been underwritten by a foreign syndicate. Mr. A. H. Sisson, formerly general manager of the St. Louis works, has been appointed general manager of the new company, and associated with him will be Mr. R. W. Morrison, of the same concern.

The recent fire at the works of the Smart-Turner Co. Hamilton, Ont., caused no interruption of business.

E. C. Atkins & Co., saw manufacturers, have moved their Toronto office to Hamilton, where their Canadian factory is now being constructed.

Mr. C. S. Cornelius, of the Wolverine Brass Co., Chatham, Ont., states that the erection and equipment of that firm's plant is well under way.

The Tilbury, Ont., Iron Works have been sold to Robt. J. Clements, formerly of Chatham Ont.

The Ontario Tubular Axle Co., Belleville, Ont., expect to build an addition in the spring.

John M. Taylor, liquidator of the Centrifugal Windmill & Mfg. Co., Guelph, has entered action against the Guelph Rag & Metal Co., to recover $304.47 for goods alleged to have been sold and delivered.

Warner-Gibson, Limited, Welland, Ont., have been incorporated with a capital of $40,000, to manufacture agricultural implements, etc. The provisional directors include C. Warner, T. T. Gibson and H. A. Plumley, Buffalo, N.Y.

The McLaughlin Motor Car Co., Oshawa, Ont., have been incorporated with a capital of $500,000, to manufacture motor cars, automobiles, etc. The provisional directors include R. McLaughlin, G. W. McLaughlin and R. S. McLaughlin, Oshawa, Ont.

The Lansdowne Rural Telephone Co., Lansdowne, Ont., have been incorporated with a capital of $20,000, to carry on the business of a telephone company. The provisional directors include W. J. Webster, R. J. Mitchell and W. McConnell, Lansdowne Township, Ont.

The Queen City Acetylene Generator Mfg. Co., Toronto, have been incorporated with a capital of $40,000, to manufacture gas appliances, etc. The provisional directors include J. H. Watkins, H. Rose and W. H. Kahrs, Toronto.

W. Doherty Piano & Organ Co., Clinton, Ont., have been incorporated with a capital of $200,000, to manufacture pianos, organs, etc. The provisional directors include W. Doherty, W. Jackson and J. W. Moore, Clinton, Ont.

The John F. Taylor Pharmacal Co., Weston, Ont., have been incorporated with a capital of $40,000, to manufacture drugs, chemicals, medicines, etc. The provisional directors include J. F. Taylor, W. Thomson, Toronto, and F. G. Taylor, Hamilton, Ont.

A new bridge will be erected at Simcoe, Ont.

The Government are considering the deepening of the Welland canal in order to permit of the locking of the largest lake steamers.

The Elmira Upholstering Co., Elmira, Ont., have been incorporated with a capital of $40,000, to manufacture upholstered furniture, etc. The provisional directors include A. K. Dunke, G. Ratz and R. Schlender, Elmira, Ont.

The Canadian Pacific Railway Co. will extend their sheds at Owen Sound, Ont.

The Canadian Birbeck Investment & Savings Co., Toronto, will erect a four story office building on Adelaide Street, at a cost of about $120,000.

The capital of the Light, Heat & Power Co., Lindsay, Ont., has been increased from $125,000 to $300,000.

Mr. Gilker has been awarded the contract for the erection of the isolation hospital at Port Arthur, Ont. The cost will be about $3,500.

The Public Works Department, Toronto, invite tenders up to January 9 for the wiring of the Parliament Buildings.

F. C. Hennicke, Buffalo, N.Y., is contemplating the erection of a factory for the manufacture of brass and iron bedsteads in Goderich, Ont. H. W. Thompson, Goderich, is interested.

A new compressor plant is being installed in the Silver Bar mine at Cobalt, Ont.

Work has commenced on the new Canadian Pacific Railway station at Listowel, Ont.

A new drill hall may be erected at Orillia at a cost of about $100,000.

A franchise has been secured for an electric line from Cobalt to Haileybury, Ont. It will eventually run to New Liskeard.

The Bank of Hamilton will establish a branch in Hamilton, Ont.

The Lehigh Portland Cement Co. have stopped construction work on their new plant at Belleville, Ont. Work will be resumed in the spring.

Machinery is being installed by the new brass works of which Mr. H. C. Hunt is manager.

The population of Fort William has increased from 4,000 to 14,000 in the last few years.

Ingersoll, Ont., will vote on proposition to purchase the Ingersoll Electric Co.'s plant for $50,000.

The Clinton Knitting Co., Clinton, Ont., have increased their capital from $25,000 to $50,000.

The Page-Hersey Iron Tube & Lead Co., Guelph, Ont., have increased their capital from $2,000,000, to $3,000,000.

The North American Oil & Gas Co., Niagara Falls, Ont., have been incorporated with a capital of $1,000,000, to manufacture petroleum, gas, etc. The provisional directors include D. A. Coste, H. D. Symmes, Niagara Falls, Ont., and B. F. Downey, Chatham, Ont.

The Canada-Mexico Development Co., Toronto, have been incorporated with a capital of $200,000, to carry on a mining, milling and reduction business. The provisional directors include W. D. Gwynne, H. F. Gooderham and R. Weir, Toronto.

The Kent International Drug Co., Chatham, Ont., have been incorporated with a capital of $20,000, to manufacture drugs, chemicals, medicines, etc. The provisional directors include G. J. Fielder, A. W. Merrill, and W. Bullis, Chatham, Ont.

The Imperial Gas Power Co., Toronto, have been incorporated with a capital of $100,000, to manufacture gas and gasoline engines, automobiles, launches, washing machines, clothes wringers, etc. The provi-

directors include W. B. Hampton, C. G. Munro and J. Donnelly, Toronto.

The city council, Port Arthur, Ont., are said to be negotiating with a pulp and paper company, the identity of which is not announced, with a view to the erection there of mills which will have a capacity for 70 tons of paper each day.

The Twentieth Century Underfeed Furnace Co., Ottawa, have been incorporated with a capital of $100,000, to manufacture furnaces, stoves, ranges, etc. The provisional directors include F. H. Lytle, R. W. Hart and O. H. King, Toronto.

The Carter Stevens Lumber Co., Toronto, have been incorporated with a capital of $40,000, to manufacture lumber, timber, etc. The provisional directors include J. B. Bartram, F. Rielly and V. V. Stevens, Toronto.

Barnett & McQueen have been awarded the contract by the Canadian Pacific Railway Co., for rebuilding the elevator D. It is understood the contract price is $600,000.

The Bedford Mica Co., Toronto, have been incorporated with a capital of $100,000, to carry on a mining, milling and reduction business. The provisional directors include J. E. Day, J. M. Ferguson and E. V. O'Sullivan, Toronto.

The National Snuff Co., Toronto, have been incorporated with a capital of $50,000, to manufacture snuff, tobacco, etc. The provisional directors include O. S. Perreault, D. C. Patterson and W. J. Brennan, Montreal.

The Champion Rivet Co., of Cleveland, Ohio, have decided to establish a branch in Canada, and it is probable that Windsor, Ont., may be the favorable location.

Messrs. McHardy Bros., Guelph, Ont., have commenced work on their large ablattoir.

A loss of $4,000 was caused by fire to Howard Fraleigh's flax mill at Forest, Ont. Thirty hands are thrown out of work.

The plans of E. & W. S. Maxwell, architects, Montreal, for the New Saskatchewan Provincial Buildings, were accepted by the judges. The plans call for a building to cost a million and a quarter, exclusive of furnishings. Provision is made for extension later. It is anticipated that the work on the excavation for ten buildings will commence early in the spring.

The premises of the Montreal Suspender & Umbrella Co., at Arnprior, Ont., were burned to the ground a few days ago. The loss is estimated at $50,000. The town has a claim on the building for $35,000. It is totally covered by insurance. One hundred employees were on the list.

Witt's Foundry, Norwich, Ont., was destroyed by fire a few days ago. The loss included much valuable machinery.

Cook & Hermon are offering to sell their electric plant at Claresholm, Ont., to the municipality.

The Consolidated Optical Co., Toronto, have been incorporated with a capital of $350,000, to manufacture optical instruments, field glasses, watches, compasses, etc. The provisional directors include A. E. Knox, F. D. Mackay, and A. G. Parish, Toronto.

The Merrick Foundry Supply Co., Toronto, have assigned to E.R.C. Clarkson and meeting of creditors has been called.

MacIntosh & Hyde have been appointed liquidators of the International Steel Co., Montreal.

Rice Lewis & Son, Toronto, have secured judgment against C. W. Gray for $1,911.

W. J. McGuire, Limited, Toronto, have issued writ (disputed) in High Court against S. F. Wilson of that city for $5,269.

Loss to the extent of $125,000 was caused by fire to the buildings and machinery of the plant of the Standard Drain Pipe Co., St. John's, Que.

The congregation of the Presbyterian church, St. Paul, Que., will erect a new church at a cost of about $165,000, to replace the one recently destroyed by fire.

The electric light plant, Granby, Que., will be extended.

Mr. W. J. Egan, Montreal, has been elected president of the Dominion Commercial Travellers' Association.

The Provincial Bank have moved into new quarters in Montreal.

Messrs. Ross & Holgate, Montreal, are preparing plans for an electric light and power plant for the city of Sherbrooke, Que.

Messrs. Duke & Dumont have been awarded the contract for the new Intercolonial Railway shops at Riviere du Loup, Que. Two large steel framed buildings for the construction of locomotives and general repairs will be erected at a cost of $89,874.

The Detonite Explosives Co., Montreal, have secured a site at Riguad, Que., and may erect a $50,000 plant. Mr. W. G. Trench is the company's superintendent.

The Consolidated Lithographing & Mfg. Co., Montreal, have been incorporated with a capital of $250,000, to manufacture paper, cardboard, photographic supplies, etc. The charter members include J. H. Burland, W. W. Burland, Montreal, and E. C. Landon, Westmount, Que.

H. E. Vipond, secretary-treasurer of the Montreal Electric Co., has written to the Fire and Light Committee of Montreal, that his company are authorized by their charter to distribute and sell electric light and power within the city and district of Montreal, and furthermore, that it is the intention of this company to commence within a short time to develop their water powers and transmit electricity to Montreal.

The Central Heat, Light & Power Co., Limited, 95 St. Peter Street, Montreal, are overhauling their plant and installing two new 150 h.p. Babcock & Wilcox boilers.

The Tyee Copper Co., Ladysmith, B.C., is making extensions to their smelting plant.

The Paterson Mfg. Co., Limited, are building a brick addition to their Montreal plant. The building is two stories and basement, 95x35 feet, and will be used for the manufacture of "Amazon" roofing. It will be running by the opening of navigation. The same firm have just completed the installation of a machine for the manufacture of "Amatite" roofing with a capacity of 1,500 rolls per day.

Carriere Bros. Co., St. Louis, Que., have been incorporated with a capital of $150,000 to manufacture doors, sashes, shutters, carriages, cars, vehicles, lumber, timber, pulp etc. The charter members include L. A. Carriere, F. Carriere and M. Benoit, St. Louis, Que.

P. D. Dods & Co., Montreal, have been incorporated with a capital of $300,000, to manufacture paints, colors, varnishes, etc. The provisional directors include G. Renaud, W. A. Dods and G. N. C. Dods, Montreal.

The Cape Breton Railway Co., purpose extending their line from St. Peters to Louisburg, N.S., a distance of thirty-one miles.

The Public Works Department, Ottawa, invite tenders up to January 7 for the construction of a heating system in the Armoury Building, Truro, N.S.

Moncton, N.B., will give L. Higgins a bonus in consideration of his starting a shoe factory in that city.

Elias Harmer & Sons will build a large saw mill at Norton, N.B.

The Miramichi Lumber & International Paper Co. are negotiating for the purchase of D. & J. Ritchie's lumber property at Newcastle, N.B. The transaction will involve about a quarter of a million dollars.

At the annual meeting of the New Brunswick Wire Fence Co., Newcastle, N.B., Hon. C. A. Murray was elected president and W. Chipman, secretary.

A new bridge over the Bonaventure River between Restigouche and Matapedia, N.B., will be erected as soon as the Government engineers can decide on a site. The bridge is to be be 3,300 feet long and will cost about $600,000.

The Martin, Bole & Wynne Co., wholesale druggists, Winnipeg, Man., have applied for increase of capital to $240,000.

The contract for the construction of the plant of the Minnedosa Power Co., Minnedosa, Man., has been awarded to the Hyde Electrical Construction Co., of Toronto, for $80,000.

Tenders will be received until January 15, 1908, for the various trades required in the construction of a building, corner Portage Avenue and Carlton Streets, Winnipeg, Man., for the Ontario, Manitoba & Western Land Co. Messrs. Wardell & Nichols, architects, 499 Main Street, Winnipeg.

The Civic Board of Control, Winnipeg, intend calling for new tenders for the $300,000 power plant to be erected by that city at Lac du Bonnet.

Brandon, Man., proposes to construct a trunk sewer 1½ miles long. Mr. W. Shillinglaw is city engineer.

Portage la Prairie, Man., council is considering large extensions to its waterworks system.

The Canadian Pacific Railway's Land Commissioner at Winnipeg has submitted a statement based upon careful enquiries by the railway and flour mill interests of the West which he estimates that the crop of this year is worth $20,000,000 more than the value realized for the crop of 1906.

The Manitoba Department of Agriculture in reporting on this year's crop says the total yield was 99,102,697 bushels. The

wheat yield was 39,680,266; oats, 12,233,140; barley, 16,752,724; potatoes, 5,092,161; roots, 2,514,291.

The Purnuds Brick Co., Limited, Medicine Hat, Alta., have been incorporated.

The Saskatoon Iron Works Co., Saskatoon, Sask., have been organized.

The ratepayers of Lethbridge, Alta., voted favorably on a by-law to raise $30,000 for gas boring.

The Bow River Collieries, Limited, will apply at the coming session of the Legislature for a charter to construct a railroad from the mine, which is 55 miles north of Lethbridge, Alta., on the Big Bow River, to the main line of the Canadian Pacific Railway, a distance of 15 miles. As soon as the charter is secured construction will be commenced.

W. J. Broley, Battleford, Sask., has been awarded the contract for the erection of the proposed power plant in that city.

A Masonic Temple will be erected at Swift Current, Sask.

A new Roman Catholic church will be erected at Swift Current, Sask.

Messrs. Galt & Smith, consulting engineers, Toronto, are making up a report for a water-works system for Swift Current, Sask., to cost about $50,000.

The ratepayers of Humboldt, Sask., voted favorably on a by-law to raise $7,500 for fire protection equipment.

The grading of the Grand Trunk Pacific Railway from Portage la Prairie, Man., to Saskatoon, Sask., a distance of 430 miles, is now completed.

The Purdy Block, Red Deer, Alta., was destroyed by fire, December 20. Loss about $15,000.

The Imperial Bank have moved into new quarters in Edmonton, Alta.

The Calgary council have awarded the contract to the Calgary Power & Transmission Co., to supply the city with power at $30 per h.p. for 24 hour day. The company are to have 5,000 h.p. plant ready by March, 1909.

The Dominion Match Co., recently incorporated at Calgary, Alta., propose to erect a factory there early this year.

The Provincial Government of Saskatchewan have acquired coal areas at Eagle Lake from the Dominion Government and propose to mine and sell coal to settlers.

E. Lindeman, the Swedish mineralogist, has examined the iron deposits of Vancouver Island, at the behest of the Dominion Government. He reports that the ore is largely of the magnetic variety, and is the most valuable commercially of the various grades of iron ore found in the Dominion.

A Vancouver despatch says D. M. Stewart will erect a $30,000 steam laundry in that city.

Lorne A. Campbell, manager of the West Kootenay Power & Light Co.'s plant at Nonnington Falls, B.C., claims the cost of haulage on all lines of the Canadian Pacific Railway within 150 miles of the company's plant can be cut almost in half by the use of electric power instead of steam. At least 20,000 h.p. is available. As nearly 2,000,000 tons of ore are carried each year it is argued the saving would more than justify the electrification of the railway in that district.

The Northern Bank will erect a new building in Vancouver, B.C.

The Vancouver Gas Co., Vancouver, B.C., have the foundation in for a water gas plant. This plant will be used with oil and coke, and the plant is so arranged as to consume everything odorous.

The Canadian-American Coal & Coke Co., Frank, B.C., will expend about $250,000, on the improvement of their property.

The Edmonton, Yukon & Pacific Railway Co. will apply to Parliament at its next session for an act extending the limit of the issue of bonds, debentures or other securities to the sum of $25,000 per mile in respect of the company's line, constructed or to be constructed east of the foothills of the Rocky Mountains and to $35,000 per mile on other portions of the company's line.

About $40,000 will be spent on addition to plant of the British Columbia Packer's Association at New Westminster, B.C. Mr. Cassidy, of that city, has the contract for construction of buildings.

A Vancouver despatch says that important seams of bituminous coal have been discovered 100 miles northwest of Barkerville on the projected main line of the Grand Trunk Pacific. These are the first coal lands discovered in northern Cariboo. Their economic importance is indisputable. The nearest coal lands are 300 miles west in the Telgua district.

The Saanich Lumber Co., Limited, of Vancouver, B.C., have just installed a blower and separator system in their planing mill at Saanich, B.C. The equipment consists of a Columbia Blower Co. separator and a single 70 inch Sturtevant fan. The work was done under the supervision of Wm. Murray, of the Columbia Blower Co. The Saanich Co. have also installed two Jenkes boilers, thereby doubling the steam plant capacity.

The works of the Hamilton Powder Co., at Departure Bay, near Nanaimo, B.C., exploded on December 23. Loss about $30,000.

Senator Cox and John Charlton have purchased the extensive lumberlands of Kinman & Brophy at Alert Bay, B.C., for the sum of $200,000.

The Fraser River Sawmills, Millside, B.C., will be extensively improved during the coming winter.

The Universal Lumber Co., Limited, have been incorporated at Spokane, Wash., to carry on lumbering operations in British Columbia. The concern owns 10,000 acres of timber lands between Rossland and Greenwood, in British Columbia, and while offices will be maintained in Spokane, it is not the intention to ship any of the forest products out of Canada. The incorporators of the company are H. W. Greenburg, C. W. Samson, S. S. Bissell and A. Herman, of Seattle.

The White Pass & Yukon Railway Co. are arranging to build a number of ore cars of a special design at their own shops.

The Intercolonial Railway Co. have placed orders for 12 hopper cars, 30,000 pounds capacity, and 10 dump cars, 80,000 pounds capacity, with Rhodes, Curry & Co., Amherst, N.S.

The actions recently instituted against the Dominion Car & Foundry Co., Limited for alleged breach of the Alien Labor Act have been dismissed, the judgment holding that the provisions of the Act do not hold where a new industry was started in a country where no experienced men could be found.

The Central Railway Co. have been granted by the interested municipalities the franchise for electric railway between Latchford and North Temiskaming, Ont. The estimated cost of building and equipment of first section, construction of which must be started before July 1 next, is $350,000.

The Bristol Co., of Waterbury, Conn., have been awarded a silver medal for their recording instruments exhibited at the Jamestown Exposition. These recorders have received high awards at every exhibition in which they have been entered, as competitors in recent years, including the ones held at the Chicago and St. Louis.

Publications Worth Reading

Any Manufacturer or Dealer in Supplies for this Column is invited to send Books, Business Topics for Review or Booklets, Pamphlets, etc., for Reference.

WESTINGHOUSE DIARY. The annual publication of the Canadian Westinghouse Co. is a little leather covered pocket diary for the year 1908 is to hand. This is a particularly valuable publication for besides having a diary for every day in the year it contains all the information of a condensed encyclopedia pocket book. Those who have been fortunate enough to receive a copy of this book in the past will gladly welcome a copy of the new edition. Any reader interested would do well to drop a card to the advertising department of the Canadian Westinghouse Co., Hamilton, Ont., mentioning CANADIAN MANUFACTURER.

THE CROSBY. A little book with a neat purpose issued by the Crosby Steam Gage & Valve Co., Boston, Mass., contains a description with splendid illustrations of the Crosby spring-seat valve and enumerates its superior points.

MECHANICAL DRAFT. Catalogue No. 5 has been issued by Sheldons, Limited, Galt, Ont. It contains forty pages descriptive and illustrating their many lines including medium and cupola blowers, mechanical exhausts, steel plate planing mill exhausters, heating, ventilating and drying appliances for heating and ventilating large buildings, schools, colleges and also factories, mills and drying rooms or kilns, lumber and brick cars, forges, blacksmith shop equipment, dust and shavings collectors, steam specialties and upright horizontal steam engines.

CITY ROADS AND PAVEMENTS, by Wilbur Pierson Judson, third edition, revised and illustrated. New York, the Engineering News Pub. Co., 197 pages. Price $2 net. This book now in its third edition is a valuable piece of literature on the subject of City Roads and Pavements suited to the modern size, both from the view point of the subject matter and the manner in

it is presented. It deals with the various kinds of pavements used discussing in a practical manner their advantages and disadvantages with numerous illustrations taken from actual practice. Relative costs per square yard of block stone, sheet asphalt and cedar block are included covering a large number of cities in the United States. The scope of this book is by no means limited to city roads and should be of value to every one at all interested in highway transportation and the securing a better knowledge of road improvements. In the chapter on Cement Base for Pavement a simple inexpensive method of testing cement is included. A perusal of this volume will well repay any one anxious to increase his knowledge on this timely subject and place him in a position to discuss with intelligence a problem with which the average civic officer or taxpayer is too little familiar.

DEVELOPMENT OF THE LOCOMOTIVE ENGINE, by Angus Sinclair. A history of the growth of the locomotive from its most elementary form showing the gradual steps made toward the developed engine, with biographical sketches of the eminent engineers and inventors who nursed it on its way to the perfected form of to-day. New York, Angus Sinclair Pub. Co., 680 pages profusely illustrated. It is eminently fitting that this important work on the locomotive should be dedicated to George Westinghouse, who is described as the "guardian of railway men and the preserver of the travelling public whose great invention of the automatic air brake has preserved more human lives than any military general or tyrant ever succeeded in destroying."

Mr. Sinclair's many years of intimate association with railway and locomotive engineering as well as membership in the American Railway Master Mechanics Association, American Society of Mechanical Engineers, and the Brotherhood of Locomotive Engineers, place him in a superior position regarding writing a book covering this field. It is interesting to peruse the pages of this book as a matter of history alone, but its greater value is associated with the wealth of information contained in its chapters concerning the mechanical genius displayed in developing the various mechanisms that went to bring about the development of the present high class locomotive. A pleasing feature of this book is the intense human element running through its pages in the biographical sketches of the many men whose brain and genius were devoted to this cause introducing many romantic incidents in the career of the locomotive engine.

Going back to the earliest form of steam engines Mr. Sinclair enlightens the reader with illustrations in most cases, regarding all the inventions that materially affected the locomotive's history. It is a book that all railway men should read as well as everyone interested in the perfection of the greatest factor in the commercial or industrial development of the world to-day.

THE STEEL SQUARE AS A CALCULATING MACHINE, by Albert Fair, New York, the Industrial Publication Co., 81 pages, illustrated. This is one of a series of practical books issued by the Industrial Publication Co. It contains simple directions for using the common steel square for the solution of complicated calculations that occur in the everyday work of carpenters, builders, lumber dealers, plumbers, gas fitters, engineers, electricians, tinsmiths, blacksmiths, masons, stone cutters, etc. The subject matter in the book includes the choice of a square, the graphical as compared with the authentical method of calculating, lines surfaces and solids, right angles and right angled triangles, problems in proportion; polygons and the markings on steel squares. This book is intended for the beginner or the man with no particular technical education and to such should be of value.

THE ENGINEERING DIGEST. Though "Technical Literature," New York, has in a few months become one of the most useful technical publications issued in the United States it has been found that the name has lead to more or less general misapprehension of the nature of its contents, as the publishers have decided to change the name to "The Engineering Digest," an eminently suitable title. This is a publication that engineers, designers and contractors could read to good advantage. It is from the press of Technical Literature Co., 220 Broadway, New York.

PERSONALS.

Mr. J. A. Phillips, formerly of Belleville, Ont., has succeeded Mr. Charles Morton as secretary-treasurer of the Central Heat, Light & Power Co., Limited, 95 St. Peter Street, Montreal.

The late Mr. George O. McClary, treasurer of the McClary Mfg. Co., left an estate of $175,000, but no will. As a consequence, the estate will be divided equally between his brother Arthur, his surviving sister, Mrs. J. M. Morse, and the seven children of his deceased sister. Mrs. John J. Gould. The London & Western Trust is administering the estate.

Mr. F. Orr Lewis, of Lewis Bros., wholesale hardware merchants, Montreal, has been elected a director of the Merchants Bank.

Mr. H. W. Benedict, of the Standard Paint Co., has been transferred from the Cincinnati branch of the company to Montreal where he will be manager.

On Wednesday, December 24, the office and travelling staff of Somerville, Limited, Toronto, showed in pleasant manner their good will toward Mr. W. A. Porter, assistant manager of the company. After several appreciative speeches Mr. Porter was presented with a cut glass berry bowl and nappies.

MAY MAKE PULP AND PAPER.

The British Canadian Pulp & Paper Co., 313 Cordova Street, Vancouver, B.C., are experimenting on a new process, invented by J. C. W. Stanley, for making paper from British Columbia cedar. It has heretofore been considered impossible to do this owing to the resin in this wood. For other reasons, cedar was never used, but it also is quite adaptable under the new process. The promoters claim to have perfected the method.

The erection of a large machine at Tiffin's mill has already been commenced and this will be used for preparing mill refuse for chemical treatment to produce pulp. It is the expectation of the company to utilize mill-waste very largely. A site at Howe Sound of 80 acres, has been secured for a large pulp mill and paper plant. The first will be gone on with at once. so that the company can be on the market with pulp while completing the paper mill. All sorts of paper are to be manufactured ultimately.

CANADIAN COPPER SHIPMENTS.

Shipments of copper from the Canadian camps during the first ten months of the current year show up as follows:

	Pounds.
January	2,410,115
February	467,776
March	2,818,482
April	3,856,742
May	2,496,964
June	1,777,627
July	3,361,573
August	4,185,560
September	1,285,220
October	3,524,079
Total for ten months	26,184,138
Same period in 1906	26,992,233

—Metal Market Report.

SHEET METAL FOR ROOFING RINKS.

During the fall, which has just closed, a number of fine up-to-date rinks have been built in many parts of Ontario. Previously a great difficulty has been experienced in getting suitable roofs for this class of building—roofs that would wear well and retain their weather proof qualities. That the problem has at last been solved is shown by the numerous instances in which rink owners have chosen sheet metal as their roofing material and have been thoroughly satisfied with the results.

The new rink at Forest has a large circular roof, which has been covered with corrugated galvanized sheets, manufactured by the Metal Shingle & Siding Co., Limited, Preston. At Orillia, there is a new rink 184 feet long, with a hip roof, also covered with the same material. Rinks which have been built at Thornhill and Dunnville recently, also adopted "Acorn Quality" corrugated galvanized sheets as a roof covering. The new rink at the Mimico Industrial School is another case in which this popular material was used. In all large roofs, where it is desired to combine fireproof and weather-proof qualities with durability and low cost, this style of roofing is to be strongly recommended.

SUPERINTENDENT COACH OF HIS CREW.

The successful superintendent is the coach of his factory crew. He endeavors to develop them to their best powers, just as the coach of a winning football eleven endeavors to train his players to their greatest skill. The unsuccessful superintendent is the man who tries to keep his employees down towards a minimum of their abilities. These same things are true, on a greater scale, of a manufacturer. The successful manufacturer endeavors to build up his factory, and its employees, to the highest development practicable. The unsuccessful manufacturer is he who runs his factory on narrow lines.—From American Shoemaking.

Practical Hints for the Factory or Mill Superintendent.

There are so many excellent technical publications issued throughout the world that even the most ambitious superintendent could not afford to read them all to get the cream of their articles. We propose in these pages to give some of the most practical hints *and suggestions which appear in the technical press in all countries.*

Faults of Iron Castings

By Forrest E. Cardullo, in Machinery.

The most useful and indispensable of all the materials with which the designer has to do, is cast iron. Of all the metals used in the construction of machinery, it is the chapest. It is the one to which we can the most readily give the form and proportions which we desire. It is, of all the common materials, the most easy to machine. While it is lacking in strength and ductility, its cheapness makes it possible to use it in such ample quantity as to overcome these disadvantages, and in many constructions it may be so shaped and proportioned, or so reinforced by other materials, as to make this lack but a slight detriment. It is therefore a matter of interest to the designer to learn of the various faults to which this valuable material is subject, and the best way in which they can be avoided or minimized.

Causes of Blowholes.

Probably the one fault which spoils more castings than any other, is the result of an outrush of gas from the materials of the cores of the mould, into the molten iron, at the instant of solidification. If the solidification of the iron has proceeded so far that the outrushing gas or steam cannot bubble through it, and escape through the vents which should be provided for the purpose, it will be imprisoned in the substance of the casting, forming one or more holes, according to the special shape of the casting, and the quantity of the escaping gas. These holes, which are known as blow holes, may not be apparent on the outside, and quite often occur in such a location that they do no particular harm, but it is more often the case that they occur at some point where they become apparent when the metal is being cleaned, or where their presence weakens the casting greatly.

Steam from Moisture in Sand.

The gases which cause blow-holes may come from three sources. They may be, and generally are, caused by the generation of quantities of steam from the moisture contained in the moulding sand, by the heat of the iron. In the case of dry sand and loam castings, the quantity of steam so generated is so insignificant, if the moulds have been properly heated, that it gives no trouble whatever. In the case of green sand castings, however, the moisture present, and therefore the steam generated, is quite large in amount, and special precautions have to be taken to prevent blow holes.

When the molten iron pours into a green sand mould, all the moisture in the lair of sand immediately in contact with the iron will at once be transformed into steam. The depth of the sand layer so affected depends on the thickness and event of the fiery mass to which it is adjacent. The steam so formed must either force its way through the molten iron in the form of a mass of bubbles, or else it must escape through the sand. To facilitate its escape, the mould is vented. That is, after the damp sand has been packed around the wooden pattern by ramming it closely into place, a wire is thrust repeatedly into the mould, making numerous passages for the escape of the steam and gas.

It is obviously impossible that one of these vent holes should extend to every point in the layer of sand adjacent to the casting, so it is necessary that the most of the steam and gas should force its way for some small distance through the sand, before it can reach a vent hole. This it can only do when the sand is somewhat porous. If the sand is too tightly rammed, it will lack the necessity porosity, and even though it be unsually dry, and the venting carefully done, the casting will be full of blow-holes. I have known of cases where moulds have been rammed so hard that the castings were nothing better than shells, the whole interior being a mass of blow-holes.

Decomposition of Binder in Cores and Entrapping of Air.

The second cause of blow holes in iron castings is the decomposition of the material, generally flour or molasses, used as a binder in preparing the cores, and its escape in the form of gas, into the iron, at the instant of pouring. It is impossible to prepare and bake a core in such a way that it will not give off large quantities of gas when the iron is poured, and so means must be provided for the escape of this gas. In order to do this, the cores are prepared with wax strips running through them. When the core is baked, the wax melts, leaving passages for the escape of these gases, known as core vents. If the core is of such form, and so set in the mould, that the gases can escape from these vents in an upward or sidewise direction, and leave the mould without forcing their way through the molten iron, no blow holes will result.

A third source of blow holes is the entrapping of air in certain parts of the mould, and its mixing, on expansion, with the iron. This trouble is due to insufficient venting of the mould, and is not a fault to which the designer need pay any particular attention.

Dry Sand or Loam Advisable for Large, Complicated Castings.

In the case of large and complicated castings, it is generally advisable to make dry sand or loam castings, in order to avoid, as far as possible, the chance of blow holes. When the mould is very large, it is difficult to vent it thoroughly, and when the work on it extends over a period of three or four weeks, it is impossible to keep the vents from filling up; hence the general use of dry sand work for large castings. Often, however, for the sake of economy, fairly large and complicated pieces must be undertaken in green sand, and it becomes a matter of importance that they be so designed that the moulder will not be compelled to invite disaster by keeping his sand too wet, or ramming it too hard, and that there is no part of the mould which may not be thoroughly vented.

Elements of Green Sand Mould

In order that we may understand th oughly the effect of the design of a casting the probability of blow holes, it is nec that we review in a brief way, the elements green sand moulding. The sand is sprin with water, and thoroughly mixed and sif preparatory to packing, or "ramming" around the pattern. The object of wet the sand is of course to cause it to stick gether when it is packed. Up to a cer point, the wetter it is, the better it will st but the moulder should not wet it any m than is necessary. In the same way, t more tightly the sand is rammed, the bet its particles will cohere, and the more ea will the mould be handled, and the patt drawn. However, tight ramming and w sand, while they make a solid and ea handled mould, invariably produce b holes, and are therefore to be avoided.

It will be apparent then, that if a patt be of a complicated form, or hard to dr or if when it is drawn it leaves the sand in a form that the mould will easily fall toge at a little jarring, the moulder will be c pelled to wet the sand more, and to ra harder than usual. Small deep open sharp fillets, and thin walls and partitio sand are especially troublesome. Not do they make it difficult ot draw the patt and handle the mould, and so make exces wetting, and hard ramming imperative, they make spots in the mould which venting wire is unlikely to reach. For th reasons, they are to be avoided when pos in any class of moulding, whether it be g sand, dry sand, or loam work, and on no count should such work be permitted in case of large green sand castings.

When designing a casting to be mad green sand, the designer ought to know position which it will occupy in the mo when it is poured. In general, the part a casting which lie in the bottom of mould will be the soundest, and those p which must be machined, or which re the greatest strength, should therefore oc *the bottom of the mould, if possible,* when casting is poured. Having decided w side will be down, the designer needs gen to pay no particular attention to the con ration of the lower part of the mould, vided only that all of the pattern ca drawn, and that there are no sand part which overhang, or whose extent is lar proportion to their thickness. To ins sound casting, the sand in the lower par the mould must be comparatively dry, loosely rammed. This condition of affa not generally hard to attain, since all work on the sand is done with the patte place, and that part of the mould is rel erally moved or handled after the sup the pattern has been withdrawn. In lower part of the mould, the sand is g ne supported at all points in a very im manner by the sand lying under it as

hard ramming or wet sand is unnecessary. If, however, the pattern must be made with loose pieces, or with sharp fillets, or must leave thin walls or tongues of sand when it is withdrawn, the case is changed. Then hard ramming and wet sand are almost compulsory, and the moulder is not to be blamed if he does not produce sound green castings. The fault is with the designer.

The upper part of the mould must of necessity be rammed harder than the lower part, since the sand is not supported from beneath, but hangs from above. This is not as great a disadvantage as it might seem to be at first sight, since the escaping gases do not have to make their way through the iron, as they would if they were given off by the sand in the lower part of the mould. The venting, however, must be just as thorough, and it is desirable that the sand should be as dry as possible. The whole arrangement of the upper part of the casting should be such that the sand may be well supported from above. Generously rounded fillets and corners, simple surfaces, plenty of "draft," and an absence of depending walls and masses of sand, make the mould easy to handle, and therefore promote freedom from blow holes.

WHEN GREEN SAND AND DRY SAND BOTH MAY BE USED.

It often occurs that the larger part of a casting is of simple form, and easy to mould. A certain part of it, however, may be of a form exceedingly difficult to mould, and therefore likely to give a good deal of trouble. It is not necessary to make this part in a dry sand mould, but a core-box may be made to take care of the difficult part of the work, even though the work could ordinarily be done without a core. It is just as easy, and often just as desirable to cast the external face of a casting against a core, as the internal face. While it may not pay to do this if only one casting is wanted, if a great many are wanted, it is often the chapest possible way of making them, and reduces to a minimum both the work of the moulder and the chance of a spoiled casting. Often forms may be cast in this way which could not be attempted in any other. If it is desirable to use this method of working, the designer has it in his power to make the construction of the core box much simpler and cheaper than it might otherwise be by giving the matter a little thought.

SUPPORT OF CORES.

In arranging the coring of a mould, it is always better, if possible, to support the cores at the top. The gases formed in the core, being light, tend to rise, and if the core is supported at the bottom only, they tend to escape into the iron, and to bubble through it. If they can escape at the top, they will pass off without coming in contact with the iron. When it is impossible to support the cores at the top, they should be so arranged that the the gases can pass off at all sides, and escape the mould without coming in contact with the iron.

Running Steam Cylinders Without Oil.

A. H. GOFF IN ENGINEERS' REVIEW, CLEVELAND.

Steam engineers have of late been learning that the use of oil for lubricating steam cylinders, pistons and valves is by no means a necessity. At a meeting of the American Society of Mechanical Engineers, held in New York, this subject came up for discussion in connection with the question, "What information can you give as to the best method for the extraction of oil from condensed steam, when it is desirable to use the exhaust steam for boiler feed purposes?"

In the course of the discussion it was made to appear that but little oil was really required for cylinder lubrication, and that cylinders might safely be run without it. Mr. John Fritz, the president of the society, spoke of one engine which had been run for a number of years without any oil in the cylinder.

We have been hearing more or less about the torpedo boats in the United States Navy, and have reliable information that upon several vessels of this class, the main engines as well as the Blake steam pumps are run without the use of oil in the steam cylinders. While the discarding of oil for steam cylinders is not a new idea, it has not been the practise to run steam pumps without oil. The pumps furnished for the torpedo boats by the George F. Blake Mfg. Co. are arranged without any oil holes whatever, so that it will be impossible to get any oil into the steam cylinders. These pumps have been given an exhaustive test for several days at the works, and they have operated with entire satisfaction without using a drop of oil. We have reliable information that the main engines on other torpedo boats are to be run without the use of oil in the steam cylinders.

Graphite, as a lubricant, is fast taking the place of oil. A journal that runs hot, and which can not be kept cool by any amount of oil, if lubricated with oil to which 10 per cent. of pure graphite has been added, will soon cool down and give no further trouble. A crankpin that will get almost red hot when lubricated with good ordinary oil, will run cool if lubricated with this same oil when a fair amount of graphite is added. The graphite fills all rough places and puts a polish like glass on the rubbing surfaces, which lessens the friction and improves the bearing.

Graphite is the ideal lubricant for valves and cylinders of steam engines. The writer has information that where a cylinder was badly cut from imperfectly fitted rings and the steam blew through, that after two months' use of pure flake graphite in the cylinder, the same was found to have a polish like a mirror and all cut places had disappeared. The valves on the engine had a beautiful polish and could be moved with much less power.

Pure flake graphite has been used on locomotives instead of oil with great success. The writer has been told by a certain engineer that he once ran a locomotive which used to stall on certain grades when pulling a stated number of cars. He began experimenting and when approaching these particular grades, he would put about a teaspoonful of graphite in each oil cup on the steam chest. He found the engine would go up the grade easily, that the reverse lever could be handled with less effort, and that he could pull three more cars up the grades with the use of graphite in the valves and cylinders than without it.

A test of graphite was made in Chicago at the plant of the Chicago Edison Co. The engine on which the trial took place was of the Porter-Allen type, tandem compound, condensing, 1,500 h.p., making 120 revolutions per minute with a boiler pressure of 140 pounds. The amount of graphite used in this large unit was about three pounds in 40 hours, and it can be seen what a great saving there is in graphite lubrication when it is stated that if the best cylinder oil had been used, about six gallons would have been fed through the lubricator in the same time. These six gallons of oil would weigh about 36 pounds.

I have been asked this question, "How long is it safe to run an engine with the sight feed lubricator shut off on account of a broken glass?" My answer is this article on running steam cylinders without oil.

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