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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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The Publisher's Page

By B.G.N.

A Message to Men in Authority

IT is our custom to send our circulation men through the industrial centres of Canada at least once a year—in some places twice and three times, in order that every change be reflected in our list of subscribers.

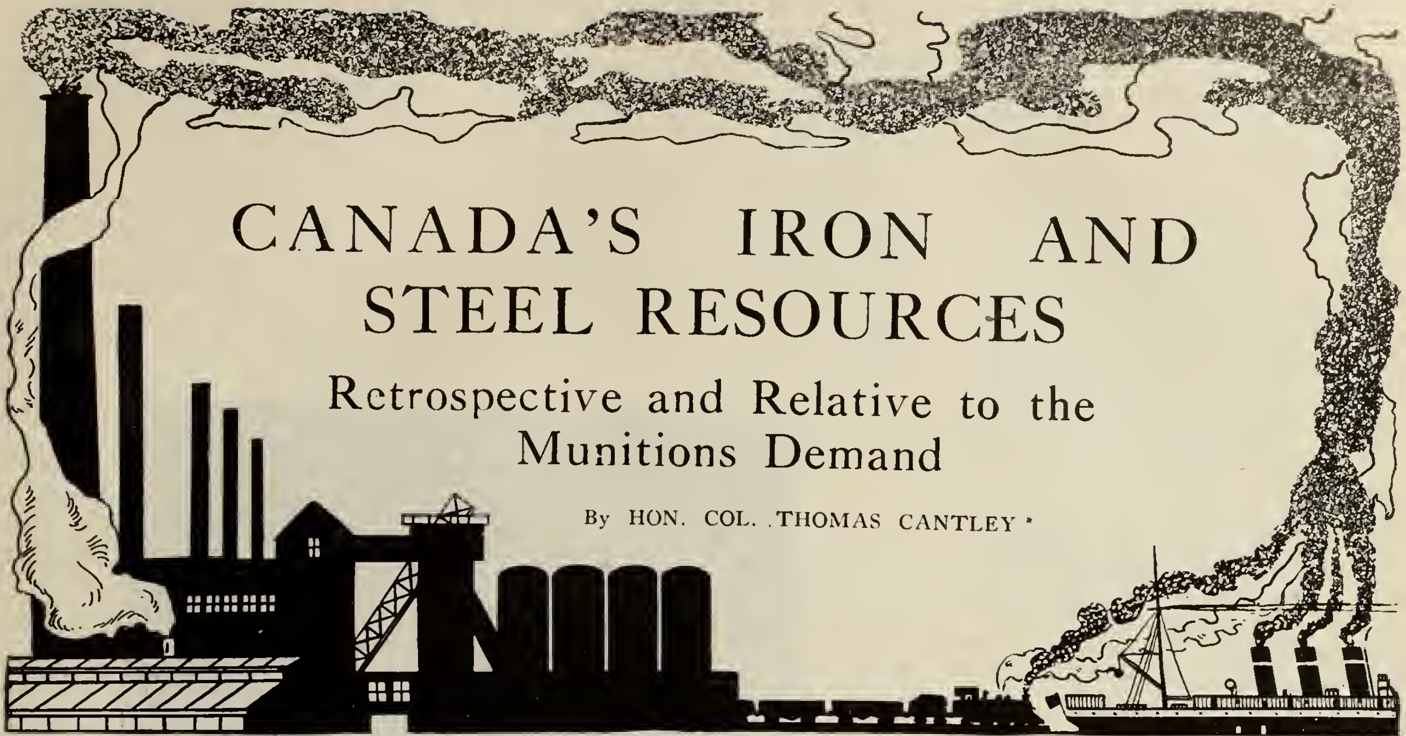
Our representatives invariably seek the permission of the owner or superintendent of the particular foundry they desire to enter, and in nine cases out of ten, not only secure the necessary consent, but frequently the fullest co-operation as well.

Sometimes, owing to definite and iron-clad rules, a certain hour, such as for instance, 12 to 1, is named, but in the majority of cases our representatives are permitted to interview the heads of departments at their convenience, and the courtesy of an escort is not infrequently provided.

Men who allow us the privilege of entering their foundries realize that the advantages and benefits are mutual. They have found that the man who studies CANADIAN FOUNDRYMAN is a better workman, a better foreman, or superintendent than the man who doesn't.

We congratulate the manufacturers who allow their executives to use their good judgment in such matters, and we take advantage of the opportunity to express our appreciation of courtesies received at the hands of our hundreds of good friends—the superintendents, the foremen and their assistants, and the facilities they have provided for the extension of our circulation in their shops.

To you is largely due the credit for the very wide and very thorough circulation of CANADIAN FOUNDRYMAN to-day.



CANADA'S IRON AND STEEL RESOURCES

Retrospective and Relative to the Munitions Demand

By HON. COL. THOMAS CANTLEY *

Steel prices covering every description of commodity into which the material enters have advanced to a prodigious extent, and we are certain that the limit has not nearly been reached. More than usual interest, as a result, is being taken in the question of Canada's resources, both as regards ore areas developed and available and plant equipment installed.

THE steel industry of Canada is represented by plants in three of the Eastern provinces—viz., Nova Scotia, Quebec and Ontario. Those of the first and last mentioned provinces are the most important, supplying over 99 per cent. of the total production. Probably the first effort in iron smelting in Canada was made in the Province of Quebec. During the early decades of the last century we find that various small enterprises were started in all three provinces—charcoal being used as fuel and local ores smelted. The amount of metal produced, however, was very small.

Nova Scotia

The Londonderry district in Nova Scotia was the first to assume commercial importance, and quite modern furnaces and plant were laid down about the middle of the last century. Iron was made here about the same date, and a rolling mill installed in 1860. It is of interest to note that the pig iron made at Londonderry had quite a good reputation, and was in demand. It is said that owing to its superior quality the British War Office, upon the recommendation of Sir William Fairburn and others, used it for the manufacture of ordnance in those days, and imported it into England for that purpose.

About 1875 there was further development in this district, with important additions to plant, coke pig iron being then made for the first time in Canada in a commercial way.

In a paper written on the iron and steel industry in 1885, Londonderry is referred to as the "site of the most important iron works in the Dominion." Up to 1887 it has produced over 200,000 tons of pig iron smelted from local ore—42,000 tons bar iron and forgings, and 40,000 tons of nail plate, wheels and castings. Operations at Londonderry have since been carried on intermittently—the last pig iron being made in 1908, and steel in 1912.

Further east in Nova Scotia, at New Glasgow, the first steel was made on a commercial basis in 1883, when two 20-ton acid-lined open-hearth furnaces were put in operation. Imported pig was used. Four years later the basic open-hearth process was adopted, thus making it possible to use local pig iron. Since this date all steel made in Nova Scotia has been exclusively basic open-hearth.

The first iron made in the Pictou district was by the General Mining Association, then operating collieries at Albion Mines in 1826, when they smelted local ores, using native flux with Beehive coke made from Pictou coal. Owing to the refractory nature of the ore used, the venture was not a success, and operations were discontinued. In Cape Breton the first pig iron and steel was made in 1899, and from this date on this has been the most important steel district in the province.

Quebec

From old records we learn of activity of the early French settlers in the Province of Quebec. How in 1737 the right of mining and smelting iron ore in the district of St. Maurice, near Three Rivers, was granted to a company by Louis XIV. From that date until a year or so ago mining and dredging of bog ore and smelting has been carried on around this district almost continuously on a small scale.

Attempts to smelt iron on a commercial scale were made at Moise in 1867, at St. Urban in 1873, at Hull in 1887 and 1872, but none with commercial success.

At Radnor and Drummondville, furnaces have been operated continuously from 1887 to 1912, using local ore, with locally-made charcoal as fuel. An average of about 8,000 tons per annum was made.

At the date of writing there are no blast furnaces in operation, and the only steel produced is in small open-hearth furnaces and electric furnaces, making castings, or the crucible method, making special steels, the tonnage involved being relatively small.

Ontario

An iron furnace was erected in Leeds County about 1800 and a second in Normandale a few years later. These initial efforts proved failures, but in 1832

*President and General Manager Nova Scotia Steel and Coal Co.

work was resumed by the other operators, and was carried on until 1847. The Marmora furnace, established in 1820, was unprofitably operated at intervals until 1875. A furnace was erected at Madoc ,and operated for eight or nine years; also at Houghton in 1854, and Burnt River, Haliburton County.

All these enterprises proved to be failures commercially, and we find in 1892 the Province of Ontario was without a single blast furnace. Two years later, in 1894, furnaces were put in operation at Hamilton by a company which now forms part of the Steel Company of Canada. These furnaces have been operated continuously since, and the growth for the following decade was rapid.

So much for history. The industry as it exists to-day may be conveniently considered as divided into two groups—one in Nova Scotia, the other in Ontario. This, both because the plants in both these districts form a natural unit, geographically and metallurgically.

Nova Scotia

In Nova Scotia the Nova Scotia Steel & Coal Co. and the Dominion Steel Corporation operate under almost identical conditions—they use ore and coal from the same beds and generally have the same metallurgical problems to overcome.

Ontario

The Ontario district may be subdivided into that of the Niagara Peninsula and the Lake Superior groups, All the important companies operate in the whole area, however, under very similar metallurgical conditions.

Niagara Peninsula

The important companies operating on the Niagara Peninsula are:

The Steel Company of Canada.

Canada Iron Corporation—Furnaces at Midland.

Canada Furnace Company—Furnaces at Port Colborne.

Standard Iron Company—Furnaces at Deseronto.

Lake Superior District

In the Lake Superior district:

The Algoma Steel Corporation—Furnaces at Sault Ste. Marie.

The Atikokan Iron Co.—Furnaces at Port Arthur.

We will now consider the different districts more in detail.

Nova Scotia

All its steel is made from Wabana, Newfoundland, ore smelted with retort oven coke, made locally from Cape Breton coal, local flux being used. The blast furnaces are seven in number, with a capacity of 1,930 tons per day. Open-hearth furnaces, including mixers, number eighteen, and also two 15-ton Bessemer converters.

Nova Scotia Output for 1913

Coke made, 713,000 tons, all from N. S. coal.

Iron ore imported, 940,000 tons, chiefly from Wabana.

Iron ore exported, 13,000 tons.

Pig iron made, 438,000 tons.

Limestone quarried, 514,000 tons.

Steel ingots made, 435,000 tons.

Nails made, 175,000 tons.

HON. COL. THOMAS CANTLEY,
President and General Manager, Nova Scotia Steel & Coal Co., New Glasgow, N.S.

Steel billets for market, wire rods, merchant bar, wire and nail products, and forgings, 180,000 tons.

Lake Superior District

In the Lake Superior district there are four blast furnaces with a capacity of 1,050 tons per day, five steel furnaces, and two Bessemer converters. During 1913 this district produced the following material:

Algoma Steel Company

Pig iron made, 308,000 tons.

Coke made from American coal, 411,000 tons.

Steel ingots made, 438,000 tons.

Steel billets made, 20,000 tons.

Rails made, 320,000 tons.

Merchant mill product, 19,000 tons.

The Atikokan Iron Company has a furnace in this district with a capacity of 100 tons per day, which has been idle since 1911.

The ores smelted in this district are partly native (Helen and Magpie Mines), but the greater part is imported from the American Lake Superior ore field. The fuel used is partly locally-made charcoal, but chiefly imported coke from Illinois or Pennsylvania. Recently 110 Koppers coke ovens have been built at the Sault for the purpose of coking imported coal at the furnace and saving the breakages inevitably obtained in transportation of coke. In 1913, some 600,000 tons of coal was imported for this purpose and 419,000 tons coke made.

Niagara Peninsula District

In this district there are seven blast furnaces with a daily capacity of 900 tons. The greater part of the ore and all of the fuel is imported for these furnaces, although a couple of the smaller companies use a certain tonnage of local ores. Seven open-hearth furnaces provide the steel-making capacity of about 350,000 tons per year.

The Steel Company of Canada report having made 180,000 tons of pig iron, 157,000 tons of steel ingots, and 192,000 tons of finished merchant bar steel in 1913. The following statistics will be of interest:

Coke.—Coke made in Canada by the following companies:

On page 626 is given a table of particulars of steel furnaces and rolling mills.

List of Manufacturers of Oven Coke

Operation.	Address	No. of Oveus and Type.	Location of Ovens.
Intercol. Coal Mfg. Co.	Montreal	36 Bee Hive	Westiville, N.S.
Londonderry I. & M. Co., Ltd.	Montreal	.. Bee Hive	Londonderry, N.S.
N.S.S. & C. Co., Ltd.	N. Glasgow, N.S.	120 Bernard	
		30 Bauer	Sydney Mines, N.S
Dom. Iron & Steel Co.	Sydney, N.S.	620 Otto Hoffman	Sydney, N.S.
Atikokan Iron Co., Ltd.	Port Arthur, Ont.	100 Bee Hive	Port Arthur, Ont.
The Algoma Steel Corp.	Sault Ste. Marie, Ont.	110 Hoppers	Sault Ste. Marie, Ont.

Raw Materials Consumed in Blast Furnaces, 1910-1914

	Total Consumption of:			Consumption per ton of Iron made				
Years	Ore cinder, etc. Gross Tons	Lime Stone Gross Tons	Coke Net Tons	Charcoal Bushels	Ore cinder, etc. Lbs.	Lime Stone Lbs.	Coke Lbs.	Charcoal Bushels
1910	1,453,910	510,650	......	......	4,399.8	1,545.3	....	....
1911	1,607,354	567,462	......	......	4,367.5	1,541.9	....	....
1912	1,915,165	666,214	1,275,349	1,886,748	4,699.4	1,634.7	2,854.6	97.
1913	2,045,780	705,483	1,413,111	2,206,191	4,514.3	1,556.7	2,843.3	104.2
1914	1,358,184	419,864	910,887	883,625	4,309.4	1,332.2	2,611.4	105.5

Coke.—The Nova Scotia district is in the centre of Cape Breton coal field, and supplied itself with coke, and is thus self-supporting.

The Ontario district obtains all its fuel supply from the United States, either directly in the form of coal or as coke. The coke imported and used in furnaces in 1913 amounted to 706,888 tons.

Iron Ore.—The iron ore production of Canada in 1913 was 307,000 tons. Since

Blast Furnaces

There are 22 blast furnaces in 12 separate plants owned by mine companies, with a total theoretical capacity of 1,500,000 tons. In 1913 five of these furnaces were idle. It is improbable that a greater tonnage than 1,350,000 tons can be obtained in 1915. The following table shows the production of pig iron by grades for 1913—Basic, 558,524; Bessemer, 227,662; Foundry, 225,231; all other, 3,701. Total, 1,015,118.

Nickel Copper Smelters

Electric Smelting.—In the above estimates we have not made any allowance for such additional tonnage as might be obtained by electric smelting. The tonnage of steel derived from this source in 1913 was under 5,000 tons, not including the tonnage obtained on ferro-alloys, which amounted to 8,000 tons off. The problem of electric-made steel is a large one. Melting scrap in a relatively inexpensive steel furnace where electric power is cheap is very attractive. This no one doubts. The difficulties that may be encountered in securing any great tonnage in this way, while problematical, are bound to be enormous, and it is unlikely that our figures will have to be changed materially because of the tonnage derived in this way.

Blast Furnace Plants

1915. Company.	Address	Location of Plant	Blast Furnaces and Tonnage
The Nova Scotia Steel & Coal Co., Ltd	New Glasgow, N.S.	Sydney Mines, C.B.	1 completed 250 tons per day
The Dominion Iron & Steel Co.	Montreal, Que.	Sydney, C.B.	6 completed 1680 tons per day
Londonderry Iron & Mining Co., Ltd.	Montreal, Que.	Londonderry, N.S.	
Canada Irou Corporation, Ltd.	Montreal, Que.	Drummondville, Que.	
Canada Iron Corporation, Ltd.	Montreal, Que.	Radnor Forges, Que.	
Canada Iron Corporation, Ltd.	Montreal, Que.	Midland, Ont.	2 completed 375 tons per day
Standard Iron Co. of Canada, Ltd.	Deseronto, Ont.	Deseronto, Ont.	1 completed 112 tons per day
Standard Iron Co. of Canada, Ltd.	Deseronto, Ont.	Parry Sound, Ont.	84 tous per day
The Steel Co. of Canada, Ltd.	Hamilton, Ont.	Hamilton, Ont.	2 completed 540 tons per day
The Canadian Furnace Co.	Port Colborne, Ont.	Port Colborne, Ont.	1 completed 300 tons per day
The Algoma Steel Corporation	Sault Ste. Marie, Ont.	Steelton, Ont.	3 completed 950 tons per day
The Atikokan Iron Co., Ltd.	Port Arthur, Ont.	Port Arthur, Ont.	1 completed 100 tous per day

then the production in the Province of Nova Scotia and New Brunswick has ceased. Production in Ontario in 1913 was 195,000 tons; in 1914, 244,000 tons. Of the latter amount, 184,000 tons was shipped to Canadian furnaces and 60,000 exported to the United States. Of the 195,000 tons mined in 1913 in Ontario, Helen and Magpie Mines shipped 22,000 tons, Moose Mountain 3,300 tons, Belmont Mines, Hastings Co., shipping to Port Colborne furnaces.

Imports of ore in 1913 from Wabana (Newfoundland) into Cape Breton were 940,000 long tons. Imported into Ontario from the United States 1,072,156 tons.

Flux.—The total limestone used amounted to 630,000 tons, of which 346,000 tons were imported. Previous to 1896, pig iron was made entirely from Canadian ores. Since that date, however, increased quantities of imported ore have been used, as well as imported fuel and flux, and in 1914 about 94 per cent. of the ore used, 50 per cent. of the coke and 56 per cent. of the limestone was imported.

Steel.—There are four plants with installation of 30 furnaces and four Bessemer converters, having a total capacity of 1,250,000 tons a year. It is improbable that this amount can be exceeded during the coming year by more than 100,000 tons, and it should be borne in mind that 300,000 tons of this capacity is Bessemer steel which is not accepted in the manufacture of munitions. In addition, there are eight or nine steel casting plants, operating either small open-hearth furnaces or converters. The tonnage derived from this source in 1913 was 39,217 tons, when the total production of steel amounted to 1,168,993 tons made by nine companies.

Rolling Mills.—The blooming mill capacity of this country will probably handicap the production of war munitions as much as the shortage in steel ingot capacity.

The table on page 626 shows the production of finished rolled products:

In glancing over the statistics of the industry in view of the present crisis in the affairs of Canada and the Empire, for our present purpose it will be noticed that the industry was of a comparatively slow growth. Very little was done before 1880. There was no cogging mill in the country till 1883.

Electric Furnace Plants

For Ferro Products of Steel

Company.	Address.	Location of Plant	Products
The Electric Reduction Co.	Buckingham, Que.	Buckingham, Que.	Ferro Phosphoros
Electric Metals, Ltd.	Welland, Ont.	Welland, Ont.	Ferro-Silicon
Electric Steel & Metals Co.	Welland, Ont.	Welland, Ont.	Steel Castings
Algoma Steel Corporation	Sault Ste. Marie	Sault Ste. Marie	Ferro-Silicon
The Moffat, Irving Steel Works, Ltd.	Toronto	Toronto	Steel Castings
Tivani Electric Steel Co.	Belleville, Ont.	Belleville, Ont.	Steel Castings

*Idle during 1914.

The first great impetus was given by the iron and steel tariff of 1887, brought down by Sir Charles Tupper, that far-seeing and progressive Canadian, the indomitable fighter, and the Dominion's greatest constructive statesman, who, in the fullness of his days, has so recently rejoined his chief and the other fathers of Confederation. To him full credit should be given for having the faith and the necessary vision to create conditions which led to the foundation being laid upon which our present achievements rest.

With the subsequent changes in import duties there was little further development until the second stage of development commenced at the close of the last century, brought about by the action of the Government in putting in force a graduated system of bounties.

This resulted in large iron and steel enterprises being undertaken both in Nova Scotia and in Ontario, to which we have already referred, with the result that in the latest normal year for which we have complete statistics the production of pig iron was 1,128,967 tons and steel 1,168,993 tons.

It is a melancholy reflection that even in such a banner year as 1913 the iron and steel production of Canada was little more than half the total requirements for the same period.

During 1914, owing to the world-wide depression, which was perhaps even more keenly felt by the iron trade of Canada than of any other country, the output fell off considerably.

Shortly after the outbreak of war, when the British War Office began to look about them for supplies of large types of ammunition, they turned first to the United States, when, thanks to the initiative, energy and courage of the Minister of Militia, General Sir Sam Hughes, Canada was invited to aid in the supply of munitions.

That we were able to do so was due entirely to the fact that in the previous years manufacturers in the older provinces by the sea, where the pioneering work in the iron and steel trade of Canada had been done, were in a position to supply the steel and make the forgings; other manufacturers were able to supply the various component parts. These establishments and other engineering shops the Shell Committee co-ordinated, and thus supplied to the War Office the first order entrusted to them of 200,000 shrapnel shells.

The development of the steel trade of Canada, which made the supplying of these shells possible, later resulted in placing in Canada, between October, 1914, and June 10th of the present year, munition orders alone to the amount of more than $160,000,000 and has provided employment for thousands of workmen, not only in the iron and steel industry, but workers in other metals, and a large army of mechanics, who, so far as can be seen, would otherwise have been without employment.

During the nine months of the present year there has been shipped to Great Britain from Canadian ports more than 4,229,000 shells—about 25 per cent. of which were fixed ammunition. Here perhaps it may be of interest to state that Scotia, who first of the Canadian steel companies undertook to supply shell steel and shrapnel shell forgings, made at their New Glasgow plant in the twelve months ended October 31st last, a total of 2,145,525 shell forgings, more than 20 per cent. of which were of the largest size high explosive shells yet made in Canada.

This munitions work has provided employment for a very large number of workpeople in various walks in life, outside of the iron, steel and closely allied industries. For instance, over 1,000,000 ammunition boxes have been supplied, calling for more than 10,000,000 feet of lumber, while wooden cases for other munition exports have in addition called for more than 25,000,000 feet.

Finished Rolled Iron and Steel, 1895, 1909

Year	Gross tons	Year	Gross tons	Year	Gross tons
1895	66,402	1900	100,000	1905	385,826
1896	75,043	1901	112,077	1906	574,742
1897	77,021	1902	181,485	1907	600,179
1898	90,303	1903	129,516	1908	496,517
1899	110,642	1904	180,038	1909	662,741

Production of Finished Rolled Forms by Leading Products

	1910	1911	1912	1913	1914
Rails	366,465	360,547	423,885	506,709	382,344
Structural shapes and wire rods	80,993	76,617	64,082	68,048	59,050
Plates and sheets, nail plates, merchant bars, tie plate bars, etc.	292,353	344,760	373,257	392,340	218,125
Total gross tons	739,811	781,924	861,224	967,997	659,519

Steel Furnaces and Rolling Mills

Company.	Address	Location of Plant	Products.
The Nova Scotia Steel & Coal Co., Ltd.	New Glasgow, N.S.	Sydney, C.B.	Ingots, billets, plates, sheets, bars, rail joints forged products.
The Nova Scotia Steel & Coal Co., Ltd.	New Glasgow, N.S.	Trenton, N.S.	
The Dominion Iron & Steel Co.	Montreal, Que.	Sydney, C.B.	Castings, ingots, billets, rails, wire rods, bars and rods, nails, wire products.
Canadian Car & Foundry Co., Ltd.	Amherst, N.S.	Amherst, N.S.	Bars and rods.
The Portland Rolling Mills, Ltd.	St. John, N.B.	St. John, N.B.	Bars.
Can. Steel Foundries, Ltd.	Montreal, Que.	1630 Longue Point, Que.	Castings.
Can. Steel Foundries, Ltd.	Montreal, Que.	P. St. Charles, Que.	
The Steel Co. of Canada, Ltd.	Hamilton, Ont.	Montreal, Notre Dame St. West	Billets, plates, bars, rods, nails, wire.
The Steel Co. of Canada, Ltd.	Hamilton, Ont.	Montreal, St. Patrick St.	Plates, sheets, bars, rods, spikes.
Beauchemin & Fils, Ltd.	Sorel, Que.	Sorel, Que.	Castings.
Joliette Steel & Iron Fdry., Ltd.	Joliette, Que.	Joliette, Que.	Castings.
Canadian Rolling Mills Co., Ltd.	Montreal, Que.	Montreal, Que.	Bar iron and steel.
Hull Iron & Steel Fdys., Limited	Hull, Que.	Hull, Que.	Castings.
Grand Trunk Rolling Mills	Montreal, Que.	Montreal, Que.	Bars.
Armstrong-Whitworth of Canada, Ltd.	Montreal, Que.	Longueuil, Que.	Ingots, high-speed and crucible steel.
Peck Rolling Mills	Montreal, Que.	St. Paul	
Dom. Steel Foundry	Hamilton, Ont.		Castings.
The Steel Co. of Canada	Hamilton, Ont.		Castings, ingots, billets, blooms, wire rods, rods and bars, spikes.
The Steel Co. of Canada	Hamilton, Ont.	Belleville, Ont.	Bars and rods, spikes.
Burlington Steel Co., Ltd.	Hamilton, Ont.	Sherman Ave., Hamilton	Bars and rods.
Superior Rolling Mills Co.	Ft. William, Ont.	Ft. William, Ont.	
The Moffat, Irving Steel Works, Ltd.	Toronto, Ont.	Toronto, Ont.	Castings (electric).
Castings of Ottawa, Ltd.	Ottawa, Ont.	Ottawa, Ont.	Castings.
The William Kennedy & Sons, Ltd.	Owen Sound, Ont.	Owen Sound, Ont.	Castings.
Provincial Steel Co.	Cobourg, Ont.	Cobourg, Ont.	
Can. Steel Foundries, Ltd.	Welland, Ont.	Welland, Ont.	Castings
Electric Steel & Metals Co., Ltd.	Welland, Ont.	Welland, Ont.	
Algoma Steel Corp.	S. Ste. Marie, Ont.	S. Ste. Marie, Ont.	Billets, blooms, rails, fastenings.
Swedish Crucible Steel Co. of Canada, Ltd.	Windsor, Ont.	Windsor, Ont.	Castings.
Manitoba Rolling Mills Co.	Winnipeg, Man.	Winnipeg, Man.	Bars.
Alberta Rolling Mills Co.	Med. Hat, Alta.	Med. Hat, Alta.	Muckbars.
The Redcliff Rolling Mills & Bolts Co.	Redcliff, Alta.	Redcliff, Alta.	Bars.
Swedish Crucible Steel Co. of Canada, Ltd.	Windsor, Ont.	Windsor, Ont.	Castings.
Manitoba Rolling Mills Co., Ltd.	Winnipeg, Man. Box 2904	Winnipeg, Man.	Bars
Alberta Rolling Mills Co.	Medicine Hat, Alta.	Medicine Hat, Alta.	Muckbars.
The Redcliff Rolling Mills & Bolts Co.	Redcliff, Alta.	Redcliff, Alta.	Bars

The grain crop of Canada—the largest she has ever harvested—is now slowly filtering into transportation channels for shipment to Britain. Other agricultural products are also being turned into cash, but during the past spring and summer, while the crops were growing, Canadian exports increased in volume at a rate never before experienced in the history of the country, and largely as a result of the embarkation of this country in the supplying of munitions, due primarily and possibly only, because Canada had built up a steel industry, relatively small, it is true, but sufficient for the moment, and this because some Canadian statesmen and the pioneers of the industry had builded better than they knew. The Dominion will during the next fifteen months probably export to Great Britain munitions aggregating in value not less than two hundred and possibly three hundred millions of dollars, fully eighty per cent. of which will be wholly the product of Canadian labor—coal miners, iron and steel workers, machinists, and others working in the engineering shops of the Dominion.

We have spoken of the volume of this munition work as being between $200,000 and $300,000,000. This is a wide variation. The uncertainty in regard to the amount resolves itself into a question of Canada being able to obtain either from her domestic furnaces or elsewhere sufficient steel for shell forging, for there is no doubt that the engineering shops of Canada can overtake the assembling and finishing of shells of the value of more than $300,000,000 if the steel can be secured.

Steel Ingot Production

The year 1913 marked the greatest production of steel ingots by Canada in that country's history, when the total output of all the furnaces in the Dominion was 1,048,538 tons, while during the year 1914 the output dropped to 775,000.

Little has been added to the steel production capacity of the Dominion since the close of 1913, and it is doubtful if Canada during 1915 will even by straining all its resources produce 1,100,000 tons.

Assuming new equipment is added, as it probably will be, to a moderate extent, we may, therefore, look for under the most favorable conditions a total output of not more than, say, 1,250,000 tons of steel ingots.

Turning now to the United States, an extraordinary situation at present prevails. Never in the history of that country has the demand been so great. Difficulty in securing steel of every description has developed rapidly during the past few weeks, and there are at present many signs of excitement in the iron and steel trade.

During the month of October last the United States production of pig iron for the first time on record exceeded 3,000,000 tons (i.e., 3,125,491), exceeding that of September of this year by more than 95,000 tons, and being almost double that of the corresponding month of 1914, when the daily output was 51,000 tons.

The amazing consideration is that, while the United States to-day is producing pig iron at the unprecedented rate of 37,500,000 tons a year, prices are advancing daily. The advance in prices in the first week of November was 50 cents a ton on coke iron and $1 a ton on charcoal iron, while basic iron has during the year advanced from $12.50 to $15.80 a ton.

Demand For And Price of Steel

So far as steel is concerned, the demand and increase in price is even greater than in the case of pig iron. Indeed, the situation is unique as regards price of finished steel, and at present it is difficult to find a seller who can make deliveries.

Eastern and Western mills are alike congested with business, and in but a few cases it is possible to find mills having any open capacity.

Plate mills are filled up with car, locomotive and shipbuilding tonnage. The railways, which were almost entirely absent from the market for many months past, have recently given out orders for a large quantity of rails, while about 300,000 tons, it is understood, have been booked for export within the coming two months to Russia.

During October the American railways also bought more than 27,000 cars, and probably more than 10,000 have been booked for export to the Russian Government.

As regards steel plates, the increase in price and difficulty is even greater, and the suggestive fact is that, notwithstanding these great advances in price, it has failed to shut off demand in the least, and in most lines it is not now a question of price, but where to find a mill that will undertake to guarantee deliveries. While the situation as regards structural steel is grave, it is in forging billets that the situation is most acute.

Steel bars in November, 1914, sold in Pittsburg at $1.10, while in November of the present year the price was $1.50, or a 36 per cent. advance; while in forging billets the difference was much greater, the figures being $25 and $42 respectively, or an advance of 68 per cent. Indeed, high carbon steel sold in large quantities at previously unheard-of prices, even during the closing days of October, orders aggregating more than 60,000 tons of high carbon forging. Billets were reported as placed at prices as high as $56 per ton, Pittsburg. Further, it is stated that the British and Allied requirements for high carbon shell steel alone—which are now becoming insistent—will total up the enormous figures of 20,000,000 tons.

It is, therefore, clearly evident that Canada and the United States will, during the coming year, face a steel famine unprecedented in the history of this continent.

The outcome will be as interesting as it will be far-reaching, and it will probably interfere more or less effectively with some of the profits so easily shown on paper as capable of being earned by munition plants yet unbuilt and dependent upon actual iron and steel producers for their raw material.

It should also provide a moral to the country at large to build up what is one of the most fundamental national assets—a strong, well-rounded and self-dependent iron and steel industry.

This article was prepared in the first instance for presentation before the Montreal Metallurgical Society, and the name of its author is sufficient guarantee not only of accuracy of detail, but of painstaking thoroughness in tracing the Canadian iron and steel industry from its inception up to date.

INDUSTRIAL PEACE PREVAILS IN CANADA

A SITUATION which promised for a time to become serious has been brought to an amicable close by a notification from the Canadian Northern Railway to the Labor Department at Ottawa of the company's acceptance of the findings of the Conciliation Board, which recently passed upon the dispute with its locomotive enginees and firemen. As a result of this finding, employees on the Eastern Lines of the C.N.R. system secure considerable benefit in wage rates and conditions.

The acceptance of the award by the railway company leaves the industrial situation in Canada peaceful beyond all precedent during the fifteen years covered by the Labor Department records. Not one strike is reported as existing from sea to sea, and there is no indication of sehious friction at any point, although Conciliation Boards at the moment exist at St. John, N.B., where the 'longshoremen are negotiating a new agreement with the ship-owners; and at Edmonton, where the street railway men are seeking a new agreement with the municipality.

Work continues peacefully at both points pending the investigations, and, as the dispute in neither case presents any serious difficulty, there is every reason to suppose the various boards will be able to effect working agreements.

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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Technical Journal devoted to the Foundry and Metal Industries.

PETER BAIN, M.E., Editor.

B. G. NEWTON - - - - Advertising Manager

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THE NEW YEAR OUTLOOK

WITH the opening of the New Year and the anticipation of another twelve months of war in Europe, it may be said that the activities of metal-working plants generally continue at high pressure. So far as steel mills are concerned, this is especially true, and all indications point to a similar, if not more intensive set of conditions for several months to come. The development of a widespread domestic demand, both here and in the United States, is responsible in large part for the prolonged, into-the-future, abnormal activity.

A feature worth noting is the sustained effort being put forth by Great Britain to become self-contained to the fullest extent possible, not only in the production of war munitions as regards the raw, semi-finished and finished materials entering therein, but also in the matter of the equipment for their manufacture. What is true of munitions is equally true regarding every class of import, and while doubtless those under the wing of her Empire will be given opportunity while opportunity lasts to furnish the work of their craftsmen as well as the flower of their manhood in order to carry the struggle to its only logical conclusion, the time is imminent, yea is here, when we should begin to cast about for war-created opportunities of peace-time trade and commerce.

For the first time in many months, the note has been sounded that the machine tool demand is at least swinging back to normal; it is therefore incumbent on those developing along such a line to proceed discreetly. Shell orders for Great Britain and her Allies are likely to dwindle both in number and extent so far as the United States is concerned in the near future, and while an equivalent of or even more than what has already been placed in Canada may continue on tap for the greater part of this New Year, every day is bringing the lessening and closure of even our opportunity more imminent.

Live interest is already being displayed by engineering firms of every size and type in Great Britain as to what is going to happen when the manufacture of war munitions ceases. How much interest is Canada displaying relative to her position in the like circumstance? We have increased our production capacity enormously, and have given it unstintingly for the prosecution of the war. Should we not, right now, set about preparing to utilize every unit of it with the equally unstinting, equally intelligent, and equally energetic desire towards the accomplishment of peace-time commercial and manufacturing achievement?

We are not of those who expect much Government assistance or co-operation, on the latter's own initiative at least, it is therefore up to our manufacturers—our metal-working plants, to get together in one united body, in addition to planning and charting an individual course of action, and make offer to help or co-operate with the Government toward the desired end, and if the latter be recalcitrant or indolent, then set about "firing" it. It has been very aptly said that "mere grumbling submission is, in a democratic State, an evasion of duty, and deserves to be penalized for the benefit of more active sections who know what they want and how to get it."

Independent action by our large industrial corporations might produce satisfactory results so far as they only are concerned, but to ensure all-round participation and general national prosperity arising out of our new capacity plant activity, the numerical as well as the financial backing of the whole, with or without Government co-operation, becomes absolutely necessary. Under the circumstances and in view of the opportunities available, we should be ashamed to even suggest the scrapping of any part or unit of our now well-equipped plants.

EXPORT OF STEEL AND IRON SCRAP

A CONSIDERABLE outburst of feeling is in evidence among steel mill interests in the United States, relative to the embargo which has been placed by Canada on the export of steel and iron scrap; the embargo having become effective on December 27, last. Little exception is taken to the enactment so far as iron scrap is concerned, but, as regards steel, the situation has, we believe, become so serious that steps have already been taken at Ottawa and in the United States, looking to relieving the situation.

It is claimed by those representing the United States mills that as quite a considerable percentage of the steel billets for shell manufacture in Canada are of American production, the scrap of same should be made available to American mills, and just how much is involved, due to the embargo, may be gathered from the suggestion which has been mooted, that the United States mills reduce their billet shipments correspondingly in retaliation. The latter course is for us naturally highly undesirable, and while there has doubtless been some good reason behind the embargo enactment, its continuance should not be allowed to hinder in any respect our production of munitions to the very highest limit of our forging and machining capacities. We look for an early and satisfactory understanding between the various interests concerned.

HONORED BY OUR KING

THE New Year Honors distributed by His Majesty the King, have, on the present occasion, not only been comprehensive in scope as far as Canadians are concerned, but they have the added feature of being for the most part demonstrative to an unusual degree of personal worth and achievement relative to their recipients.

The work and worth of such men as Sir Thomas Shaughnessy, president of the C.P.R.; Hon. W. T. White, Dominion Minister of Finance; Collingwood Schreiber, railroad engineer; John Kennedy, harbor engineer, and Brig.-Gen. Alexander Bertram, deputy chairman of the Imperial Munitions Board, have long been recognized and appreciated within and beyond our own borders. The engineering profession, as will be noted, is particularly prominent in our list.

All of the recipients of His Majesty's favor are well advanced in years, with the exception of Sir W. T. White, K.C.M.G., notwithstanding, we not only offer to each and all our hearty congratulations on the Honors bestowed, but trust that they may be long spared to go in and out amongst us in usefulness and in exemplification of good citizenship.

Review of the Past Year's Steel, Iron and Metal Markets

Staff Article

Prosperity is rampant so far as the production of steel and iron is concerned, and, only in some lesser degree does a like condition exist relative to the more prominent metals. Prices of all may be said to have pyramided to extreme heights, and, while in a number of instances some recession has taken place, it will be found that the upward trend continues general.

IRON AND STEEL

THE conditions prevailing in the iron and steel trade at the close of the year 1915 are the most extraordinary that have ever been experienced in the history of the trade in Canada. At the begining of the year business was dull, and only the most optimistic expected any great improvement, the basis for the latter being the possibility of increased export business to markets hitherto largely supplied from Germany. A hope was generally expressed that Canadian steel companies might be able, by means of a great effort, to capture some of the foreign business likely to develop as a result of the war. As events turned out, the business came to Canada, but in a rather different form than was anticipated. There still remains, however, the possibility of hopes being realized, and Canadian steel companies may be successful in the open market for such products as they can manufacture when the war is over.

Munition Demand the Main Factor

The cause of the present unparalleled prosperity in the steel trade is, of course, the enormous demand for munitions. It was not, however, until about the middle of July that the advance in prices of raw and semi-finished materials began, although for some months previously a large number of shells had been made and the output of steel had been increasing. The mills at the beginning of the year were quiet, and were thus in a position to handle a considerable tonnage without much difficulty, and by installing forging presses were able to meet the demand for shells for some time. Eventually the need for munitions became so urgent that the mills were soon operating at capacity, and have since been obliged to make large extensions to their plants. During the first half of the year business was gradually working up to a normal condition. After that, with the heavy increase in demand for munitions, came the extraordinary activity in the trade which still exists. The need for steel has become so great that Canadian mills cannot supply the demand, and a considerable tonnage has been imported from the States.

Steel Famine Possible

With a shortage of steel, it was obvious that prices would advance, and since July the market has been gradually rising, until prices have reached a level never before attained in this country. The close affinity between this market and that of the States has been clearly demonstrated during the year, and higher prices at Pittsburg have at all times been followed by an equivalent advance here. About the middle of November there was an important development in the steel trade, when the United States Steel Corporation withdrew prices on steel bars for Canadian consumption. This action was taken on account of the inability of the mills to fill orders or make any definite promise of delivery. Existing contracts were filled, but no new business was solicited. For some time previous to this, the mills in the States had been booked up with orders for tonnage from Europe, and had been rapidly getting behind on deliveries.

Activity in Futures

At the present time orders are being taken for delivery into the second half of 1916, and this activity in futures is almost entirely owing to the heavy demand for munitions. As long as present conditions prevail in the steel trade in the States there is pratically no possibility of the Steel Corporation resuming their former connection in this market. The result of this may be serious, as it is estimated that Canada imports about half its steel requirements from the States, and with the demand increasing all the time, it follows that a serious shortage may develop. The rapid increase in prices of billets is another indication of the shortage of steel. In less than six months Bessemer and open-hearth billets have advanced about $10 per ton, while forging billets have doubled in price.

High Prices General

The effect of the high price and scarcity of steel has been widespread, and the natural result has been an increase in cost of finished steel products covering a wide range. Sheets and wrought iron pipe are two lines which have been affected, and have been gradually advancing for some months. All lines of bolts, nuts and rivets have advanced, while higher prices for boiler tubes and boiler plates have been recorded on more than one occasion. In fact, all steel products have advanced and there is every indication that higher prices will yet prevail. Another feature which has an almost immediate effect on prices was the increase of 7½ per cent. in the tariff last March. The market had, however, become adjusted to the new conditions before the upward movement started in July, and the increased tariff was almost forgotten in the excitement which followed later.

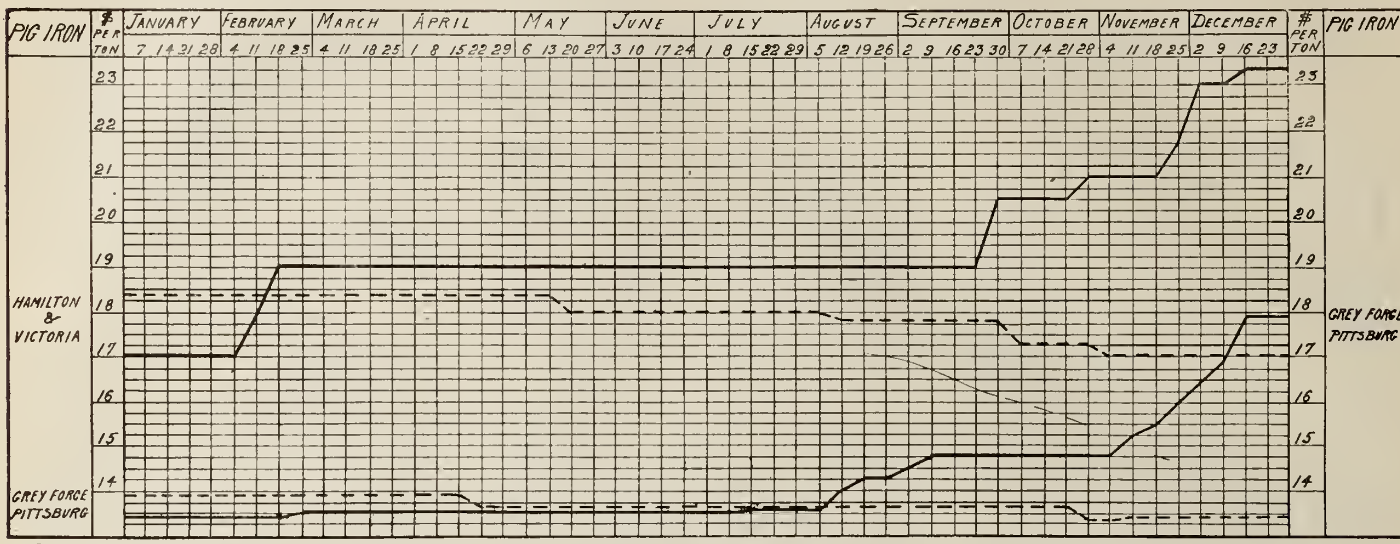
Domestic Purpose Steel

The demand for steel for domestic requirements has been for the most part light, although there has been some improvement in this regard during the second half of the year. Factory and shop extensions have created some business in small shapes, but the building trade generally has been dull. The financial stringency during the entire year has seriously affected the building trade on account of the high rates of interest charged on loans and the uncertainty as to future developments. A certain lack of confidence has been noticeable, more especially during the early part of the year, and the general contraction in ordinary business and decrease in values were not calculated to improve conditions in the building trade or develop interest in building propositions.

The difficulty of raising money has made it necessary for municipalities to exercise rigid economy on civic works. There has, therefore, been comparatively little cast iron or steel pipe laid down this year. Railways have reduced their maintenance expenditure to a minimum and track extensions have been very much curtailed. The demand for rails and other steel products used in railway construction and equipment has, therefore, been considerably less than in normal times. The steel companies have not felt the loss of this business this year as they did during 1914, as their plants have been turned over almost entirely to the production of steel for munitions. One steel plant, in addition to a large munition business, has rolled a large quantity of wire for military purposes.

Steel Plant Extensions

A feature of the present boom is the large extensions which practically all the steel companies have made to their plants. These extensions have cost large sums of money, for in addition to the buildings, open-hearth furnaces and rolling mills have been installed with all the necessary and costly equipment. The Dominion Steel Corporation, the Nova Scotia Steel & Coal Co., and the Steel Company of Canada have all incurred heavy expenditures in extending their plants to meet the enormous demand for steel for munitions. These concerns have also installed heavy type forging presses for the production of shell cases. The Algoma Steel Co. was for some time very busy on rail orders, but latterly has also been engaged on the production of steel for sheels. During the year an industry closely associated with the steel trade was established in Hamilton, Ont., for making galvanized sheets. The concern in question, the Dominion Sheet Metal Co., installed a plant for galvanizing sheets, the first plant of its kind to be operated in Canada.



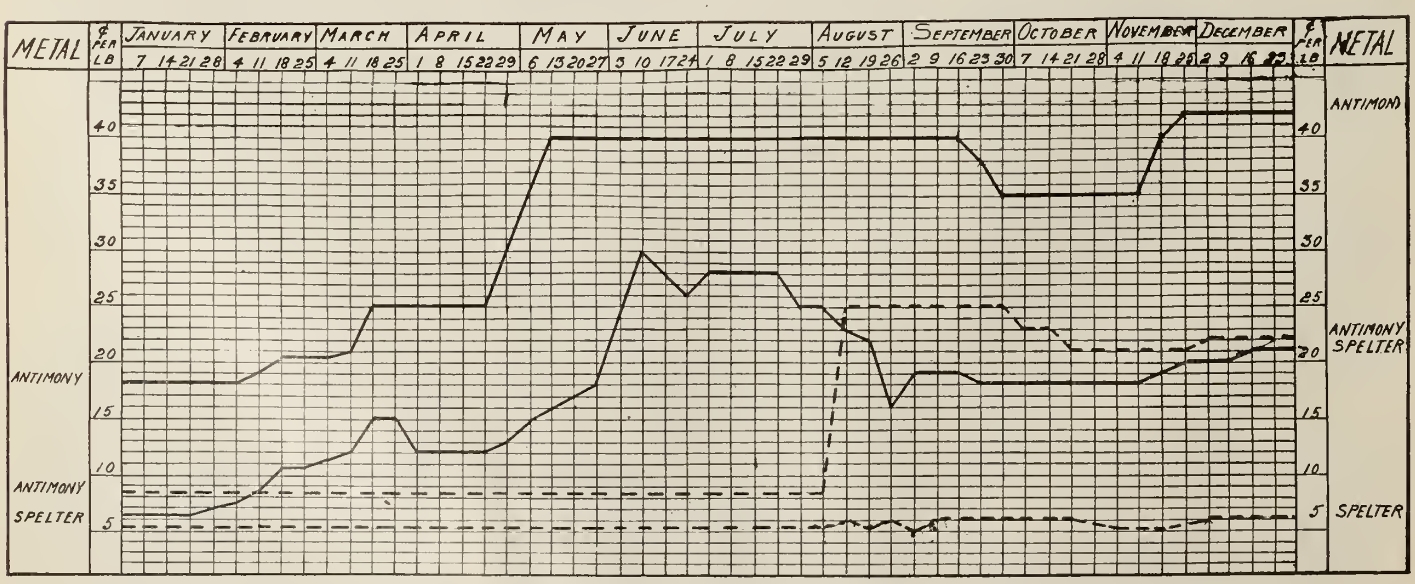
PRICE FLUCTUATIONS OF CANADIAN AND AMERICAN PIG IRON DURING 1905. DOTTED LINES SHOW 1914 PRICES.

Judging from appearances, there is every probability of the present era of prosperity being continued for several months yet. How long it will last depends entirely upon the duration of the war. It is reasonable to suppose that while the war lasts the steel trade will be active; what will happen after that is a matter of conjecture. It is to be hoped that the Canadian steel companies will be able to extend the scope of their business and participate in the large demand for steel products that it is generally believed will exist in Europe after the war and during the period of reconstruction. From a financial standpoint the steel companies have made large profits and are in a sound condition. This should go a long way towards helping them to extend their connections, and enable them to lay down plants for making products which have not heretofore been made in Canada.

METALS MARKET

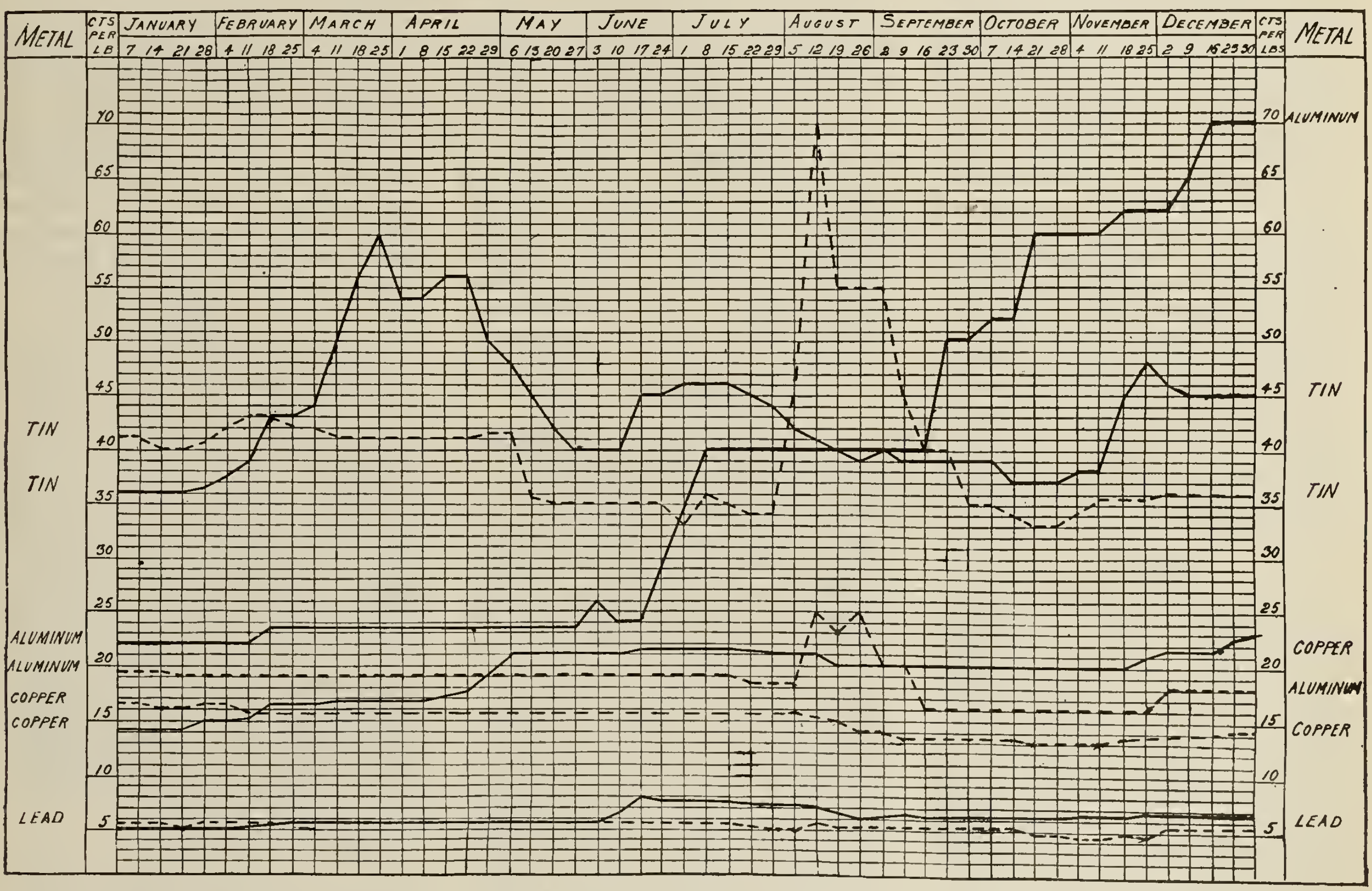
THE metals market has during the entire year been very much influenced by war conditions. This is naturally what might have been expected, but it is doubtful whether at the beginning of 1915 any among those interested anticipated such fluctuations as developed in the succeeding months. The enormous demand for munitions alone eventually became far greater than was expected, and, therefore, a correspondingly heavy consumption of metals for their manufacture resulted. The metals particularly affected were copper, lead, antimony, and spelter. Copper and lead did not fluctuate to the same extent as the others mentioned, because production was increased to take care of the consumption, and there was never at any time any marked scarcity. Antimony at the beginning of the year was at a high level, but, as supplies became very scarce, the price advanced to more than double the figure prevailing in January. The spelter market has been very erratic, and speculation has on more than one occasion driven prices upward. The usual recession followed, thus causing many and wide fluctuations.

As in the previous year the tin mar-



PRICE FLUCTUATIONS OF ANTIMONY AND SPELTER DURING 1915. DOTTED LINES SHOW 1914 PRICES.

ket has been erratic and a wide range of prices has been the logical result. Tin has been affected by the war, but not in the same sense as copper or antimony. The tin market was affected more by the possibility of supplies being unobtainable rather than any extraordinary demand. The aluminum market for some months was very steady, but about the middle of the year a scarcity of this metal began to be experienced. This has affected the market more and more, until the price at the end of the year has reached three times what it was at the beginning. The close of the year finds producers extremely active. Many old refining plants have been requisitioned and more modern plants have been extended to take care of the demand. In many cases old workings that ceased to pay are in operation.



PRICE FLUCTUATIONS OF TIN, ALUMINUM, COPPER AND LEAD DURING 1915. DOTTED LINES SHOW 1914 PRICES.

Tin

During the latter part of 1914 the tin market was affected by the loss of cargoes at sea, some ships being sunk by enemy cruisers. This year there has been no recurrence of these conditions, but the market has fluctuated considerably, especially about the end of March, when the highest level was reached. In the early part of the year the British Government placed an embargo on tin shipments, except under very stringent conditions. This at the time unsettled the market, especially in New York, as it had a tendency to delay shipments and also create uncertainty as to the obtaining of sufficient quantities. The market on this account was very firm for a while and prices high. The situation in time became considerably easier and the market steadier. The trade routes from the East have been open all the year, and shipments of tin have been coming forward regularly, until now stocks on hand are amply sufficient to meet the demand. Some excitement was caused about the end of November when an unfounded rumor to the effect that the Suez Canal had been closed caused a sharp advance, but the market soon weakened and prices dropped.

It must be admitted that there is a possibility of the canal being closed for military reasons, in which case shipments of tin would be delayed from three to four weeks coming round by the Cape. Such a contingency, however, would not seriously interfere with spot supplies, but would no doubt cause prices to jump up, especially if the market was at all nervous. Considering the conditions prevailing last January the market was not particularly high, and during the whole of that month was steady at 36c. During the month of February prices advanced to 43c and by the end of March had jumped to 60c, the highest level of the year. The market at the time being largely speculative, and with no backing, prices soon began to decline and by the end of May tin was being quoted at 40c per pound. Towards the end of June the price again advanced to 45c, and in July to 46c, afterwards gradually falling to 39c, this level being practically maintained until early in October, when it fell again to 37c. During November the Suez Canal scarce caused another sharp advance to 48c which was followed by a steady decline, finishing the year at 45c.

Copper

Copper, being one of the most important metals used in the manufacture of munitions, has naturally attracted considerable attention during the year. The market has, considering the conditions prevailing, been remarkably steady, registering a range of only seven points for the entire year. As the year progressed, the consumption increased until eventually all records were broken and production reached the highest point ever. The position of copper has been a particularly strong one throughout the year, and there is no doubt but that it will be maintained while the war lasts. The copper situation was for a time unsettled, as being a contraband of war, supplies which had hitherto been going to Germany through neutral countries were eventually stopped by the British Government making certain arrangements with those countries. The market was in consequence affected, as several important shipments were held up pending decisions of the British Prize Court established for the purpose of dealing with contraband cargoes captured at sea. In time the situation was straightened out, and there has been little trouble recently from this source.

At the beginning of the year the price of copper was just over 14c. The market soon became stronger and the price advanced gradually. About the middle of April the price rose rapidly, and early in May, 20c was reached. Towards the end of June the market advanced to 20½c, and this level was maintained until the end of July, when it dropped back to 20c, and again about the middle of August to 19c. This level was maintained until the end of November when the market became stronger, and prices gradually advanced to 21½c which level was maintained until the end of the year. The market finished the year firm with every prospect of higher prices at the next buying movement. An interesting feature in the copper market during the year has been the decision of the Canadian Government to assist in the development of copper refiners in Canada. A special commission was appointed to investigate the possibilities of operating refineries on a commercial scale. Success in this direction will help in no small measure to lower the production cost, as hitherto practically all copper mined in Canada has had to be refined in the States.

Spelter

The market has been very unsettled for the greater part of the year, and has been influenced largely by speculation. There has been a very heavy demand for spelter for munitions but consumption fell off for ordinary uses. The high price of spelter has seriously affected several trades, particularly galvanized sheets, some makers having practically withdrawn from the market on this account. Outside of the United States, the principal sources of supply were Belgium and Germany. With no spelter coming from either of these countries, the demand centred on the States with the result that the mines there have been extremely active, and the industry has been booming. Zinc ore, a few months ago reached the unprecedented price of $100 per ton at Joplin, Mo., and later touched $110 per ton. A record such as this indicates to some extent the effect which the war has had on this industry. Notwithstanding the heavy consumption of spelter there has been nothing to warrant the sharp fluctuations that have taken place, the market having on more than one occasion run wild. The high price of primary spelter, the grade used in making cartridge cases, did not affect the general situation to such an extent as the high cost of the lower grades, the letter being used in industries where the cost of spelter is an important consideration.

The price at the beginning of the year under review was practically normal but it did not stay long at that level. At the end of January it began to advance. and by the end of March spelter was quoted at 15c. A sharp decline to 12c followed, and the market was steady until the end of April, when it strengthened and the price again advanced sharply, touching 30c in the middle of June, the highest level attained during the year. A sharp reaction occurred, and the price fell to 26c at the end of June, but the market recovered immediately, advancing to 28c, where it remained until the end of July. The market then suffered a sharp break and prices tumbled until the end of August when a 16c level was reached. The price jumped back to 19c during September, and then dropped one point to 18c, where it remained until the middle of November. At the beginning of December, the market was firm at 20c, and about the middle of the month advanced to 21c, which quotation was maintained until the close of the year.

Lead

An enormous quantity of lead has been consumed during the year largely in the manufacture of munitions, but with the exception of a sharp fluctuation in June, the market has been very steady. The position of this metal has been generally a strong one. As the consumption increased so did production, and conditions have been for some time fairly well balanced. The control of the market by the "Trust" in New York, has been an important factor in the stability of lead. "Independent" quotations being usually pretty close to the "Trust" figures. The price of lead is now higher than the average for any year since 1907, but considering the conditions prevailing, this is only what might be expected. As will be gathered from the above there is nothing of particular importance to note with regard to price fluctuations. An advance from 5c to 6¾c during the greater part of the year with a sharp advance to 8c in June were the principal features.

Aluminium

The increasing utility of aluminium has been clearly demonstrated during the year just closing. The demand for this metal has been out of all proportion to the supply as it is being used to a large extent in the manufacture of war equipment. The aluminium produced in Great Britain is being entirely absorbed in that country. The output in the States is controlled by a "Trust" who also have properties in Canada, and the total aluminum production in the States and Canada for 1915, has been estimated at about 50,000 tons or nearly double that of 1914. At about the half-year a scarcity of aluminum developed which became more acute as the year progressed. The market consequently became very strong and prices have been more or less nominal.

The average price of aluminum during 1914 was about 18½c per pound. At the beginning of 1915 the price was 22c, not particularly high considering that the war had been in progress about five months. The market was comparatively steady until early in June when it began to move and advanced about 2½c to 26c, reacting immediately to 24c. The real movement began about the end of that month when the price jumped to 40c, staying at that level until the middle of September. The scarcity of aluminium then became serious, it being practically impossible to get the metal. Prices consequently continued to advance rapidly until a range of 65c to 70c was reached about the middle of December which level has since been maintained.

Antimony

The position of antimony has of course been greatly affected by the war, as large quantities of it have also been used in the manufacture of munitions. In fact so great was the consumption of this metal that a scarcity developed early in the year, and prices naturally advanced to unprecedented levels. English antimony has been off the market for several months and the British Government early in the year assumed control of that market. This action was taken in order to secure and conserve the supply. Large quantities of antimony are being shipped from China and Japan, while in the States the industry has recently developed, and antimony is now being obtained from American ores.

A glance at the diagram will show clearly the big advance which antimony has made during 1915, the average price in normal times being about 8c to 9c per pound. At the beginning of this year antimony was quoted at 18c, a little better than the highest monthly average for 1914. The market began to move early in February, and climbed steadily to 25c at the end of April, jumping up to 40c in the middle of May. The market remained steady at this level until the middle of September when it weakened, the price dropping to 35c at the beginning of October. This level was maintained until the middle of November when the market became stronger and prices advanced to 42c in the latter part of the month. Since then the market has shown a weaker tendency but prices have been maintained at the above level.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

METAL POLISHING

METAL polishing operations are usually known as roughing, dry fining, and finishing or oiling. The abrasive used for roughing usually runs from No. 20 to No. 80, for dry fining from No. 90 to No. 120, for finishing from No. 150 to No. 65 F. For the first two operations, roughing out and dry fining, the polishing wheels should be used dry. For finishing, the wheels are first worn down a little, and then tallow, oil, beeswax and similar substances are used on the wheels. This third operation is sometimes known as "greasing." Sufficiently good finish is frequently secured by the dry fining operation, where the wheel is covered with charcoal and smoothed down with a piece of flint. Most polishers keep a lump of pumice stone handy to clean the greased wheels or remove the glaze from finishing wheels

Polishing Wheels

A few years ago, wooden wheels covered with leather and turned to fit the piece to be polished were almost universally used. At the present time, the wooden, leather-covered wheel is used largely on flat surfaces and on work where it is necessary to maintain square edges. When this kind of wheel is made with a double coating of leather it becomes a good finishing wheel.

Compressed wheels or wheels having a steel centre and made with surfaces of leather, canvas or linen, are used largely on cutlery and for polishing chilled plows. The compressed wheel is of strong construction, is durable, and easily kept in balance.

Where a high-grade polish is required, there is probably no wheel which can compare with the wheels made of walrus. These are largely used on guns, pistols and cutlery. As walrus, or sea-horse, wheels are expensive, most concerns buy the hides and make their own wheels.

Polishing, according to the dictionary, is "to make smooth and glossy," but in the practice of most trades, this operation is divided into three general divisions—grinding, polishing and buffing. In trade terms, polishing is the operation by which coarse scratches or tool marks or, in some instances, the rough surfaces, left after forging, rolling and similar operations, are removed and a smooth finish secured. To secure such a smooth surface or a bright finish, polishing is distinctive in its purpose from that of modern grinding, which is to remove material and thus change the size and shape of the work.

Buffing is usually supplementary to polishing and produces a "grainless" finish—that is, free from noticeable scratches. Polishing wheels of several kinds are in use among the different trades. Another common form of polishing medium is a belt made of leather or canvas. The wheels and belts secure their polishing properties by being coated or "set up" with glue abrasive.—Grits and Grinds.

PROTECTION AGAINST CORROSION

PROTECTION against corrosion is most difficult in the case of quantities of small-size articles. A method which has been giving first-rate results in the case of buckles, rings, and harness fittings generally may help to solve this vexed question elsewhere. Cheap varnish is diluted to two or three times its volume with methylated spirits. On account of evaporation, the mixture is made up as required. The apparatus consists of two oil drums each minus one end. An ordinary 5-gallon drum, which is 11in. in diameter, has ½in. holes punched in the bottom and sides. The other drum may be of 6¾-gallon capacity, of 12-in. diameter, or a 10-gallon drum. The larger vessel is filled about one-quarter full and the articles to be treated put in the smaller vessel. The perforated drum is lowered into the liquid, immersing the articles to be coated. Withdrawing the smaller vessel immediately, the major portion of the fluid drains back again in a minute or so. To finish draining and to harden the coating, the contents are then shot out on a wire draining surface, and in fifteen minutes are ready to pack. The process is really a cheap and effective form of cold lacquering in bulk. The articles remain bright for long periods of time, while the coating is not in the least obvious.

AMERICAN ELECTRO-PLATERS' SOCIETY. TORONTO BRANCH.

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Secretary—Ernest Coles, P.O. Box 5, Coleman, Ont.

Treasurer — Walter S. Barrows, 628 Dovercourt Road, Toronto.

PLACE AND DATES OF MEETING.

The Occident Hall, corner of Queen and Bathurst Streets. Fourth Thursday of each month, at 8 p.m.

THE BONTEMPI RUST-PROOFING PROCESS

AN addition to the number of rust-proofing processes is announced in an English contemporary. According to the information so far published, the process consists in the oxidizing of cast and wrought iron and steel pieces used in civil, mechanical, electrical, and naval engineering work, thus rendering them able to withstand for a practically unlimited period the corrosive action of the atmosphere, of water, and of sulphurous and other gases.

The pieces to be treated are first cleaned by means of emery paper or by sand blasting. They are then placed on a kind of steel-wire cage; this is driven inside an air-tight muffle which has been previously heated by means of gas jets. When the muffle has been closed in front, after insertion of the pieces to be treated, superheated steam is delivered inside the muffle, with the object of preparing the surfaces of the pieces for the subsequent action of chemical fumes. After the pieces in the muffle have been subjected to the action of the superheated steam for about 30 minutes, the delivery of steam is cut off, and the chemical substance, in the form of a powder, is placed in a separate retort at the back of the muffle. The retort is heated separately, also by gas-jets; the fumes from the chemical powder enter the muffle under pressure, and give the pieces under treatment a protective coating of oxide. On the cage being removed from the muffle, it is covered by a casing, to allow of the gradual cooling of the pieces under treatment.

The pieces so treated, on being removed from the muffle, are of a light grey color, and in that state they are practically non-corrosive in any medium; whilst they are still hot, they are dipped in oil, with a view to render them of a more attractive rich blue-black color. If required, the material so treated can be painted; the paint is more adhesive on treated than on non-treated material. The chemical used is non-poisonous and non-explosive.

The process described has been invented by Augusto Bontempi, an Italian chemist, and is being operated by the British Bontempi Rust-Proofing Company, Ltd., Creek Street, Deptford, London, S.E., which has acquired the British and British Colonial patents.

PLATING ALUMINUM WITH NICKEL

AN apparently successful method of plating aluminum with nickel is described in a recent number of the Bulletin de la Societe d'Encouragement pour l'Industrie Nationale, by J. Canac and E. Tassilly. The process permits the direct deposition of nickel on aluminum in an adherent form. The metal is cleaned by passing it through a bath of boiling potash and then scrubbed with milk of lime. After soaking in a bath of 0.2 per cent. potassium cyanide for several minutes, it is submitted to the action of an iron-hydrochloric acid bath. 500 parts HCl, 500 part H_2O and one part iron, until the metal takes on a certain appearance described as metallic "watering." It is washed with water after each of these operations.

The formula found satisfactory for nickel plating is:—Water, 1,000 cu.c.; nickel chloride, 50 grams; boric acid, 20 grams. The current is 1 amp. at 2½ volts. The plated metal is said to have a pleasing soft gray appearance, easily taking a metallic luster when polished with a wire brush, the plating being remarkably adherent. It is claimed to endure hammering and to bend in sheet form without cracking. The metal, as cleaned in the iron-acid bath, shows under the microscope a surface full of minute cavities in which the nickel deposits and adheres.

Questions and Answers

Question.—How can I produce a verde antique on copper plated perforated sheet steel lamp shade forms, the process must be cheap, effective and results reproduceable.

Answer.—If you have a bright acid dip which is old, construct a frame of wood which will permit a number of the shades to be suspended over the containers of acid. Copper plate as heavily as permissible and suspend the shades on the wooden frame in such manner as to allow the fumes from the uncovered container of bright dip to reach the entire surface of the shade. When the wood frame is loaded, cover the whole with a damp piece of burlap and allow to remain undisturbed for an hour or so, the verde will be a very beautiful green and uniform over the exposed wet surface of the shade. Allow to dry and brush lightly with a fine brass wire brush. Lacquer with good grade body lacquer and finish with wax applied to a soft canton flannel buff section. This is the cheapest method possible when practical results are desired the effect produced is superior to many complicated and costly methods. Acid copper deposits finish better than those obtained in alkaline solutions, therefore the acid bath is preferable, it being less expensive to operate and maintain.

If the verde forms slowly, immerse a piece of brass in the solution while covered, thus causing a denser volume of fumes to rise.

* * *

Question.—Can you inform us of the method used in shops making munitions when washing the oil from brass sockets previous to inspection. We were advised to use caustic soda solution then rinse and dry from boiling water, this method cleans the socket but imports a dull color to the brass which is objectionable.

Answer.—Prepare a solution of ¾ pound mineral cleaner, ¼ pound sal soda per gallon of water. Do not throw the compounds into the tank, place them in bags and suspend from a rod placed across top of tank, allowing about ½ the quantity to become immersed, the solution will be effected more thoroughly and quickly. The tank should be equipped for operation as an electric cleaning tank and a voltage of about 8 to 10 volts employed. Suspend the sockets on holders made from brass or copper rods of ample size to conduct at least 10 or 15 amperes per socket. The cleaning will be effected in 30 seconds and holders may contain eight to twelve sockets, remove from cleaner rinse in cold water, dry from boiling water. Rinse waters must be clean and for this reason should be used only a few hours without changing. The sockets will dry bright and free from stains. The mineral cleaner and sal soda solution may be used without the current, the operation being necessarily much slower but equally as effective.

* * *

Question.—My firm is making brass collars, which I understand is part of a large high explosive shell. The pieces are cleaned in the plating room by washing in potash solution and rinsing; then they are immersed in the cyanide dip and dryed by passing through boiling water. In turning the collar, a soap compound is employed instead of oil, and I do not think this soap solution removed from the collars into my potash is in any way beneficial. As I have no other tank for an extra solution, I am obliged to use the potash used for cleaning work for plating. Can you suggest any method I could use to substitute my present treatment?

Answer.—Unless the brasses are covered with cheap mineral oil, we believe the damage done to your potash cleaning solution by washing the collars is more imaginary than actual. If only a soap solution is employed in machining, the collars may be cleansed satisfactorily by momentarily immersing them in boiling water, after which pass through the cyanide and dry by passing through a separate hot water bath, which may be kept in a clean barrel and heated with a steam coil. Potash or soda solutions should not be necessary for the removal of the cutting compound solution from war munitions.

CENSUS OF CANADA'S INDUSTRIES

A CENSUS of Canada's industries and manufactures will be taken by the Census and Statistics Department, Ottawa, between January 1 and 21, 1916. In order to make the data to be procured of immediate service and value, the commercial and industrial interests concerned are requested to give prompt attention to the schedules which have been distributed in the matter of having them filled in correctly and completely. Where less than three industries of a kind are to be found in a district, province, or in the Dominion, presentation will be made in the final statement under the heading of general.

The information called for will be treated as strictly confidential, will not reveal any individual business, will not be used as a basis of taxation or other liability, and will not be disclosed to any municipal or provincial authority, or to any other Department of the Dominion Government. The contents of the schedule will show number of employees, wages paid, salaries paid, capital employed, materials of production, products manufactured, days of plant operation, etc.

As a special object of this particular census is to measure the extent to which Canada's industries have been affected by the war, products for general or peace time purposes are required to be stated separately from those attributable, directly or indirectly, to war account.

Watching the Apprentice—The proprietor of an engineering works in Scotland was watching the leisurely efforts of an apprentice who was swinging his hammer in a gentle way. "Look here laddie," he said, going up to the youth and taking the hammer from him; "when I see a man that takes his hammer by the end of the shaft, and strikes a blow like that, I give that man thirty-two shillings a week; but a man that takes it in the middle like this only gets twenty-five shillings a week, and the sack whenever we get slack. See!" But the boy required an extension of his lesson. "Please, sir," he said, "and where do I hold it for five shillings a week?"

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey Forge, Pittsburg	$18 45
Lake Superior, charcoal, Chicago	19 25
Ferro Nickel pig iron (Soo)	25 00

	Montreal.	Toronto.
Middleboro, No. 3	$24 00	.....
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Glenarnock	28 00	.....
Summerlee, No. 1	33 00	.....
Summerlee, No. 3	32 00	.....
Michigan charcoal iron	28 00	.....
Victoria, No. 1	27 00	24 00
Victoria, No. 2X	27 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

METALS.

Aluminum	$ .68
Antimony	.40
Cobalt 97% pure	1.50
Copper, lake	25.00
Copper, electrolytic	24.75
Copper, casting	24.50
Lead	.08
Mercury	100.00
Nickel	50.00
Silver	.48
Tin	.46
Zinc	.21

Prices Per Lb.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$14 25	$14 25
Copper, crucible	17 50	17 50
Copper, unch-bled, heavy	16 25	16 25
Copper wire, unch-bled.	16 25	16 25
No. 1 machine, compos'n	13 00	13 00
No. 1 compos'n turnings	11 25	11 25
No. 1 wrought iron	11 75	11 75
Heavy melting steel	9 75	9 75
No. 1 machin'y cast iron	14 75	14 75
New brass clippings	11 75	11 75
New brass turnings	9 75	9 75
Heavy lead	5 40	5 40
Tea lead	4 40	4 40
Scrap zinc	13 00	13 00
Aluminum	32 00	32 00

COKE AND COAL.

Solvay foundry coke	$6.50
Connellsville foundry coke	5.95
Yough steam lump coal	3.98
Penn. steam lump coal	3.88
Best slack	3.25

net ton f.o.b. Toronto.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	32 00
Open-hearth billets, Pittsburgh.	33 00
Forging billets, Pittsburgh	55 00
Wire rods, Pittsburgh	40 00

PROOF COIL CHAIN.

¼ inch	$9.00
5-16 inch	5.90
⅜ inch	4.95
7-16 inch	4.55
½ inch	4.30
9-16 inch	4.20
⅝ inch	4.10
¾ inch	3.95
⅞ inch	3.80
1 inch	3.70

Above quotations are per 100 lbs.

MISCELLANEOUS.

Solder, half-and-half	$0.25
Putty, 100-lb. drums	2.85
Red dry lead, 100-lb. kegs. p. cwt.	9.65
Glue, French medal, per lb.	0.15
Tarred slaters' paper, per roll.	0.95
Motor gasoline, single bbls., gal.	0.27½
Benzine, single bbls., per gal.	0.27
Pure turpentine, single bbls.	0.87
Linseed oil, raw, single bbls.	1.06
Linseed oil, boiled, single bbls.	1.09
Plaster of Paris, per bbl.	2.50
Plumbers, oakum, per 100 lbs.	5.00
Lead wool, per lb.	0.11
Pure Manila rope	0.16
Transmission rope, Manila	0.20
Drilling cables, Manila	0.17
Lard oil, per gal.	1.10

SHEETS.

	Montreal.	Toronto.
Sheets, black, No. 28	$3 60	$3 60
Canada plates, dull, 52 sheets	3 60	3 60
Canada plates, all bright.	4 60	4 75
Apollo brand, 10¾ oz. galvanized)	6 50	6 50
Queen's Head, 28 B.W.G.	6 45	6 45
Fleur-de-Lis, 28 B.W.G.	6 25	6 25
Gorbal's best, No. 28	6 50	6 50
Viking metal, No. 28	5 75	5 75
Colborne Crown, No. 28.	6 20	6 30
Premier, No. 28 B.G.	5 90	6 00

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$12.75
3-16 in.	8.85
¼ in.	6.15
5-16 in.	4.90
⅜ in.	4.05
7-16 in.	3.85
½ in.	3.75
⅝ in.	3.60
¾ in.	3.60

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped union, 65.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.06
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy.	.30
Copper sulphate	.15
Cobalt Sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide substitute	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 129-130 per cent.	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	3.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.20
Zinc sulphate	.07

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.47 to .52
Cobalt	1.75 to 2.00
Copper,	.27½ to .30
Tin	.45 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck	.90
Emery in kegs	.05 to .06
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.04 to .06
Emery composition	.07 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Toronto, Ont., Jan. 11. — Industrial conditions have changed little during the past few weeks. Factories working on war orders are operating at about the same rate of production and indications point to about the same degree of activity for several months at least. Conditions are now more stable and orders are being placed on a more systematic basis than formerly. The outlook in industrial circles continues favorable and there is a general feeling of confidence in the future. Canadian manufacturers should however, bear in mind that the present period of prosperity will come to an end sooner or later, when it will be necessary to look to other markets for business. When conditions become normal again there will be increased opportunities for trade both in Canada and other countries. The British Board of Trade has already started a campaign for the purpose of capturing trade which formerly went to Germany. The time has arrived for a similar policy to be adopted in Canda.

There are no new developments with regard to shell orders and manufacturers are producing shells in satisfactory quantities. In the future, the placing of orders will apparently rest on financial considerations rather than technical. The system of credits already inaugurated by the Minister of Finance will probably have to be extended in order that Canadian manufacturers may get the large orders for shells which they are now capable of executing. All orders in future will be placed on a competitive basis as in the case of the large calibre shells for which preparations are now being made to manufacture.

There is a general tendency in both steel and metal markets for higher prices, the result is that finished products will also increase in cost. Indications point to higher prices for almost all finished products with no possibility of a reaction in sight. Steel and iron products, machine tools and machine shop supplies of all kinds have increased in cost and will no doubt go higher in the near future.

Steel Market

The greatest activity continues to prevail in the iron and steel trade and the mills are operating at capacity. The market has been steadier lately but higher prices are probable in the near future. Prices in the American market are rising steadily and a corresponding condition may be expected in Canada. Prices of galvanized sheets are very firm and the situation shows no improvement. All raw materials are increasing in cost and the output of sheets has decreased. There is a good demand for black and blue annealed sheets, the mills operating at capacity. No. 9 and 10 blue annealed are quoted at 2.25c and No. 28 black sheets 2.60c Pittsburgh.

The embargo on export shipments of iron and steel products is being maintained by the American railroads but there is a possibility of the situation being considerably relieved within the next two or three weeks. In the meantime domestic consumers are reaping the benefit by getting quicker deliveries. The situation has had no effect on prices which continue to advance steadily with a strong market. Steel bars are now quoted at 2c, iron bars 1.95c, and shapes 1.90c f.o.b. Pittsburgh. The demand for billets continues heavy and the market very firm with prices unchanged. The U. S. Steel Corporation report unfilled orders of 7,806,220 tons on Dec. 31st.

Pig Iron

The pig iron market is very strong and prices firm. The entire production of the furnaces is being consumed and there is a possibility of a shortage of pig iron in the near future. Grey Forge, Pittsburgh has advanced to $18.45. Hamilton and Victoria brands are unchanged at $23 per ton, but will advance shortly.

Old Materials

The embargo on the export of wrought and steel scrap is still in force and local scrap dealers believe that it will not be lifted notwithstanding the protests from American interests. The market for wrought and steel scrap is weaker, the mills are now buying very heavily at the present time. The scrap copper market is fairly strong and prices are a little higher. The lead market is strong and prices of tea and heavy lead have advanced. Aluminum and No. 1 machine composition have both advanced but other prices are unchanged.

General Supplies

Linseed oil made a sharp advance during the week .and is now quoted at 98c for raw and $1.01 for boiled oil. The flax seed situation is acute, and higher prices for oil are quite possible. Another advance in cotton waste is looked for in the near future, due to the increase in cost of raw materials. Putty has advanced 15c, and is now quoted at $2.95 per 100 lbs. in drums. Canadian crude oil is now quoted at $1.83 per barrel, representing an advance of 10c from the last quotations; higher prices for gasoline and benzine may, therefore, be expected. Cut leather lacing has advanced, and is now quoted at $1.30.

Metals

The general market is stronger, with a fair local demand, which is gradually improving. The copper market is very strong, and quotations have again advanced, but are nominal. The British Government is restricting purchases in America, and is apparently determined, if possible, to stop further advances, and absolutely to stop speculation. How this will affect the market is difficult to say, as the copper position is an extremely strong one, and the supply is unequal to the demand. Quotations on tin are higher locally, but have declined in the primary market. The situation is more or less abnormal, and prices of tin are nominal. The spelter market is quiet, with little interest being shown by consumers. Quotations for spelter are higher in the local market. The "Trust" have advanced lead, and the market is strong and higher. Antimony and aluminum are unchanged, but prices of solders are higher.

Copper.—The copper market is very strong and higher. It is reported that the British Government is restricting purchases of copper, and is determined, if possible, to stop further advances. This step has also been taken with the hope that speculation will be stopped. The situation is unprecedented, and it is quite possible that prices may go higher, as the supply is unequal to the demand, and production is getting behind the consumption. Local prices are 2c higher, and lake copper is now quoted at 26c per pound.

Tin.—The primary market is slightly lower, but steadier. Locally tin has advanced 2c per pound. The tin situation is more or less abnormal, and buyers are keeping out of the market awaiting developments. Local prices are higher and nominal at 45c per pound.

Spelter.—The local market is stronger and higher. London is unchanged, and New York firmer on early deliveries. Spelter has advanced 1c, and is now quoted at 20c per pound.

Lead.—The market continues strong and higher in the primary market. The "Trust" have advanced the price to 5.90c at New York. The lead position is a strong one and the demand is heavy. Lead has advanced ½c, and is now quoted at 7½c per pound.

Antimony.—The market is quiet, with an easier tendency. Spot antimony is scarce, and there is little inquiry for futures. Quotations are unchanged at 40c per pound.

Aluminum.—The situation is unchanged, and the market featureless. Quotations are firm and unchanged at 68c per pound.

Solder.—Higher prices are now being quoted for solders, due to the strength in the tin market. Half-and-half has advanced 1c, and is quoted at 25c per pound.

Foundry and Plating Supplies

The market for practically all foundry supplies and chemicals continues very firm, with a decided tendency to higher prices. Felt polishing wheels have advanced due to the scarcity of wool, while bullneck wheels are higher on account of the increase in the price of leather. Pumice is getting scarce, and higher prices are looked for. Emery in kegs and emery composition have advanced slightly, and the market is very firm. Higher prices are being quoted for copper anodes, and tin and zinc anodes are very firm. There is no improvement in the situation with regard to chemicals; prices continue high, and some lines are very difficult to obtain. Copper sulphate is very scarce. and prices have advanced to 15c per pound, while copper carbonate is quoted at 30c per pound. Sulphuric acid and carbolic acid are very scarce, and prices are more or less nominal.

Business in foundry and plating supplies is quiet. Foundries during last year were operating at considerably under capacity, and the demand for equipment and supplies has, therefore, been comparatively light. The prospects for this year cannot be said to be very bright, although considerable improvement is expected in the agricultural implement business on account of the very favorable conditions prevailing in the West. Platers are doing a fair business, considering the conditions prevailing. The substituting of nickeled cast iron nose plugs for shells instead of brass has been productive of considerable business, and the demand for the necessary equipment is increasing.

Trade Gossip

Hamilton, Ont.—The Tallman Brass Co. are making an extension to their plant.

Lachine, Que.—The Dominion Bridge Co. are building a brass foundry at a cost of $20,000.

Montreal, Que.—The Williams Mfg. Co. will build a foundry at their plant on St. James street.

Lunenburg, N.S.—The foundry owned by Leonard G. Holder has been completely destroyed by fire.

Welland, Ont.—The Canada Forge Co. will build an addition to their forging plant at a cost of $25,000.

The Manchester Ironworks, Ltd., of Calgary, Alta., have been incorporated with a capital of $50,000.

The International Steel Corporation, Ltd., have changed the name of the concern to Canadian Iron Ores, Ltd.

Col. Cantley, president of the Nova Scotia Steel & Coal Co., is not going to England, as was recently reported.

A. McKay Edwards, of the Galt Stove & Furnace Co., has been elected mayor of Galt, Ont., for the ensuing year.

Dartmouth, N.S.—The Williston Steel & Foundry Co., of Halifax, will build a steel plant here at a cost of about $16,000.

Halifax, N.S.—Work has been started on the erection of a steel plant for the Williston Steel & Foundry Co. Approximate cost, $16,000.

New Glasgow, N.S.—The Nova Scotia Steel & Coal Co. are building an addition to their steel plant at Sidney Mines, estimated to cost $100,000.

Montreal, Que.—A large extension will be made to the local plant of the Steel Company of Canada. The cost will be approximately $24,000.

Lieut.-Colonel W. M. Gartshore, vice-president and general manager of the McClary Mfg. Co., has been elected mayor of London, Ont.

Frank P. Jones, vice-president and general manager of the Canada Cement Co., Montreal, will probably join the board of the Dominion Steel Corporation.

W. L. Helliwell, manager of the Gurney Northwest Foundry Co., Winnipeg, Man., has been appointed to a more important position on the staff of the firm at the head office in Montreal.

The Canadian Car & Foundry Co., of Montreal, has received an order for one hundred 40-ton tank cars from the Imperial Oil Co., and also an order for cars from the Michigan Central Railway.

The Canadian Car & Foundry Co., Montreal, has closed an order for nearly 2.000 freight cars valued at about $2,000,000, for the French Government. Work on the order is to be started at once.

The Imperial Munitions Board have accepted the process of sherardizing cast iron nose plugs for shells as an alternative to nickel-plating. Brass plugs are now being replaced with cast iron ones.

The Federal Brass Co. has been incorporated at Ottawa with a capital of $50,000 to acquire the business now carried on by the Federal Electric & Mfg. Co. at Montreal. Incorporators: Joseph Phillipe Arthur Belanger and Louis Joseph Cyprien Gagnon of Montreal.

The Montreal Steel & Foundry Co. has been incorporated at Ottawa, with a capital of $150,000, to manufacture all kinds of machinery and mechanical specialties, appliances and instruments, at Montreal, Que. Incorporators: Emilien Gadbois, Joseph Marechal Nantel, and Charles G. Derome, all of Montreal, Que.

The International Steel Corporation, Ltd., has been incorporated at Ottawa, with a capital of $100,000, to manufacture, produce and deal in iron, steel and all other metals, at Toronto. Incorporators: James Richardson Roaf, Wm. Graham and John E. Mordon, all of Toronto, Ont.

Montreal, Que.—The Canadian Electro-Products Co., incorporated with a capital stock of $500,000, with J. S. Norris, Howard Murray and Julien C. Smith as directors, has purchased the Record Foundry Building here, and is installing machinery for the manufacture of shells and other munitions. It will also install an electric furnace.

Graham Fraser, a pioneer of the steel industry in Canada, died at New Glasgow, N.S., on Dec. 25th. The deceased who was 68 years old, established the Hope Iron Works in 1872, which was the nucleus of what afterwards developed into the Nova Scotia Steel & Coal Co. Mr. Fraser was general manager of the new company for some time when he resigned and was appointed manager of the Dominion Steel Co. He held this position until the Steel Co. amalgamated with the Dominion Coal Co., when he retired from active work.

Catalogues

Sand Blast Machines.—The New Haven Sand Blast Co., New Haven, Conn., have issued a bulletin illustrating and describing their automatic sandblast machine. Two types of machine, high and low pressure, are described and some of the principal features of their construction dealt with in detail.

Foundry Torch.—Two bulletins issued by the Mahr Manufacturing Co., Minneapolis, Minn., describe and illustrate the "Mahr" patent portable foundry torch. The illustrations show the torch being used on various classes of work in the foundry and demonstrate the utility of this appliance.

The Sterling Lines is the title of supplement No. 1 to catalogue 11024, issued by the Sterling Wheelbarrow Co., Milwaukee, Wis. The equipment dealt with includes different styles of steel foundry flasks for a large variety of work. Each style is illustrated and its principal features described at length. The catalogue is illustrated in an attractive style.

Buffing and Polishing Machinery.—Bulletin No. 700 on buffing, polishing and burnishing machinery, the latest of the series of "Munning-Loeb" publications on electro-plating and polishing equipment and supplies, fully describes the Munning-Loeb line of buffing and polishing lathes from the small bench lathes to the large double-spindle pedestal lathe, also belt strapping machines, flexible grinders, tumbling barrels, burnishing barrels and sand blast apparatus. This bulletin will be sent to anyone on request.

Metal Cutting Saws.—The Simonds Mfg. Co., Fitchburg, Mass., have issued a very attractive catalogue dealing with their various products, which include metal saws, hack saws, files, machine knives, saw blades, etc. The various lines are illustrated and are accompanied by tables giving particulars and prices of the different sizes. A complete price list of files and saws is included, as well as for hack saw blades. Several pages are devoted to different methods of cutting steel and contain much valuable material on the subject for the buyer, dealer and operator. A copy of this catalogue will be sent free to any machinist writing for it.

Book Reviews

Report of the Selby Smelter Commission, by J. A. Holmes, E. C. Franklin, and R. A. Gould. 1915. 528 pp., 41 pls., 14 figs. One volume. Paper covers. $1.25. This No. 98 bulletin describes in detail the methods used, some of them new, in determining the contamination of the air and the damage to trees, crops, and live stock by the smoke and fume from the Selby Smelter, in California, and gives the conclusions of the commission on the methods used by the smelter company to prevent injury. The bulletin is of especial interest to metallurgical companies, municipal or State boards of health, and persons investigating damage by smelter smoke. Owing to the expense involved in the preparation and publication of this bulletin and the limited printing funds available for the use of the Bureau of Mines, it has been necessary to place a price of $1.25 on the work. Orders should not be sent to the Bureau of Mines, but should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D.C.

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

TO OUR READERS—Use this Directory when seeking to buy any foundry or pattern-shop equipment. You will often get information that will save you money.
TO OUR ADVERTISERS—Send in your name for insertion under the headings of the lines you make or sell.
TO NON-ADVERTISERS—A nominal rate of $5.00 per line a year is charged to non-advertisers.

Air Compressors.
Berkshire Mfg. Co., Cleveland, O.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Can. Niagara Device Co., Bridgeburg.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Independent Pneumatic Tool Co., Chicago, Ill.
Osborn Mfg. Co., Cleveland, O.
Smart-Turner Machine Co., Hamilton, Ont.
A. R. Williams Machy. Co., Toronto.

Alloys.
Ajax Metal Co., Philadelphia, Pa.
Frederic B. Stevens, Detroit.
Webster & Sons, Ltd., Montreal.

Anodes, Brass, Copper, Nickel, Zinc.
Tallman Brass & Metal Co., Hamilton, Ont.
W. W. Wells, Toronto.

Ammeters.
Chas. J. Menzemer, Niagara Falls.

Babbitt Metal
Ajax Metal Co., Philadelphia, Pa.

Barrels, Tumbling.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Frederic B. Stevens, Detroit.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Barrows, Foundry
Sterling Wheelbarrow Co., Milwaukee, Wis.

Boiler Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.
Webster & Sons, Limited, Montreal.

Blowers.
Can. Buffalo Forge Co., Montreal.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. S. McCormick Co., Pittsburg, Pa.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
P. H. & F. M. Roots Co., Connersville, Ind.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Blast Gauges—Cupola.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
H. S. Carter & Co., Toronto.
Sheldons, Limited, Galt, Ont.
Frederic B. Stevens, Detroit.
Whiting Foundry Equipment Co., Harvey, Ill.

Boxes, Tote
Sterling Wheelbarrow Co., Milwaukee, Wis.

Brass Melting Furnaces.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Frederic B. Stevens, Detroit.
Whiting Foundry Equipment Co., Harvey, Ill.

Bricks, Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.

Brushes, Foundry and Core.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Manufacturers' Brush Co., Cleveland, Ohio.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Frederic B. Stevens, Detroit.

Brushes, all Kinds.
Manufacturers' Brush Co., Cleveland, Ohio.
Osborn Mfg. Co., Cleveland, O.
Sleeper & Hartley, Worcester, Mass.
Ford-Smith Machine Co., Hamilton.

Buckets, Grab
Pawling & Harnischfeger Co., Milwaukee, Wis.

Buffing and Polishing Machinery.
W. W. Wells, Toronto.

Buffing and Polishing Compositions.
W. W. Wells, Toronto.

Buffs.
W. W. Wells, Toronto.

Burners, Core Oven.
Webster & Sons, Ltd., Montreal.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
Frederic B. Stevens, Detroit.

Cars, Core Oven.
H. S. Carter & Co., Toronto.
Osborn Mfg. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.
Monarch Eng. & Mfg. Co., Baltimore.

Cars, Sand Blasts.
Pangborn Corporation, Hagerstown, Md.

Castings, Brass, Aluminum and Bronze.
Tallman Brass & Metal Co., Hamilton, Ont.

Cast Iron.
Frankel Bros., Toronto.

Castings, Aluminum and Brass.
Tallman Brass & Metal Co., Hamilton, Ont.
F. W. Quinn, Hamilton, Ont.

Castings, Nickel.
W. W. Wells, Toronto.

Cars, Foundry.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Monarch Eng. & Mfg. Co., Baltimore.
Frederic B. Stevens, Detroit.
Whiting Foundry Equipment Co., Harvey, Ill.

Chain Blocks.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
John Millen & Son, Ltd., Montreal.

Chaplets.
Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.
Wells Pattern & Machine Works Limited, Toronto.

Charcoal.
Webster & Sons, Ltd., Montreal.
Frederic B. Stevens, Detroit.

Chemists.
Toronto Testing Laboratory, Ltd., Toronto.

Chemicals.
W. W. Wells, Toronto.

Chippers, Pneumatic
Independent Pneumatic Tool Co., Chicago, Ill.

Clay Lined Crucibles.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.

Clamps, Core Box
National Clamp Co., Chicago, Ill.

Clamps, Flask
National Clamp Co., Chicago, Ill.

Copper, Phosphorized
Ajax Metal Co., Philadelphia, Pa.

Core Binders.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
J. W. Paxson Co., Philadelphia, Pa.
Robeson Process Co., New York City.

Core Box Machines.
Webster & Sons, Ltd., Montreal.
J. S. McCormick, Pittsburg, Pa.
J. W. Paxson Co., Philadelphia, Pa

Core Cutting-off and Coning Machine.
Brown Specialty Machinery Co., Chicago, Ill.
H. S. Carter & Co., Toronto.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.

Core Compounds.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
J. W. Paxson Co., Philadelphia, Pa.
Robeson Process Co., New York City.
Frederic B. Stevens, Detroit.

Core Machines, Hammer.
H. S. Carter & Co., Toronto.
Brown Specialty Machinery Co., Chicago, Ill.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.

Core-making Machines.
Berkshire Mfg. Co., Cleveland, O.
H. S. Carter & Co., Toronto.
Mumford Molding Machine Co., Chicago, Ill.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Frederic B. Stevens, Detroit.
Webster & Sons, Ltd., Montreal.

Core Oils.
Cataract Refining Co., Buffalo, N.Y.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.

Core Ovens.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
Oven Equipment & Mfg. Co., New Haven, Conn.
Sheldons, Limited, Galt, Ont.
Frederic B. Stevens, Detroit.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Wash.
Joseph Dixon Crucible Co., Jersey City, N.J.
Webster & Sons, Ltd., Montreal.

Core Wax.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
United Compound Co., Buffalo, N.Y.

Cranes
Northern Crane Works, Ltd., Walkerville, Ont.
Pawling & Harnischfeger Co., Milwaukee, Wis.

Cranes, Travelling and Jib.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Webster & Sons, Ltd., Montreal.
Northern Crane Works, Ltd., Walkerville, Ont.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Electric and Hand Power.
H. S. Carter & Co., Toronto.
A. R. Williams Mach. Co., Toronto.
Dominion Bridge Co., Montreal.
Webster & Sons, Ltd., Montreal.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Ltd., Walkerville, Ont.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Hydraulic.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Crucibles, Reservoir, Tilting Furnace, Bottom Pour, Etc.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Seidel, R. B., Philadelphia.
Stevens, F. B., Detroit, Mich.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.

Cupolas.
H. S. Carter & Co., Toronto.
A. R. Williams Mach. Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Northern Crane Works, Ltd., Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Sheldons, Limited, Galt, Ont.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola Blast Gauges.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola Blocks.
R. Bailey & Son, Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.

Cupola Blowers.
Can. Buffalo Forge Co., Montreal.
Can Sirocco Co., Ltd., Windsor, Ont.
Webster & Sons, Ltd., Montreal.
Monarch Eng. & Mfg. Co., Baltimore.
Sheldons, Limited, Galt, Ont.
Stevens, F. B., Detroit, Mich.

Cupola Linings.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.

Cupola Twyers.
Webster & Sons, Ltd., Montreal.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.

Cutting-off Machines.
Webster & Sons, Ltd., Montreal.

Cyanide of Potassium.
W. W. Wells, Toronto.

Dippers, Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.

Drying Ovens for Cores.
Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Dynamos.
W. W. Wells, Toronto.

Dust Arresters and Exhausters.
Pangborn Corporation, Hagerstown Md.

Dryers, Sand.
Pangborn Corporation, Hagerstown, Md.

Elevators, Foundry, Hydraulic, Pneumatic.
A. R. Williams Mach. Co., Toronto.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Pangborn Corporation, Hagerstown, Md.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Emery Stands.
Ford-Smith Machine Co., Hamilton.

Fans, Exhaust.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Webster & Sons, Ltd., Montreal.
Stevens, F. B., Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Sheldons, Limited, Galt, Ont.

Fillers (Metallic).
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Stevens, F. B., Detroit, Mich.
Shelton Metallic Filler Co., Derby, Conn.

Fillets, Leather and Wooden.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.

Fire Brick and Clay.
R. Bailey & Son, Toronto.
H. S. Carter & Co., Toronto.
Gibb, Alexander, Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.
Whitehead Bros. Co., Buffalo, N.Y.

Fire Sand.
Webster & Sons, Ltd., Montreal.
Whitehead Bros Co., Buffalo, N.Y.

Flasks, Snap, Etc.
Berkshire Mfg. Co., Cleveland, O.
Guelph Pattern Works, Guelph, Ont.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Sterling Wheelbarrow Co., Milwaukee, Wis.
Webster & Sons, Ltd., Montreal.

Foundry Coke.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

Foundry Equipment.
H. S. Carter & Co., Toronto.
A. R. Williams Mach. Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
E. H. Mumford Co., Elizabeth, N.J.
Mumford Molding Machine Co., Chicago, Ill.
Northern Crane Works, Walkerville, Ont.
Osborn Mfg. Co., Cleveland, O.
Pangborn Corporation, Hagerstown, Md.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Foundry Parting.
H. S. Carter & Co., Toronto.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.
Whitehead Bros. Co., Buffalo, N.Y.

Foundry Facings.
Joseph Dixon Crucible Co., Jersey City, N.J.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.

Furnace Lining.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Eng. & Mfg. Co., Baltimore
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

Furnaces.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

Furnaces, Brass.
H. S. Carter & Co., Toronto.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

Goggles.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.

Graphite Products.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Jonathan Bartley Crucible Co., Trenton, N.J.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Webster & Sons, Ltd., Montreal.

Graphite, Anti-Flux Brazing.
Joseph Dixon Crucible Co., Jersey City, N.J.

Grinders, Disc, Bench, Swing.
Ford-Smith Machine Co., Hamilton Ont.
Perfect Machinery Co., Galt, Ont.

Grinders, Chaser or Die.
Geometric Tool Co., New Haven, Conn.

Grinders, Electric
Independent Pneumatic Tool Co., Chicago, Ill.

Grinders, Pneumatic, Portable.
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

Hammers, Chipping
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

Helmets.
Tilghman-Brooksbank Sand Blast Co. Philadelphia, Pa.

Hoisting and Conveying Machinery.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Walkerville.
A. R. Williams Machy. Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

Hoists, Electric, Pneumatic.
A. R. Williams Mach. Co., Toronto.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Walkerville.
Pawling & Harnischfeger Co., Milwaukee, Wis.
E. J. Woodison Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

Hoists, Hand, Trolley.
Webster & Sons, Ltd., Montreal.
Northern Crane Works, Walkerville.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

Hose and Couplings.
Can. Niagara Device Co., Bridgeburg, Ont.
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

Ingot Metals.
Frankel Bros., Toronto.

Iron Cements.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
J. W. Paxson Co., Philadelphia, Pa.
Smooth-On Mfg. Co., Jersey City.
Stevens, F. B., Detroit, Mich.

Iron Filler.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
J. W. Paxson Co., Philadelphia, Pa.
Smooth-On Mfg. Co., Jersey City.
Stevens, F. B., Detroit, Mich.

Ladles, Foundry.
Joseph Dixon Crucible Co., Jersey City, N.J.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd. Hamilton, Ont.
Northern Crane Works, Walkerville, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Ladle Heaters.
Hawley Down Draft Furnace Co., Easton, Pa.
Webster & Sons, Ltd., Montreal.

Ladle Stoppers, Ladle Nozzles, and Sleeves (Graphite).
Joseph Dixon Crucible Co., Jersey City, N.J.
J. W. Paxson Co., Philadelphia, Pa.
Seidel R. B., Philadelphia.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Webster & Sons, Ltd., Montreal.

Melting Pots.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Stevens, F. B., Detroit, Mich.
E. J. Woodison Co., Toronto.
Webster & Sons, Ltd., Montreal.

Metallurgists.
Canadian Laboratories, Toronto.
Charles C. Kawin Co., Toronto.
Frankel Bros., Toronto.
Toronto Testing Laboratories, Toronto.

Millville Gravel.
H. S. Carter & Co., Toronto.

Mixers.
Webster & Sons, Ltd., Montreal.
J. W. Paxson Co., Philadelphia, Pa.

Molders' Tools.
H. S. Carter & Co., Toronto.
Wm. Dobson, Canastota, N.Y.
Stevens, F. B., Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.

Molding Machines.
Berkshire Mfg. Co., Cleveland, O.
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
E. H. Mumford Co., Elizabeth, N.J.
Mumford Molding Machine Co., Chicago, Ill.
Osborn Mfg. Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.
Midland Machine Co., Detroit.
Tabor Mfg. Co., Philadelphia.

Molding Sand.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Webster & Sons, Ltd., Montreal.

Molding Sifters.
Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.
Whitehead Bros. Co., Buffalo, N.Y.

Ovens for Core-baking and Drying.
Osborn Mfg. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

Oil and Gas Furnaces.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

Patterns, Metal and Wood.
Limited, Toronto.
Guelph Pattern Works, Guelph, Ont.
F. W. Quinn, Hamilton, Ont.
Wells Pattern & Machine Works,

Pattern Shop Equipment.
H. S. Carter & Co., Toronto.
Hamilton Pattern Works, Hamilton.
Hamilton Facing Mill Co., Ltd, Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
F. W. Quinn, Hamilton, Ont.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

Pig Iron.
Dom. Iron & Steel Co., Sydney, N.S.
Frankel Bros., Toronto.

Phosphorizers.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Whitehead Bros. Co., Buffalo, N.Y.

Plumbago.
Joseph Dixon Crucible Co., Jersey City, N.J.
H. S. Carter & Co., Toronto.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

Plating and Polishing Supplies.
Osborn Mfg. Co., Cleveland, O.
W. W. Wells, Toronto.

Pneumatic Paint Spray.
Can Niagara Device Co., Bridgeburg, Ont.

Pyrometer Shields.
Joseph Dixon Crucible Co., Jersey City, N.J.

Polishing Wheels.
Osborn Mfg. Co., Cleveland, O.
W. W. Wells, Toronto.

Ramming Plates and Machines.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Osborn Mfg. Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

Rammers, Pneumatic
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

Retorts.
Joseph Dixon Crucible Co., Jersey City, N.J.
Jonathan Bartley Crucible Co., Trenton, N.J.

Riddles.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

Rosin.
Webster & Sons, Ltd., Montreal.

Rouge.
W. W. Wells, Toronto.

Sand Blast Machinery.
Brown Specialty Machinery Co., Chicago, Ill.
Canadian Ingersoll-Rand Co., Ltd. Montreal.
Can. Niagara Device Co., Bridgeburg, Ont
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Pangborn Corporation, Hagerstown, Md.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.
J. W. Paxson Co., Philadelphia, Pa.
Stevens F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

Sand Blast Rolling Barrels.
Pangborn Corporation, Hagerstown, Md.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.

Sand Blast Devices.
Brown Specialty Machinery Co., Chicago, Ill.
Can. Niagara Device Co., Bridgeburg.
Pangborn Corporation, Hagerstown, Md.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.

Sand Conveying Machinery
Standard Sand & Mach. Co., Cleveland, O.

Sand Mixing Machinery
Standard Sand & Mach. Co., Cleveland, O.
Vulcan Engineering Sales Co., Chicago, Ill.

Sand Molding.
H. S. Carter & Co., Toronto.
Hamilton Facing Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

Sand Sifters.
H. S. Carter & Co., Toronto.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Standard Sand & Mach. Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Sand Shakers.
Brown Specialty Machinery Co., Chicago, Ill.

Saws, Hack.
Ford-Smith Machine Co., Hamilton, Ont.

Separators, Moisture, Oil and Sand.
Pangborn Corporation, Hagerstown, Md.

Sieves.
Osborn Mfg. Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

Silica Wash.
Webster & Sons, Ltd., Montreal.

Skimmers, Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.

Small Angles.
Dom. Iron & Steel Co., Sydney, N.S.

Soapstone.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.

Spelter Bowls.
Joseph Dixon Crucible Co., Jersey City, N.J.

Special Machinery.
Osborn Mfg. Co., Cleveland, O.
Wells Pattern & Machine Works, Limited, Toronto.

Sprue Cutters.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
F. B. Shuster Co., New Haven, Conn.
Stevens, F. B., Detroit, Mich.
Vulcan Engineering Sales Co., Chicago, Ill.
Webster & Sons, Ltd., Montreal.

Squeezer Molding Machines
Mumford Molding Machine Co., Chicago, Ill.

Squeezers, Power.
Davenport Machine & Foundry Co., Iowa.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Mumford Molding Machine Co., Chicago, Ill.
Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.

Steel Rails.
Dom. Iron & Steel Co., Sydney, N.S.

Steel Bars, all kinds.
Dom. Iron & Steel Co., Sydney, N.S.
Northern Crane Works, Walkerville, Ont.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Stirrers, Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.

Talc.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
E. J. Woodison Co., Toronto.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

Taps.
Geometric Tool Co., New Haven, Conn.

Teeming Crucibles and Funnels.
McCulloch-Dalzell Crucible Company. Pittsburg, Pa.

Threading Machines.
Geometric Tool Co., New Haven. Conn.

Tools, Pneumatic
Independent Pneumatic Tool Co., Chicago, Ill.

Track, Overhead.
Northern Crane Works, Walkerville, Ont.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co.. Harvey, Ill.

Tripoli.
W. W. Wells, Toronto.

Trolleys and Trolley Systems.
Can. Fairbanks-Morse Co., Montreal.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Trucks
Sterling Wheelbarrow Co., Milwaukee, Wis.

Trucks, Dryer and Factory.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Tumblers.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.

Turntables.
H. S. Carter & Co., Toronto.
Northern Crane Works, Walkerville.
J. W. Paxson Co., Philadelphia, Pa.
Stevens F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

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Webster & Sons, Ltd., Montreal.

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Wall Channels.
Dom. Iron & Steel Co., Sydney, N.S.

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Stevens, F. B., Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.
W. W. Wells, Toronto.

Wire, Wire Rods and Nails.
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Osborn Mfg. Co., Cleveland, O.

CANADIAN FOUNDRYMAN

AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields.

Vol. VII. TORONTO, JANUARY, 1916 No. 1

EDITORIAL CONTENTS

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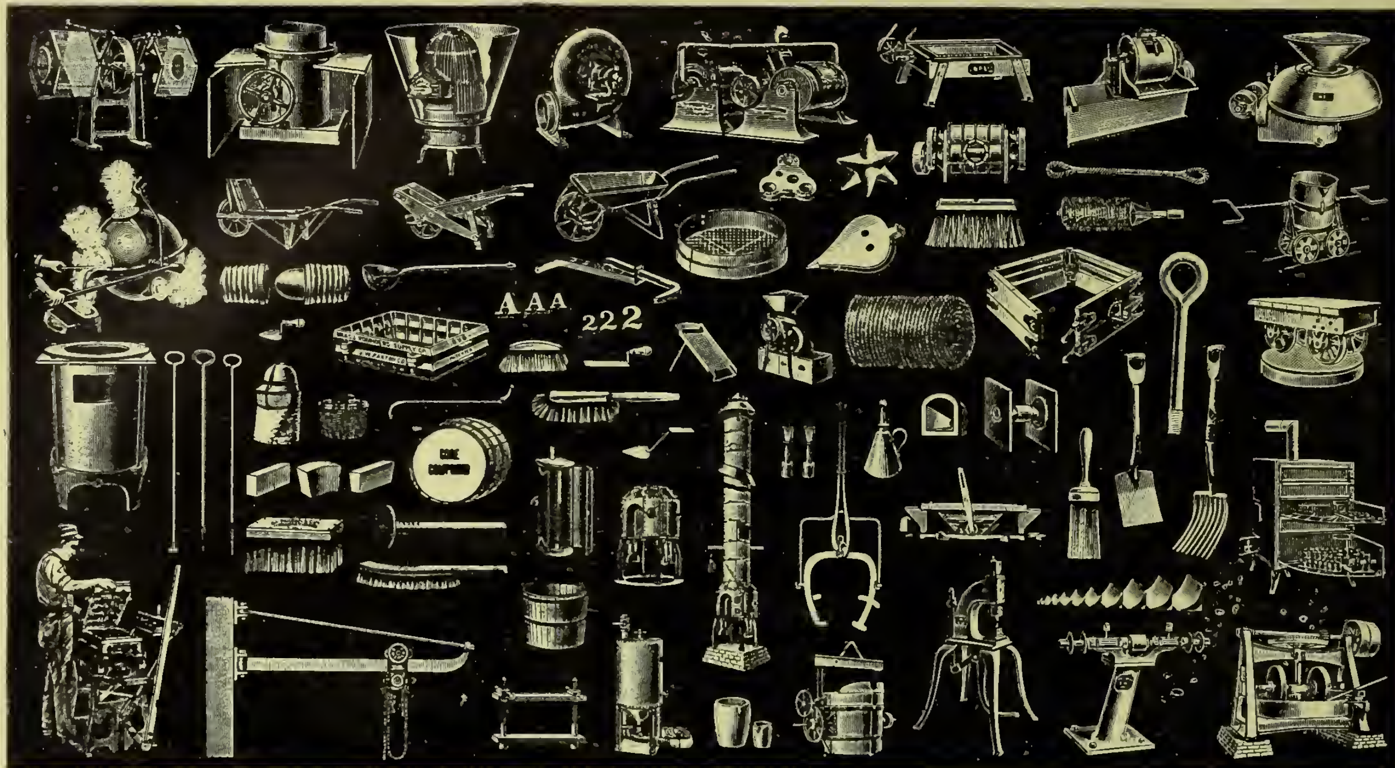
ADVERTISING INDEX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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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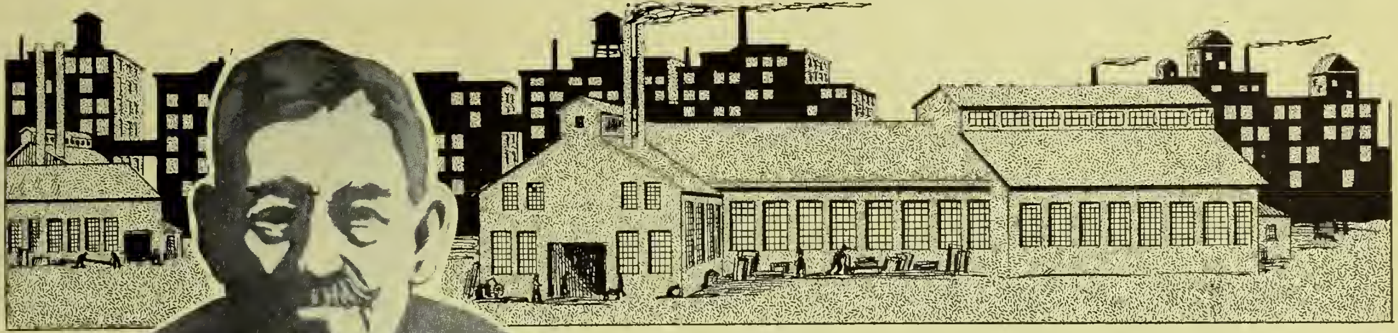
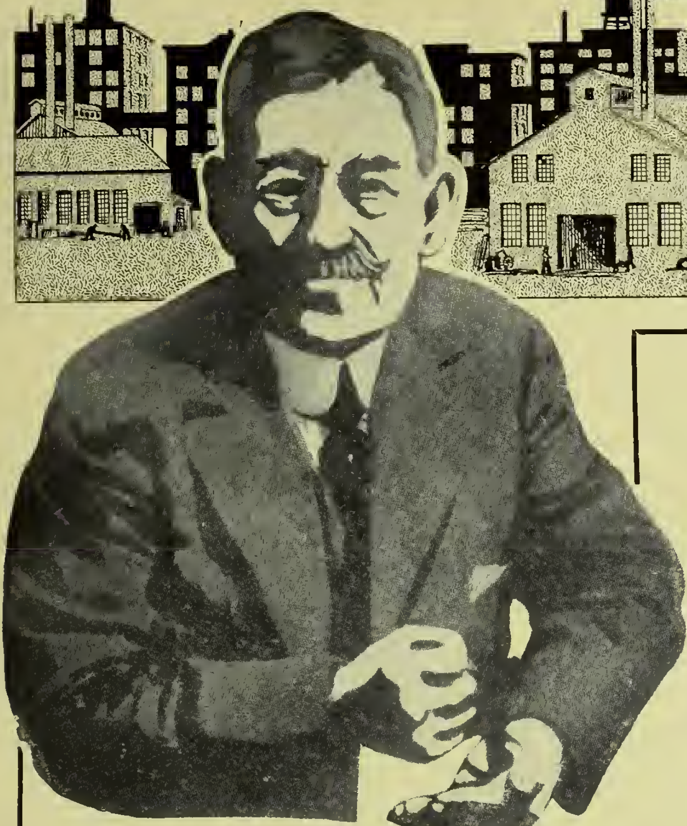
VOL. VII. PUBLICATION OFFICE, TORONTO, FEBRUARY, 1916 No. 2





The Publisher's Page

By B.G.N.

Concerning Advertising

Extracted from an address before the Technical Publicity Association, N.Y.

By W. L. SAUNDERS, *Chairman of the Board,* INGERSOLL-RAND CO.

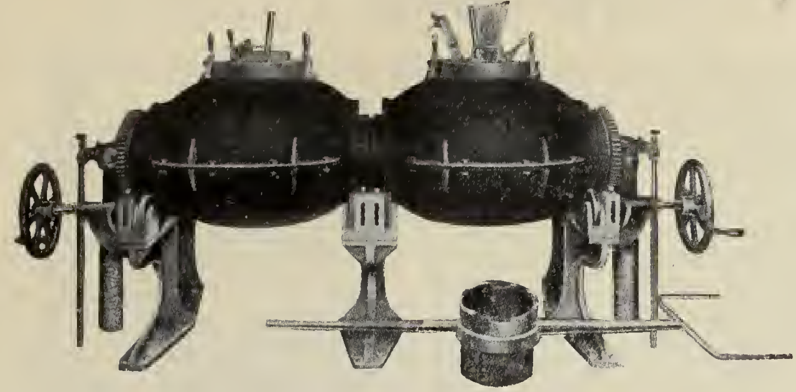
Good technical advertising is essentially concrete. It is an exact science, and knowledge of the subject is the first qualification; everything else is secondary to this. Technical advertising involves salesmanship of the highest order. It is not the gift of gab that counts; is not a polished manner or a pleasing presence, but it is familiarity with the thing advertised in all its bearings, which involves a wide general knowledge of the product and business; next a faculty of clear, brief and direct expression. Proper display is not to be neglected, but this is easy.

Advertising affords a means by which the man who knows most about the business may imprint his ideas effectively upon the minds of thousands. His audience is the world, and in no other way can he bring up the average efficiency in productive results. He may not do as much good in each case as though he met the customer personally, but on the whole he creates a greater general impression and paves the way for personal interviews that follow. I speak as one of experience in these matters. Up to recent years I have personally been the advertising man of the interests in my charge.

I realize that the head of the business can well afford to spend his time and energies directing the fundamental conditions that govern good technical advertising. I also realize that there is no fire of genius whatever in this matter and here we must distinguish between technical and general advertising, just as we must distinguish between technical and general salesmanship. A good talker can sell patent medicines regardless of whether they do the customer any good or not. A genius can put a patent medicine on the market and make a fortune out of it, regardless of its merit, but in technical advertising, as in technical selling, the gift of gab is one of the lesser, not greater virtues.

No one with common sense doubts the value of advertising—the only doubt is the value of the man who advertises. You must first establish confidence in the product that you are handling or you can never be successful on large lines. It is just as important that you should thoroughly believe in the thing that you are advertising as it is that the man who hires you should thoroughly believe in you. Confidence is the key-note of it all.

Monarch-Rockwell Double Chamber Melting Furnaces



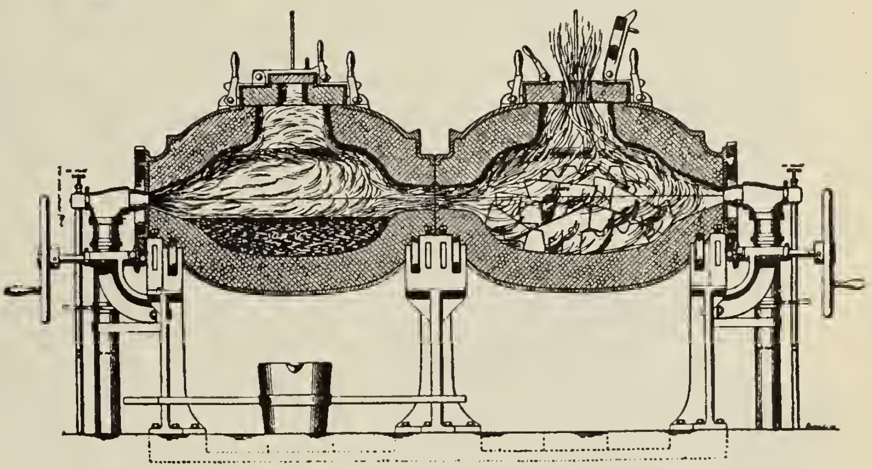
Cuts melting costs nearly in two

The two chambers can be used alternatively. The exhaust heat from the active or primary chamber flows into the other chamber, thereby simultaneously melting in one chamber and heating the metal in the other chamber to very near the melting point with one burner and at no additional cost.

For Copper, Brass Bronze, Aluminum, Iron and Steel, etc.

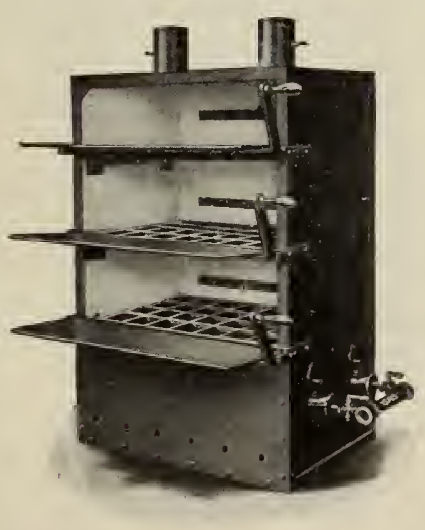
The Monarch-Rockwell Double Chamber Melting Furnace makes melting practically continuous, permitting melts of various mixtures of metals to follow one another in rapid succession.

Oil or gas fuel.



ACTION OF HEAT

Simplex "Single Chamber" Recommended Likewise



Monarch-Arundel Drop Front Gas Core Oven. Any Size. For All Fuels.

Our "Arundel" Core Oven is rigidly constructed of sheet steel, all hand made with asbestos insulation.

Built with a special drop-down front, and in all sizes up to six feet square.

Drop us a line for detailed information of the complete line of Monarch Melting Furnaces and Core Ovens. The fact that the largest manufacturers in Canada and the United States are extensive users is sufficient to warrant your thorough investigation.

Prompt Deliveries. Catalog CF 7-1916

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COMBINATION MACHINES

JOLT SQUEEZER

POINTS OF EXCELLENCE:

Foolproof: Plunger cannot be blown out; Air cannot be turned on when yoke is back.

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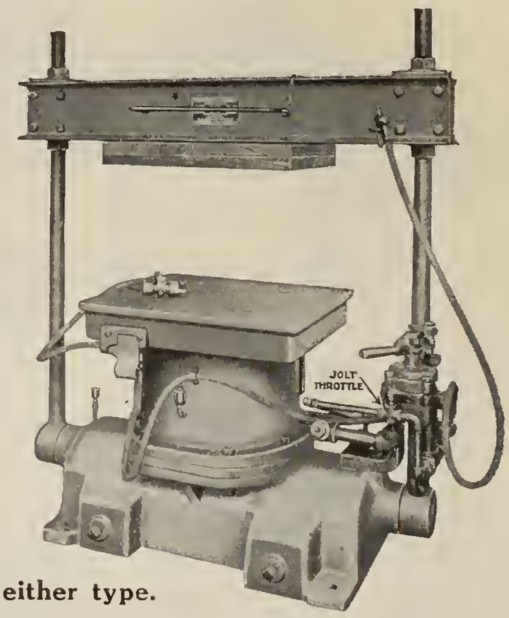
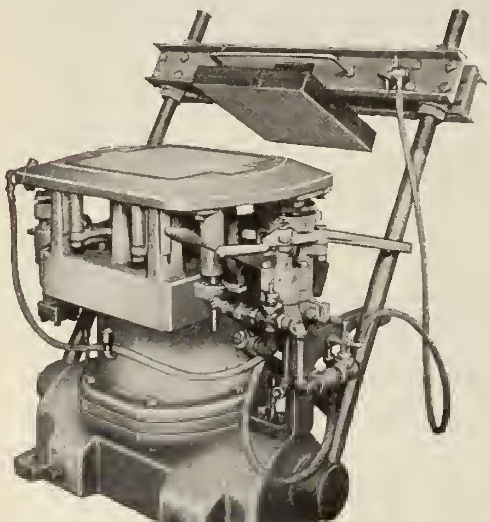
Throttle Valves: Westinghouse Air Brake Valves. The same valve that is used on trolley cars. Not the cheapest by any means, but the BEST.

Construction: Rigid in all parts. Our machines are built to withstand hard usage, as foundry machinery should be. **It pays.**



A Jolt Attachment can be added to Plain Machines of either type.



JOLT & SQUEEZE RAMMING SPLIT PATTERN MACHINE

The last word in Split Pattern Machines!

MUMFORD SPLIT PATTERN MACHINES have always given universal satisfaction and long service wherever used.

THEY ARE NOW BETTER THAN EVER BEFORE!

In a neighboring Iron Foundry perfect lifts are being obtained continuously on a flanged tee pattern, WITH TWO POCKETS 4" DEEP. This was impossible before a MUMFORD Jolt and Squeeze Ramming Split Pattern Machine was put on the job, although there are many other makes of molding machines at work in this shop.

WHY?

These machines, or information concerning them, may be had only from

E. H. MUMFORD COMPANY

Sole licensees and manufacturers under the Patents of E. H. MUMFORD.

ELIZABETH, N.J.

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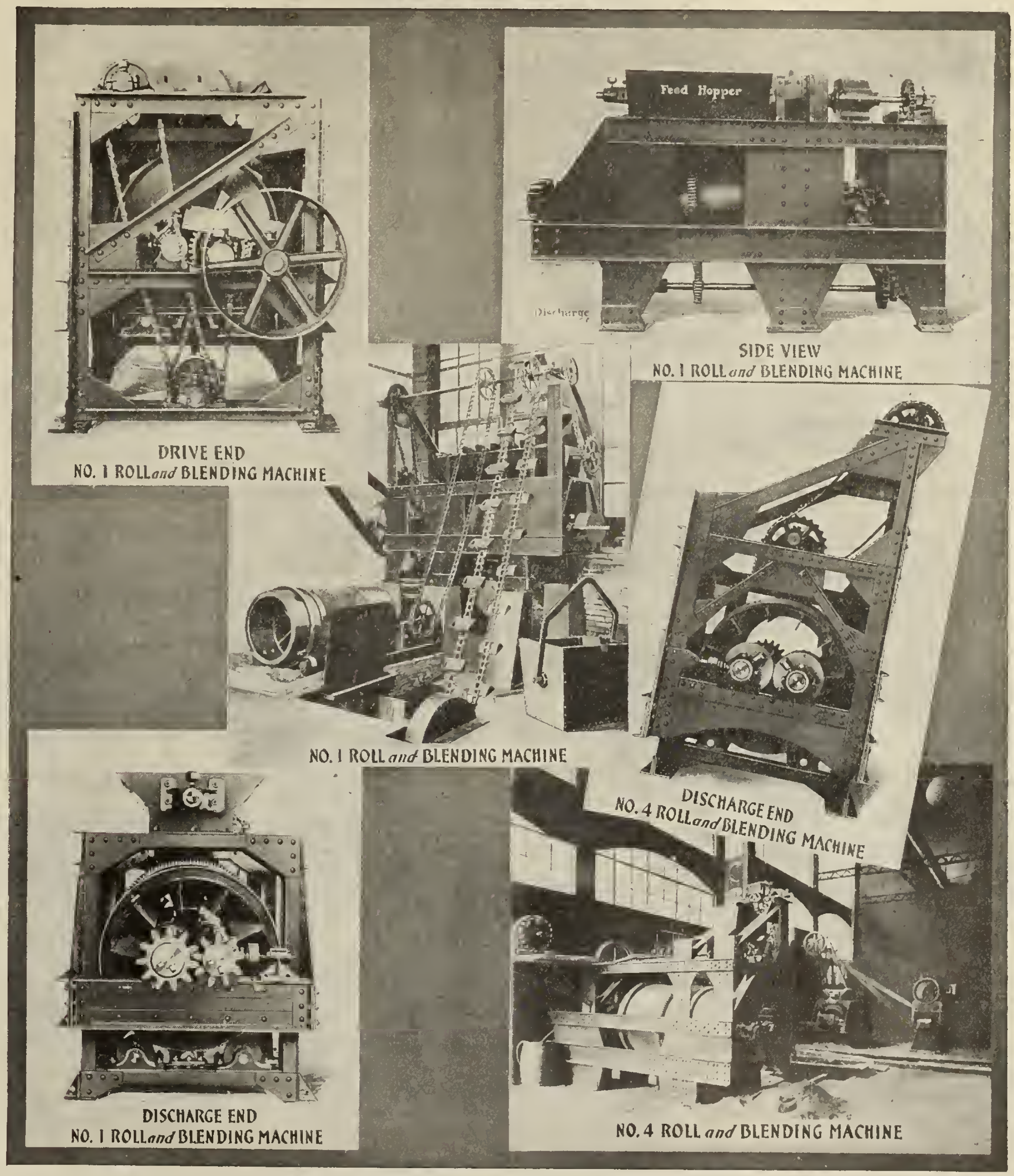
STANDARD

SAND MIXING and CONVEYING MACHINERY

Is being widely copied, which proves its established record of fifteen years in the foundries.



DRIVE END NO. 1 ROLL *and* BLENDING MACHINE

SIDE VIEW NO. 1 ROLL *and* BLENDING MACHINE

NO. 1 ROLL *and* BLENDING MACHINE

DISCHARGE END NO. 4 ROLL *and* BLENDING MACHINE

DISCHARGE END NO. 1 ROLL *and* BLENDING MACHINE

NO. 4 ROLL *and* BLENDING MACHINE

Don't worry about the scarcity of labor to handle your raw and finished material. DO IT MECHANICALLY. Our Engineering Department will gladly show you how.

The E. J. WOODISON CO., Canadian Agents

The Standard Sand & Machine Co., Cleveland, Ohio

"Buffalo Brand"

VENT WAX

Eliminates Core Troubles   Reduces Core Costs

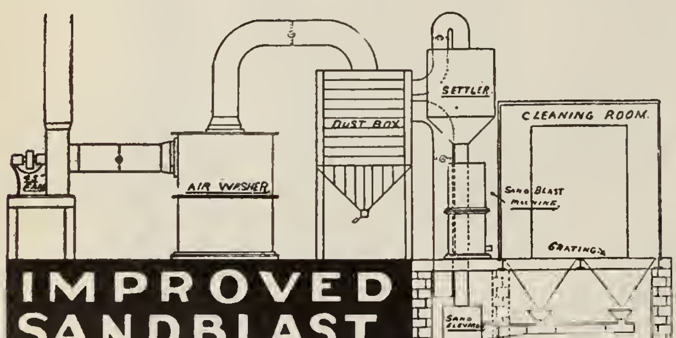
It is hard but pliable, and will not stick together at any ordinary temperature. Is absorbed by the core at the time of drying, thereby leaving a good clean vent hole, just the size of the wax used.

It will improve the core instead of making it soft around the vent. Works in unison with any kind of core binder.

Guaranteed not to injure the most delicate core ever made.

Write your supply house for samples and prices, or write us, as we are convinced that a trial will prove it to be the easiest and best way to vent any core.

United Compound Co.
178 Ohio St. - Buffalo, N.Y.



IMPROVED SANDBLAST CLEANING ROOM

Established 1869. First in business and leaders ever since.

TWELVE REASONS why Tilghman-Brooksbank New Sandblast Room Plants and Systems are the BEST

Study them carefully:

1. These machines insure better working conditions for the operator;
2. The initial cost is very small;
3. Only a very shallow pit is required;
4. The air in the room is changed from five to seven times every minute, at very little cost;
5. Simple in design;
6. Guaranteed to give first-class service;
7. There are no wearable parts;
8. There is plenty of light for operator to work by;
9. The room is absolutely clear of all obstruction;
10. There is no shoveling of sand or shot back into the machine;
11. Entirely automatic;
12. These machines will increase your output.

WRITE FOR FULL PARTICULARS AND REFERENCES.

We specialize in
SANDBLAST MACHINERY, HELMETS, GLOVES, RESPIRATORS, OPERATORS' COATS, GOGGLES AND AIR COMPRESSORS.
Also Special Machines for Special Work.

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Let us assist you in "Grinding Down Costs"

To do this simply give us an outline of your grinding operation and we will furnish the **best possible wheel** for the purpose.

Gresolite
for Grey and Chilled Iron.

Emery
for Steel Foundry and General Purpose.

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for Precision and Fine Tool Grinding.

Write for booklet "Safety as Applied to Grinding Wheels."

Canadian Hart Wheels
LIMITED
Manufacturers Grinding Wheels and Machiner
456 Barton Street East
HAMILTON, CANADA

Making an Eight Ton Kettle Casting in a Dry Sand Mould

Staff Article

The use of dry sand for moulding a casting of the size and type described is somewhat unusual. The method of production for this special job had to be arranged to suit the existing equipment and while shops with ample facilities would adopt different methods, the plant in question produced a large number of these special castings with almost negligible loss.

WHEN preparations were being made for the production of a number of cast iron pots or stills as shown in drawing Fig. 1, careful consideration had to be given to the manner in which the moulding would be done. The size and nature of the casting was quite a departure from the regular line of work turned out, which, while of considerable dimensions, did not present such problems in coring, venting, and pouring. It was decided to mould the job upside down as this would allow the

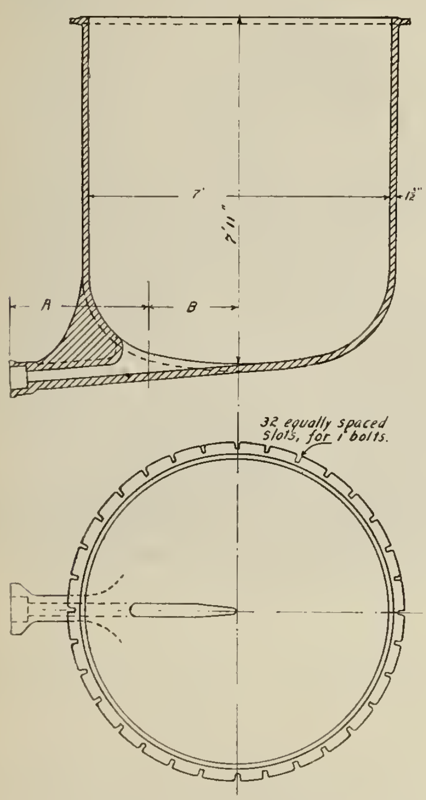


FIG. 1. PLAN AND SECTIONAL ELEVATION OF CAST IRON STILL.

weight of the core to be supported on solid ground, the use of chaplets in any shape or form being strictly forbidden, and by no other method of moulding was it possible to comply with this restriction.

Further discussion resulted in the making of a built-up core with a separate top or cap as the existing core oven was not large enough to accommodate a one-piece core of the required size. By sinking the whole job in the ground, the need of special flasks was overcome, while the pouring of the metal was done at floor level.

The first step in the work was to excavate a hole about fifteen feet square and ten feet deep which was carefully levelled up and packed solid to support the foundation plate, see Fig. 2. A number of tie rods are anchored to this plate, their upper ends being made with an eye into which are hooked other bolts carried up to the top of the mould.

Constructing the Core

The centre of the foundation plate has an opening provided with a grating to support the coke which forms the centre

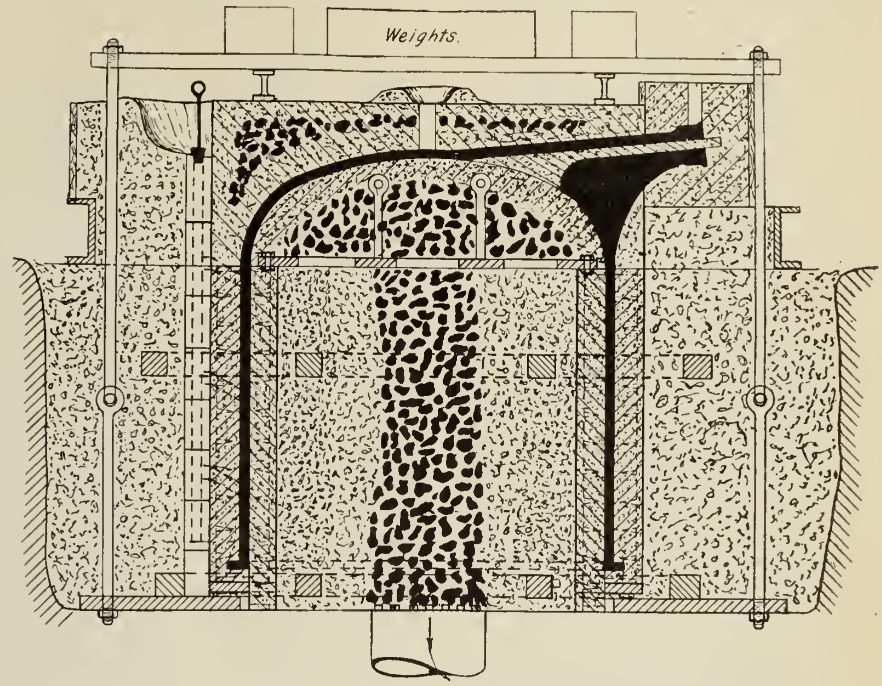


FIG. 2. SECTIONAL ELEVATION OF COMPLETE MOULD.

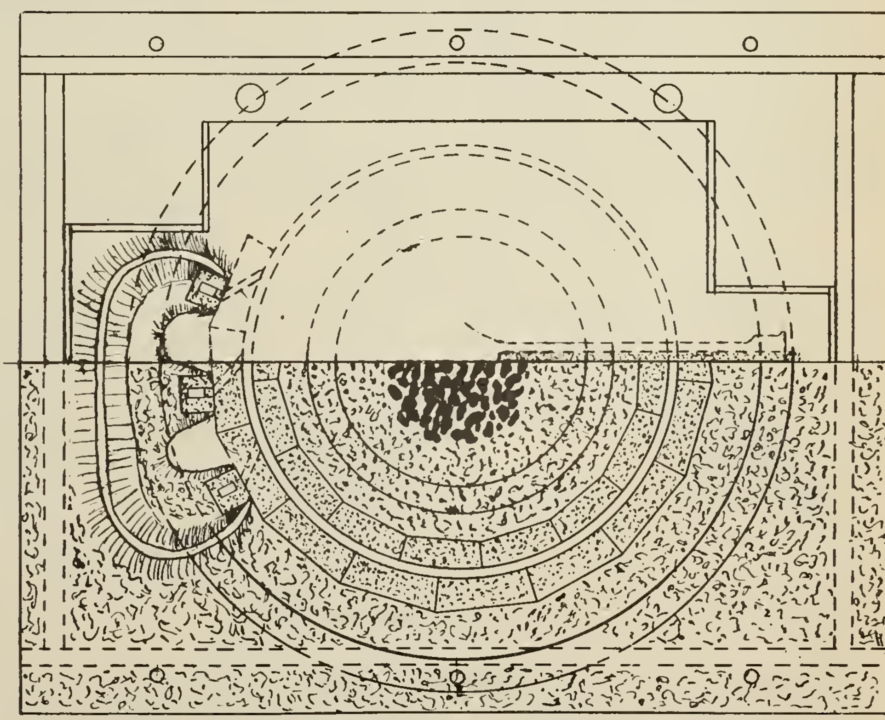


FIG. 3. HALF SECTIONAL PLAN OF MOULD.

of the core, and allows the venting of the gases to take place through a passage below the foundation plate. This passage was found useful as a means of draining off water which made its appearance for a few days after the hole

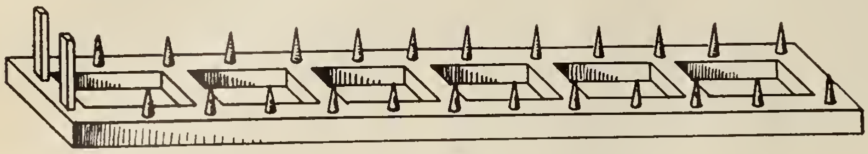


FIG. 4. IRON CORE FRAME FOR SEGMENTS.

was completed. After being covered with a layer of dry sand, the construction of the core is proceeded with.

The straight body of the core is formed of 16 segments shown in plan view of mould, Fig. 3. These segments are made of dry sand, formed on iron frames and baked. One of these frames is shown in sketch Fig. 4, two short bars being cast in position at the lower end. These bars project outward from the bottom of the core, and anchor it in position.

In building up the main core, the segments are assembled in position and bolted back to rings which pull the joints tightly together. The centre of the core is now filled up with coke, a suitable backing of green sand being placed between the dry sand segments and the coke centre. When filled the upper surface is carefully levelled and faced on the top of the segments to make a tight joint with the cap, which is now placed in position.

The cap is a dry sand core with a coke centre, and is made up on a circular frame which allows the gases easy access to the main vent. The frame is bolted to the top of the segments by eight bolts, access to the holes being had by cutting away sufficient material, the holes being afterwards filled up with green sand. The cap is lifted by three eyebolts fixed to the frame, the space around them being filled with dry sand plugs after the

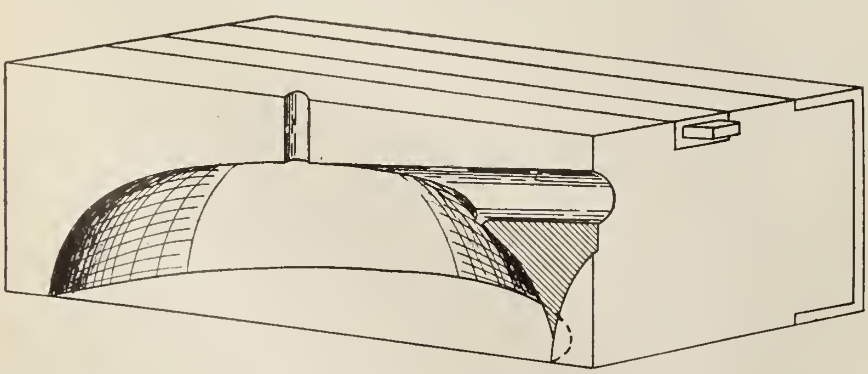


FIG. 5. VIEW OF HALF COPE.

cap is in position. A coating of black wash is now applied to the entire surface of the core, after which the building of the mould is proceeded with.

The Mould

The mould segments which are made on frames similar to those in the core segments, are now placed in position, the first four being accurately located 90 degrees apart on the centre lines shown. The lower ends of these segments rest directly on the toe of the inner segment, and as the cope is held down on top of the mould segments by means of the tie-rods, the core is thus securely fixed in relation to the mould and cope, and the tendency to float or rise when the metal is poured is quite overcome. The lower ends of the mould segments are cored out to form the flange of the casting, two vertical webs in the core forming the slots for the cover bolts.

After the first four segments are accurately located and stayed, the remainder are placed in position: one segment in each quarter being rubbed down to get accurately fitted joints. The lower ends are positioned from an outer ring, Fig. 2, being adjusted by means of bolts and wedges to give the proper thickness of metal in the casting. Green sand is now filled in and rammed behind the segments, a second ring, Fig. 2, being placed about two feet from the top, and the upper end of the segments securely bolted and stayed therefrom.

Runners and Gates

While this filling is in progress the runners are built up as in Figs. 2 and 3. There are three of these formed by means of cored blocks built up from the foundation plate.

Each runner is formed of a separate column of blocks. A hole is cut through the side of one of the blocks which is placed opposite a cored passage in one of the segments. These passages are cored offset so as to enter at a tangent, in order to avoid cutting the face of the core. This arrangement also imparts a circular movement to the metal so that it flows round the core, preventing any excessive local cooling of the metal.

FIG. 6. SHIPPING THE FINISHED CASTING.

The Cope

The cope is formed in two pieces, the parting being along the line of the drain pipe. As shown in Fig. 5, it includes about two-thirds of the drain pipe, the remaining portion of which is formed in a small two-piece mould as shown in Fig. 2. This small mould supports the outer end of the drain pipe core, and provides a riser at the highest point of the casting. Another riser is also provided in the centre of the casting through which additional metal is poured to take care of shrinkage in cooling.

In order to avoid crushing the cope by tightening the tie rods too much, four stays of heavy tube are placed between the foundation plate and the back staves across the top of the cope. The cope is made of dry sand with coke centres in the thicker portions and vent holes to allow the escape of steam during the drying.

Pouring

The main runner, Figs. 2 and 3, embraces the three gates which at the commencement of pouring are plugged. When a suitable quantity of metal is in the main runner, the plug is pulled out of the lowest gate, thus giving the first metal the least drop to the bottom of the mould. When a couple of tons have run in, No. 2 plug is pulled, followed by No. 3 plug after a suitable interval.

As the work is special, and the number limited, it was not desirable to go to more expense than necessary to turn out a satisfactory job with existing equipment. The method described meets the requirements of the job, but calls for very careful work in building, as a slight variation in the setting of the mould means a big difference in the weight. So far a limit of two or three hundred pounds has been easily maintained between maximum and minimum weights.

OPEN-HEARTH VS. ELECTRIC FURNACE FOR COMMERCIAL STEELS

THE fundamental question is one of cost, and any authentic figures are always welcomed as throwing fresh light on this subject, which is of great commercial interest. The fact that the electric furnace can successfully compete with the crucible process, and in some cases with the small converter, is, we think, established, but a comparison of the electric furnace with modern open-hearth furnace is open to discussion, and is made the subject of an article by S. Cornell in a recent issue of the Metallurgical and Chemical Engineering.

In order to provide data on this point a table has been compiled for a year's operation of a large open-hearth plant and compared with what is claimed to be practice obtainable in an electric furnace plant of the same capacity. The open-hearth plant consisted of 80-ton furnaces, having a production of 200 tons of ingots per day for each furnace, compared with 20-ton electric furnaces, approximately the same capacity per day.

Dealing with the materials necessary to make one ton of steel, and including all consumable material and cost of repairs, it is calculated that the cost per ton of steel is $14.50 for the open-hearth against $18 for the electric steel. The cost and quantity of raw material is taken to be the same in both cases, and the difference is due entirely to a fuel cost for producer gas being 54 cents for the open-hearth, as against $4.40 for electric power in the electric furnace.

The general labor charges which are common to both processes is worked out at $1 per ton of steel, whilst the cost of general repairs is given as 6 cents per ton.

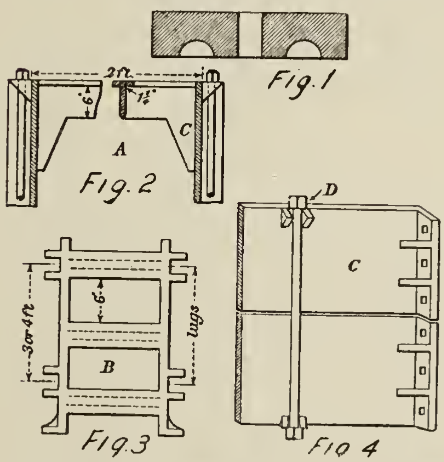
From a careful consideration of the outlay necessary in installing electric furnaces of sufficient capacity to produce the same tonnage as a set of open-hearth furnaces, it is calculated that in order to compete in cost the electrical energy must be produced at below 1 cent per kilowatt-hour.

The present electrical equipment using blast furnace gas cannot do better than 7 cents per kilowatt-hour.

HINTS TO FOUNDRYMEN

A CONTRIBUTOR to "Engineering" says it appears to be general practice to make patterns for all classes of castings, light or heavy, and to ignore loam work as being either too costly or causing too much dirt in the shops. This is entirely wrong, as I think some of those in charge have but little knowledge of how loam work can be made to advantage over sand, both as regards cost and keeping the shop just as clean.

I was talking to a gentleman the other day, who thought that his was quite a modern concern. They were engaged on one class of engine, etc., or what might be called repetition work. There was one casting in particular being made from patterns; this was what molders commonly call a block fly-wheel.



ILLUSTRATING HINTS TO FOUNDRYMEN.

up to 12 ft. in diameter, as shown in sketch (Fig. 1). Now to make such castings as these in sand is not only increasing the cost, but causing a lot of unnecessary hand labor for the molders.

Anyone that claims to know anything of modern foundry practice could take 10 per cent. from the cost of a casting of this kind by making it in loam, and more than another 10 per cent. from all others that were required. There is plenty of room yet for green, dry sand and loam work in a modern foundry, and castings can only be produced economically by sound judgment in the use of them.

Jobbing Foundry-Box Parts

The writer has worked in plenty of jobbing foundries doing a fairly decent class of work that could be cast on its joint, but if anything came along that had to be cast vertical, it had to be rejected as being something out of their particular line. Now if the boxes had been made to tackle any class of work, such castings as hydraulic bodies, rams, etc., could have been made.

All that is required is a crane of sufficient height to turn them up, to make the bars in the box with lips as shown in the sketch (Fig. 2) like a T, and to place lugs (Fig. 3) at the back about 3 ft. or 4 ft. apart, for the boxes to be bolted with these when they are being used vertically. A cross-section of the box is shown at A; the top and distance of the bars should be apart are indicated at B, while C shows a side view of a pair of boxes, and D the bolts and method of fastening. These can be made in lengths to the requirements of the foundry; 6 ft. and 9 ft. are fairly handy. The boxes can be bolted at the ends to make any length required; they are perfectly safe, no plating or the back of the bars or ramming being required.

Splitting Castings

The best method of treating splitting plates for castings is to glue a thin layer of asbestos over them; when cast they will rap out, leaving a smooth, clean face.

BRITAIN GETS CONTROL OF FERRO-MANGANESE

AMERICAN manufacturers using ferro-manganese in the manufacture of steel have been asked by representatives of the British Government to dispose of their products containing that constituent only to Great Britain and her allies. The supply of this material is said virtually to be controlled by Great Britain and Russia.

Customers of the Bayonne Steel Casting Co., of Bayonne, N.J., have received from that concern notice that British agents have requested them to have all their customers sign a promise not to export, except to the United Kingdom, France, Russia or Italy, any of the steel products purchased from the Bayonne Co. in which ferro-manganese is employed.

The customers were asked also to agree to notify the British Consul-General in New York of any shipments of steel or steel products containing ferro-manganese to any destination other than Europe or Canada.

A representative of the Bayonne Co. says 95 per cent. of its customers have signed the proposed agreement.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

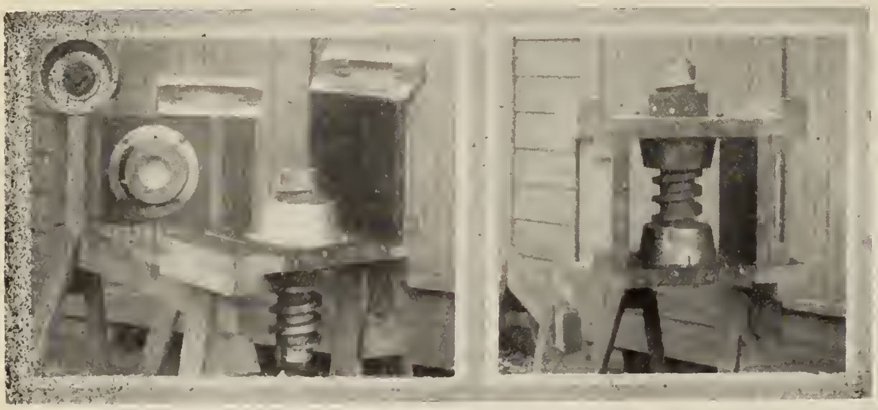
MAKING A CAST STEEL WORM

By D. O. Barrett

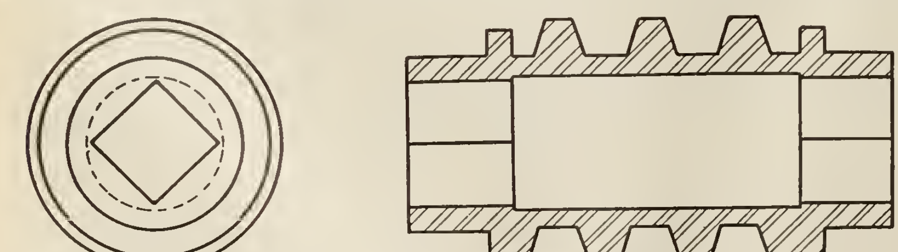
THE worm shown in the drawing was used in bottom dumping coal cars, one at either end, both right and left hand. The worms were 4 13-16 inches in diameter, and $9\frac{1}{4}$ inches long, and were steel castings cored out as shown. These slipped over a square shaft by means of which they were turned. They were cast in dry sand cores entirely, the core boxes for same being shown in the photo. An assembled view of the core boxes is shown with the worm in position. The box was held together by means of a clamping bolt at each end, and was constructed of oak, and iron bound. The cone-shaped pieces extending into the box at either side were core prints, the core box for which is shown in the upper left hand corner on the dis-assembled box. The box for the square centre core is also shown. There were thus four cores in all.

After the large square core was rammed up, the worm was simply turned out, and the box opened. The worm was provided with an extremely long cast iron bearing which had been babbitted to form a nut. In this manner the action of removing the worm was entirely automatic and there was no danger whatever of crushing the sand.

In order to prevent the feather edge which would otherwise be formed where the thread passed into the nut at one end and the print at the other, a projection was provided in the end core as well as in the main box, so that this was taken care of. These end cores also formed the shroud rings at the ends of the worm. It was, of course, necessary to set the end cores accurately in relation to the main core, and it will be noticed that there is a notch in the upper side of this core for locating same. Two boxes were made, one right and one left hand, and the quality of the work turned out was very satisfactory.



MAKING A CAST STEEL WORM.



MAKING A CAST STEEL WORM.

GASOLINE FIRES

by A. R. S.

IN the Jan. 13, issue of Canadian Machinery you answer a question regarding gasoline fires. I should like to add a few words to your answer based on an experience of six years, over a large portion of which time I can safely say that I have seen a gasoline fire twice a month. I have just had one in our factory that was rather bad, as it burned for nearly three hours and there was a tank that contained nearly 5,000 gals. involved. As a general rule I would suggest the following for protection from these fires.

First, I am against the use of ammonia as this bottle might be broken from a small blaze and cause loss of life from breathing the fumes. For a small fire in a can or other receptacle, sawdust is the best thing that can be used. It will float on the liquid and smother the fire where sand or earth will not. Sand will do where there is only a small amount burning on the floor, but, where there is any considerable quantity sawdust is the best. If the fire should spread so that these measures can not be followed, then turn live steam into the room and smother it in that way. The steam will smother it by replacing the air. It is also a good plan to have an asbestos blanket or two around as they also will sometimes smother the fire. Most gasoline fires are caused by the accumulation of vapor, and the room in which it is used should have exhaust fans that will collect this vapor from the floor and also the ceiling. The reason for this is that some days the vapor will rise and at other times it will sink.

NEW ELECTRIC STEEL FURNACE PLANT

THE Canadian Electro-Products Co., whose incorporation with a capital of \$500,000 was announced recently, expects to have a new electric furnace plant for the manufacture of high-grade steel in operation in Montreal in about a month or six weeks. The plant is being designed on the basis of two units, each of a capacity of 25 tons of steel a day, and at least one of these units should be in operation within the time mentioned.

The authorized capital of \$500,000, it is understood, will be half in preferred and half in common shares, but only a portion of the authorized amount will be necessary for the initial installation.

J. S. Norris, of the Montreal Light, Heat & Power Co. and Messrs. Howard Murray and Julian C. Smith, of the Shawinigan Water and Power Co., are among those behind the new venture and will be members of the board of directors when organization is completed. The company, however, is a private enterprise, and will not be a subsidiary of either Montreal Power or Shawinigan Power. However, as the operation of the new plant, when both units are working, will call for about 4,000 h.p., naturally both the older companies will benefit, one as the distributor and the other as the producer of the power required.

CAUSES OF SHRINKAGE CRACKS IN STEEL CASTINGS

By William R. Bossinger*

SHRINKAGE cracks in steel castings constitute a common defect of steel foundry operations. The cause of shrinkage cracks is the same for all castings, but their locations are never identical, owing to the varying forms of different sections. It is not unusual to make castings from one pattern for a period of several months without being troubled by this defect, yet suddenly all of the castings from one heat will develop these cracks. If it were possible to prevent steel from expanding or contracting, this difficulty would be overcome, but since this is beyond control, the alternative must be accepted and this phenomenon must be contended with, namely, the contraction of the steel after the mold is filled. To reduce these defects or to eliminate them entirely, every effort should be made to prevent setting up solid walls that will cause the metal either to stretch or crack when the force of contraction is brought to bear on the walls of the molds.

Numerous appliances, devices, etc., are resorted to to overcome this defect, including the use of brackets, chills, tie bars, the use of sawdust or cinders in the cores, maintaining the metal at a minimum temperature when pouring and keeping it as low in sulphur as possible, as too high a percentage of the latter element is one of the common causes leading to shrinkage cracks. Long castings with attached ribs, flanges or lugs will crack if the sulphur is not well under 0.05 per cent. in basic steel, regardless of the fact that other properties and conditions may be favorable to the elimination of this defect. While the various causes leading to shrinkage cracks are well-known to the management of steel foundries, nevertheless this will not eliminate losses from this cause until a knowledge of the cause of shrinkage cracks is imparted to all of the men constituting the organization. The success in keeping down shrinkage cracks is based upon the training of the men who are directly responsible for the development of this defect. Each casting presents a different problem, as the thickness of metal and the lack of uniformity in section will change the location of these cracks in one casting as compared with another of an entirely different form. To train the shop force in eliminating difficulties from this cause, the common sense of the employees is a contributing factor of no little importance. Theary and practice combined, as well as previous experience, likewise should be taken into consideration. It is not unusual to stop cracking in one part of a casting, only to have this defect develop in another part of the same piece. This, however, should not prove discouraging, as it indicates that proper methods are being taken to prevent these defects. The law of the segregation of metals should be recognized as being closely allied to the causes underlying the formation of shrinkage cracks. Segregation will cause the formation of shrinkage cracks on the outside surface of many castings.

*Marion Steam Shovel Co., Marion, O.

The Use of Chills

The free use of chills is recommended, as they will reduce this default by controlling the cooling to a greater extent than the use of brackets. Unless efforts are made to prevent the employment of chills that are too large or heavy, or which extend over onto the junction of heavy and light sections, the chills will increase the tendency to crack. If the chill is too large, it will cause shrinkage cracks at the point of the chilled face. This is caused by the too rapid contraction of the casting directly underneath the face of the chill. When the chill is of the proper thickness, it causes the heavy part of the casting to pass through the first stage of contraction, imparting to the metal sufficient strength to meet the stresses caused by passing through the first cooling stage. Stresses in the chilled parts of steel castings are eliminated when the proper chills are employed. The chills will absorb heat from the casting until they reach a temperature of 1,400 degrees Fahr., and on cooling with the casting all stresses should be relieved as the casting strains are released by what practically constitutes annealing at this temperature. The use of chills is resorted to for the purpose of reducing the size of feeders on many castings. The chills are inserted in the molds over lugs and flanges that have light, thin sections on top. A chill should be of sufficient size to set the heavy section of metal before the metal in the lighter section has left its fluid state. In this way fluid steel will be carried to the chilled part and other fluid steel will be drawn from the feeder to replace metal taken from the lighter section. Another reason why the chill is to be favored in place of the use of brackets is that the chill will fall out of the mold when the casting is shaken-out, whereas the brackets have to be chipped off.

Improper Gating

Improper gating also is frequently the cause of shrinkage cracks, forming hot spots in line with the flow of metal. If a flat casting is gated in the centre and the metal is forced in one direction, causing the sand to absorb and retain heat in this section of the mold, thereby causing a hot spot in the casting resulting in a shrinkage crack, it can be attributed to the remainder of the casting cooling and contracting in advance of the centre of the hot section. To further illustrate this point, an I-beam section will be considered which is gated in the centre of the web. If poured in this way, the casting will be liable to crack, as the flanges will resist contraction and the centre will be weakened by the higher temperature of the metal due to the method of gating in the web and this part of the section would not have sufficient strength to withstand contraction and the crushing of the sand walls on the flanges.

From a Paper read at the American Foundrymen's Association Convention, Atlantic City, N.J.

MANGANESE BRONZE

LARGE quantities of non-ferrous scrap must accumulate from time to time, and the problem of its economic disposal is of interest. The methods used at the Washington Navy Yard were recently described in a paper before the American Society of Naval Engineers by Lieut. J. B. Rhodes, U. S. Navy, dealing particularly with manganese bronze. The following materials were available, with the compositions approximately as shown:

1.—Naval brass: Copper, 62 per cent.; zinc, 37 per cent.; tin, 1 per cent.

2.—Cartridge-case metal: Copper, 68 per cent.; zinc, 31.6 per cent.; nickel, 0.4 per cent.

3.—Manganese bronze: Copper, 59 per cent.; zinc, 41 per cent.

4.—Commercial brass can be used in small quantities, but should be avoided, as the lead content is too high.

The results of experiments during about six months have shown that it is practicable to make high-grade ingots in an oil-fired "Rockwell" furnace of about two tons capacity. This has been accomplished in spite of the well-known prejudice against open-flame furnaces in the manufacture of non-ferrous alloys. Oxidation has been reduced to a very small amount by using wood scraps from pattern shop, and salt. The bath is protected by the molten salt, and the wood ensures a reducing rather than an oxidizing atmosphere in the furnace.

In undertaking the manufacture of manganese bronze a special hardener is first made, and is regarded as the secret of the whole process. A satisfactory mix consists of 100 lb. copper, 25 lb. mild steel, 25 lb. of 80 per cent. ferro-manganese, made by melting the steel and alloy together, and then adding the copper as quickly as the melt will take it.

In using the scrap it is necessary to

know the approximate analysis. The desired composition is:

	Per cent.
Copper	57.0
Zinc	40.0
Iron	1.0
Manganese	0.75
Aluminum	0.75
Tin	0.50

The usual losses in zinc, manganese, aluminum, and tin are allowed for, and a heat melted and cast. After analysis, the final adjustments are calculated and allowed for (particularly zinc, which must be 41 per cent. in the finished casting) when re-melting for use in the finished casting.

In melting in the oil furnace, the most difficult scrap to melt should be charged first, although all but finals may be charged at once. As soon as melted, the hardener should be added. In about half an hour, charge the remaining scrap (if charge is not made all at the same time) and continue the melt. After the heat is well up, add zinc, then tin (if necessary), and finally aluminum; stir well and tap. Small ladles are used for pouring the ingots. Ingots are numbered to show the heat, and turned into the store awaiting analysis. The cost of the method is high, on account of the labor in pouring and marking ingots, but, counting in furnace loss, labor, fuel, and upkeep of furnace it is less than 2 cents per lb., so that scrap worth 7½ cents per lb. can be converted into manganese bronze to cost not over 10 cents per lb.

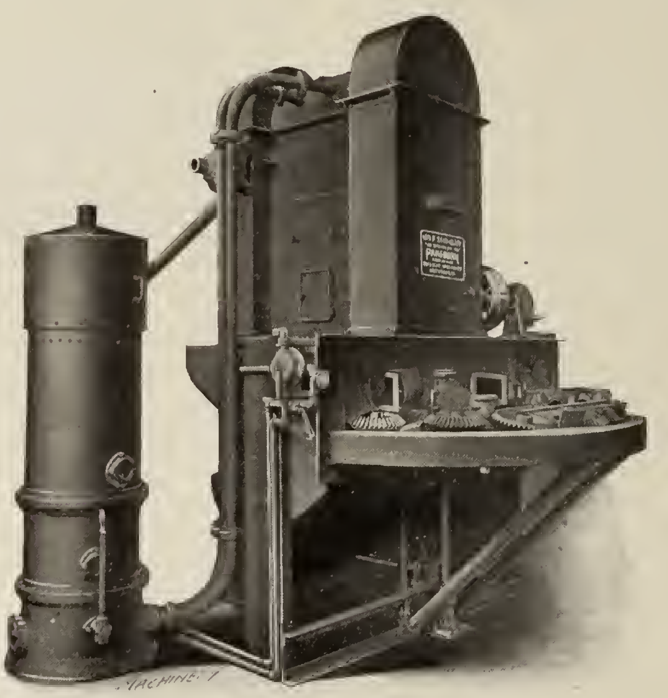
One of the heats gave 82,000 lb. tensile strength, and 28 per cent. elongation. Quite frequently 75,000 lb. tensile strength and 20 per cent. elongation are obtained in sand castings. If high pouring temperatures are avoided and the metal is poured when it ceases to give off zinc fumes in large volume, excellent values will be obtained so long as the zinc content is kept at 41 per cent.

DIRECT HIGH PRESSURE ROTARY TABLE SAND-BLAST

A RECENT product of the Pangborn Corporation, Hagertown, Md., consists of the direct high pressure rotary table sand blast here described and illustrated. This apparatus is built in two sizes — 90-15 and 70-15, for medium and small work, and comprises in its detail a multiple chamber sand-blast, complete rotary table with driving mechanism and housing and belt bucket elevator. The larger machine has two nozzles and the smaller machine one nozzle. The tables the 90 inches and 70 inches diameter respectively and both sizes have the same clearance over the surface of the table. The over-all heights are 12 feet and 9 feet 6 inches respectively.

The equipment is controlled and operated from the front of the machine and the controls are all centralized. The table makes one complete revolution in 5 minutes. With the series of rubber-flap curtains neither dust nor sand comes outside the housing.

The operator starts with a pile of work on the floor or on a truck to his left, and keeps putting a layer of the pieces on the table as it rotates. The nozzles revolve inside the housing and cover the whole surface of the table. As the pieces come out from under the curtains they are turned over, and when thoroughly sand-blasted, are removed and the vacant space on the table again covered with new work. The sand, after striking the work, falls through the grates of the table to the boot of the elevator, and is returned automatically to the sand-blast.



DIRECT HIGH PRESSURE ROTARY TABLE SAND BLAST.

The refuse is thoroughly separated from the sand each time it is used. With the multiple chamber sand-blast there is no loss of time in refilling the latter. The dust-laden air is exhausted through the openings at the rear of the housing. The rotating of the table and handling of the sand require approximately 4 horse-power. Sand, chilled iron grit, shot, or in fact any abrasive can be successfully and satisfactorily used with this equipment.

B.C. NEEDS COPPER REFINERY

THE HON. LORNE CAMPBELL, Minister of Mines for British Columbia, recently outlined some ideas which he holds respecting what should be the policy of the Mines Department at this time. He laid stress on the necessity of the erection at some point on the coast, at as early a date as possible, of a copper refining plant.

Mr. Campbell explained that at present nearly all the raw material produced in this province is shipped to refineries in New Jersey. The blister copper from the Granby smelter at Anyox, for instance, is shipped overland to New York, to be refined further in American plants. Concentrates from the Britannia mines, Howe Sound, mostly go to the Tacoma smelter, whose product also finds its way to New York markets.

The minister believes that a plant established at a suitable place on the Coast could handle this business and ship its product direct to the order of the British Government for manufacture in Great Britain. There is no present intention of bonusing a refinery, but the Government is collecting all possible data on the matter with the idea of furthering the project of the establishment of such an institution at some point on the Coast.

Mr. Campbell added that the present activity in the mining industry in this province is rapidly developing to a point which will admit of no delay in pushing forward such projects as he mentions. The returns of the last week's business just to hand, show big increases in the ore shipments from the Boundary and Kootenay mining district. A total of 19,300 tons of ore, chiefly copper and silver-lead, was moved last week, as compared with 8,800 tons for the corresponding period last year. The returns indicate an increasing ratio each week.

The Manufacture of Galvanized Sheets in Canada

Staff Article

Continual evidence of this country's industrial progress is afforded by the frequent establishment of factories for the manufacture of products, the demand for which has hitherto been supplied entirely by foreign producers. The demand for sheet metal in this country assures a market which is distinctly encouraging to the organizers of this enterprise.

A NEW industry for Canada was inaugurated on September 1 last when the Dominion Sheet Metal Co. started operations at their new galvanized sheet plant at Hamilton, Ont. The plant occupies a site covering five acres, and is situated on the belt line railway, jointly operated by the G. T. R., C. P. R. and the T. H. & B. It is within a short distance of Lake Ontario, the water of which being soft and clean, is particularly suitable for the process of galvanizing. If hard water only were obtainable, the effects of lime and other deposits, which prevent the sheets from receiving the coating properly would have to be neutralized.

In normal times approximately 70,000 tons of galvanized sheets are used in Canada per year, and prior to the establishment of this plant no sheets were produced in Canada, the bulk of the supply being imported from the United States and some from England. The product of this plant bears the trade mark of "Premier," but in addition the company makes a "tight-coated" "Premier" galvanized sheet when desired. This latter is especially useful for purposes requiring extreme forming, seaming, etc. The black sheets from which the "Premier" galvanized sheets are made are specified from certain mills, and must conform to exact physical and chemical analysis. All the materials used, such as open-hearth or Bessemer black sheets, spelter, lead, tin, sal-ammoniac and acids, etc., must conform to approved chemical analysis, subject to test.

Plant Layout

The factory comprises two bays, east and west, the former being 50 ft. x 200 ft., and the latter 60 ft. x 200 ft. A spur from the belt line railway runs into the east bay for its entire length; the loading and unloading of the cars is, therefore, done under cover. By this arrangement the handling of the sheets, both black and galvanized, is greatly facilitated. In this bay is installed a 124-in. squaring shear for trimming sheets, which was built by the Bertsch Co., Cambridge City, Ind. Provision has also been made for installing any additional machines that may be required in the future.

In the west bay the entire space, with the exception of a galvanized sheet store room at the north end, is occupied by the galvanizing plant. At the south end of this bay is the black sheet storage; further along are the picking machines, washing tanks, storage tanks and galvanizing machines, while extending into the east bay are the cooling machines. The west bay has a monitor roof for providing sufficient ventilation. In handling the sheets, a five-ton electric crane is installed. The crane operates over the entire length of the west bay, and was built by the Northern Crane Works, Walkerville, Ont. When the black sheets arrive on the cars they are placed on hand trucks and weighed, and then moved into the west bay, where they are picked up by the electric crane and transferred to the store room. Here they are placed in piles, according to gauge. When undergoing treatment they are placed side up in crates, to which are attached crane hooks. An interesting feature about these crates is that they are made of "Monel" metal, each crate representing an outlay of $1,000. "Monel" metal possesses the characteristics of being able to withstand the corrosive action of the hot acid in the pickling tank and lasts indefinitely, whereas crates made of bronze would soon corrode. This metal is a by-product, and is obtained from Sudbury, Ont.

A. T. ENLOW,
PRESIDENT AND GENERAL MANAGER.

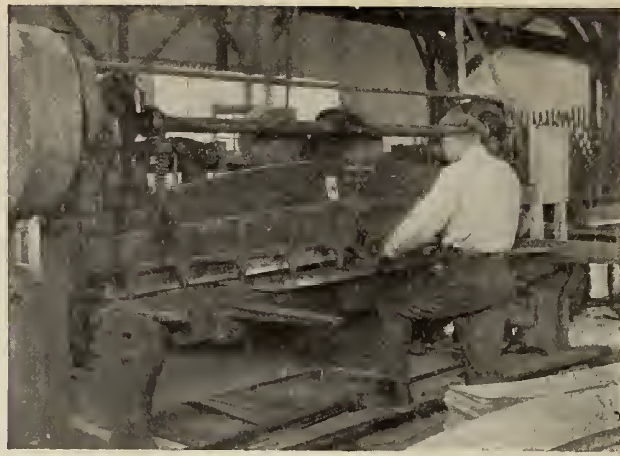
Pickling Process

The first process consists of pickling, where the sheets are treated with sulphuric acid to remove the scale and clean the surface, so that when being galvanized the spelter will adhere perfectly to the sheet. The pickling machine consists of two plunger tanks of the latest type, each tank being 12 ft. 6 in. x 3 ft. x 5 ft. deep, and having a capacity of from 100 to 300 sheets, according to gauge, at one operation. The tanks are constructed of solid 8 x 10 in. Georgia pine, and have a bottom of lead. At one side of each tank is a plunger, also made of Georgia pine. The plungers are mechanically operated, and are used to agitate the liquid in the tanks, by which means the sheets are kept separated so that the acid may work more effectually.

There are three pipe connections for each tank for water, sulphuric acid and steam, respectively, the latter accelerating the pickling process. Adjoining the pickling machine are two independent sulphuric acid storage tanks, one for each pickling tank, equipped with floats and gauges for regulating the quantity of acid used. The acid flows by gravity to the pickling tanks. The independent acid tanks are connnected to a large storage tank located outside the building, and hav-

NEW PLANT OF DOMINION SHEET METAL CO., LTD., HAMILTON, ONT.

STORE ROOM FOR BLACK SHEETS.



SQUARING SHEETS ON SHEARING MACHINE.

ing a capacity of 60,000 pounds. She acid is obtained from the Grasselli Chemical Co., which adjoins this plant. The steam for the pickling flush is obtained from a boiler, which will be referred to later in detail. The sheets remain in the pickling liquid for about thirty minutes, after which they are removed to the rinsing tanks.

The machinery for operating the plungers is located in a pit under the shop floor and adjacent to the tanks. The electric motor which drives the machinery is above the floor level, and is controlled by a "Wagner" polyphase motor starter. The motor is 10 h.p., 3-phase, 60-cycle, 220 volts, and was supplied by the Wagner Electric Mfg. Co., through their Toronto office.

A belt drive connects the motor to a pulley on the machine underneath, the power being transmitted to a crank shaft by a link-belt chain. A disc crank at the end of the shaft is connected by means of a connecting rod to another crank, which lifts a vertical rod up and down, thus operating the plungers. The motor starter and acid feed controller are located near together, both being within reach of the operator.

Washing Process

After the sheets have been in the pickling tanks the prescribed length of time, the crate holding them is lifted out by the crane which carries them over to the rinsing tanks near-by. These are two tanks constructed of wood, each being 3 ft. x 12 ft. 6 in. x 5 ft. deep. They contain clean, fresh water, which flows through in a continuous stream, thus effectively washing the sheets and removing all traces of acid. The sheets remain in the rinsing tanks for about thirty minutes.

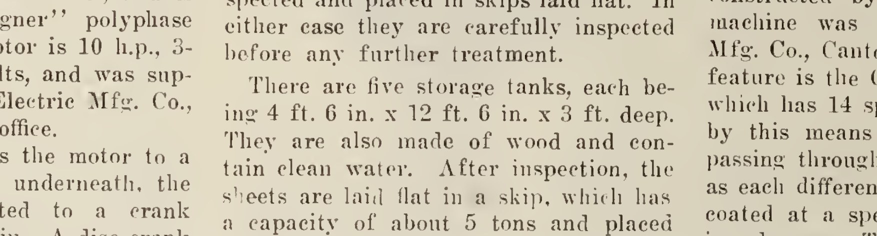
If the sheets are not to be galvanized immediately, they are carried by the electric crane to storage tanks containing water, where they remain until required for further treatment. If required at the galvanizing machine, they are carried to the feed tank direct by the crane, after having first being inspected and placed in skips laid flat. In either case they are carefully inspected before any further treatment.

There are five storage tanks, each being 4 ft. 6 in. x 12 ft. 6 in. x 3 ft. deep. They are also made of wood and contain clean water. After inspection, the sheets are laid flat in a skip, which has a capacity of about 5 tons and placed in the tank.

Galvanizing Process

Great care and expert knowledge is required in this operation, which consists of coating the sheets with a thin layer of zinc spelter. It will shortly be possible to obtain Canadian smelted zinc. There are two galvanizing plants installed which are operated independently of each other. Each plant consists of a "pot" constructed of brick, and having a natural gas-fired furnace underneath. The "pot" contains the spelter, one charge weighing about 80,000 pounds, and also the machine for doing the galvanizing. The pot and furnace were constructed by the company, and the machine was supplied by the Berger Mfg. Co., Canton, Ohio. An interesting feature is the C. G. E. motor controller, which has 14 speeds ahead and reverse; by this means the speed of the sheet passing through the tank can be varied, as each different gauge of metal must be coated at a speed definitely determined in advance. The motor and drive for each machine are located in a pit near the machine, and thus do not obstruct the operators. The motors are each $7\frac{1}{2}$ h.p., and were supplied by the Wagner Electric Mfg. Co.

Before being galvanized, the sheets are inspected and dipped in a tank containing muriatic acid; this acid cleans the sheets, and also acts as a flux or binding medium for the spelter. The sheets are fed from the tank through a pair of 6-in. rubber rolls through a bath of sal-ammoniac, which is a flux and floats at one end of the pot only, on top of the spelter. The sheets travel down on guides immersed in spelter through the bottom



PICKLING DEPARTMENT WHERE SHEETS ARE PREPARED FOR GALVANIZING.

rolls which carry the sheets along. The sheets then pass through another set of finishing rolls, which assist in the process, and also draw the sheets out of the pot. The speeds of the various sets of rollers vary, a feature which is carefully worked out in the construction of the drive gear. The temperature of the spelter in the pot is recorded on a pyrometer supplied by the Brown Electric Pyrometer Co., Philadelphia, Pa.

GALVANIZING MACHINE WITH FEED TANK.

Cooling the Sheets

As the sheets leave the finishing rolls on a chain conveyor, they are carried between a series of rolls or levellers, which, as the name indicates, flatten out the sheets while hot. The sheets are then carried a short distance on another set of rollers to a table in front of the revolving cooling racks. On this table is a trip gear automatically operated, which places each sheet in position on each rack as the latter comes round. The cooling machine revolves very slowly, and, while doing so, compressed air is played on the sheets, giving to the smooth silvery surface that spangled appearance which distinguishes all galvanized sheets. The accompanying illustration will give the reader an idea as to the type of machine used for the cooling process. There are two of these automatic cooling machines installed, both having been built by the United Engineering and Foundry Co., Pittsburg, Pa. The cooling machines are operated by the motors that drive the galvanizing machines.

SHIPPING "PREMIER" GALVANIZED SHEETS.

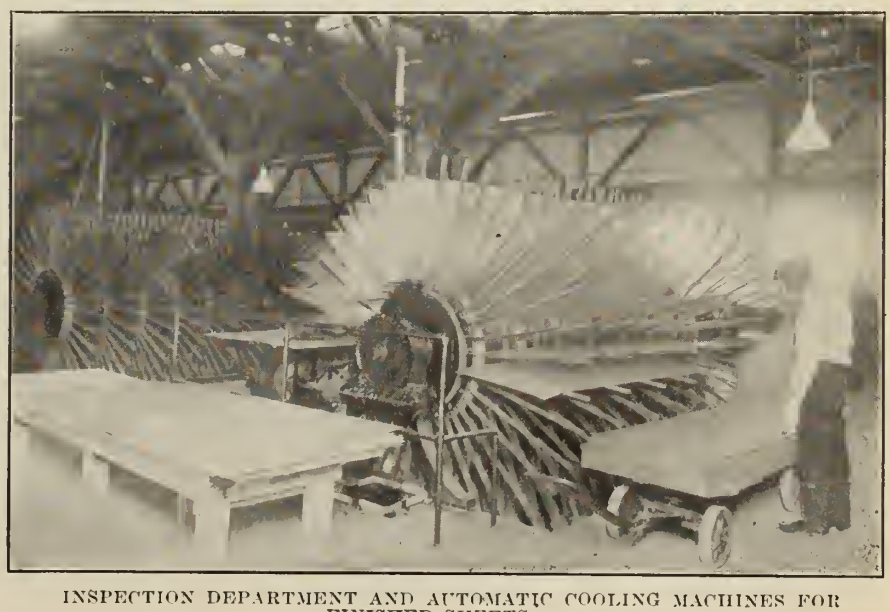
By the time the sheets have travelled over to the other side of the cooler they are cool. They are then taken from the racks, placed on trucks and carefully inspected on both sides for any imperfection. Any sheets that are imperfect are placed on one side, while the perfect sheets are branded. The sheets are now finished and are loaded into cars, which are inside the shop, or are bundled, weighed, and taken to the warehouse to await shipment when required.

Heating and Lighting Feature

The boiler for heating the plant is located in the warehouse. The boiler is rated at 30 h.p., is of the horizontal return tubular type, and was built by E. Leonard & Sons, London, Ont. It is fired from waste heat from the galvanizing pot furnaces, but is also equipped with gas burners as a stand-by. This boiler also furnishes the steam for the pickling tanks.

Current from the Hydro - Electric system is used throughout the plant for the motors and the lighting system. In connection with the latter there are a number of 600-watt tungsten lamps installed, which give an exceptionally bright appearance to the interior of the shops. The offices are located in a separate building. On the property is a pond used for receiving the discharge from the acid tanks, a considerable saving in operating expenses being made by means of this.

Although the plant has only been in operation for a comparatively short period, the company has been very successful in producing a high-class sheet. The president and general manager of the company, A. T. Enlow, has had a lifelong experience in the sheet metal business, and is ably supported by an efficient technical staff. The company has thus been spared many of the troubles which would doubtless handicap a concern embarking on a new venture of this description under less favorable conditions.



INSPECTION DEPARTMENT AND AUTOMATIC COOLING MACHINES FOR FINISHED SHEETS.

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WORKMEN'S COMPENSATION LAWS

RECENT years have witnessed a gradual recognition by various authorities in widely separated parts of the world of the duty of the State to the individual and the adoption of Workmen's Compensation Laws has become the rule rather than the exception amongst the leading industrial countries.

Like the majority of innovations affecting the relations of capital and labor, early efforts of legislation in this field were viewed with suspicion by both. Employers were loud in their protests against this addition to their many liabilities, and while the attitude of many firms would have been more sympathetic had the question been a personal one between them and their own employees, the great majority accepting the laws as promulgated, proceeded to carry them out to the letter, and having done their legal share, left it up to the men to do theirs.

Three decades have passed since State Insurance was made compulsory in the German Empire, and fully twenty years ago Britain introduced industrial compensation measures. While a period of some years intervened before the justice of this legislation was recognized by other nations, the economic effect of such measures had meanwhile become fully apparent in the countries of their adoption. Greater care was shown in the selection of new employees, and while cases of undoubted hardship arose through the discharge of some work people as unfit under the new conditions, the ultimate results have quite dispelled the gloomy forebodings which heralded the putting into effect of the legislation. A freshening of industrial effort was the immediate and perhaps the most important result; increased interest and care in the performance of their duties increased the efficiency of most employees; in consequence, the employers' attitude to the law changed gradually from sphinx-like indifference to genuinely human co-operation.

While the working out of all industrial legislation and safety-first movements will ultimately result in the survival of the fittest, such a trend of events must be preceded by earnest effort on the part of each individual to render himself fit. The "greatest good for the greatest number" may well be the motto of all industrial effort, and the continued enactment of protective legislation marks progress toward such a goal.

CANADIAN NATIONAL EXHIBITION

PLANS are already being formulated for this year's Canadian National Exhibition, and strange to say, little attention is apparently being given the all-important matter of stimulating our manufacturing and industrial enterprise relative to both our own domestic needs and the export opportunities that the war continues to open up and lay to our hand. We learn that this year's exhibition will assume largely a military aspect. Modern methods of warfare will be played-up, and an attempt be made to feature war in its actuality—casualties excepted. The midway shows are also to be hand-picked, if you please.

We had thought that the war was already in our midst in a very real sense, so much so that a caricature of it might be reckoned both ill-timed and ill-conceived. Again, why should so important an undertaking be allowed to develop a tendency towards becoming a gigantic picture show. The policy that appeals only to the senses of our people, and makes its platform a record-breaking attendance and a huge, immediate profit, whether in peace or war time, is both short-sighted and narrow, and courts disaster ultimately.

The exhibition of 1916, more so than any of its predecessors, calls for a broad and comprehensive display of our manufacturing capacity and enterprise. Our metal-working plants — to take but one branch of the above—have during the past eighteen months in the sphere of munitions production, earned for themselves high distinction for grappling with and solving successfully problems hitherto foreign to their experience and training. A lull is now evident in munitions manufacture and attention is being directed to channels in which the wealth of experience acquired may be equally fruitful of results. Our metal-working plant managements, large and small, are casting about for commodities to manufacture, either for domestic or foreign consumption, and the knowledge that our exhibition authorities are prepared to foster and encourage the efforts put forth in these directions, by specially featuring such products, will not only be an additional incentive, but act as a powerful agent in achieving results.

War is grim and sordid; it is with us every day and every hour of the day, and we are very much in earnest about it. We can afford, however, to abate it as a ruling passion, and all the more so when it leads to neglect of our economic responsibilities. The year 1916 calls for a manufacturing propaganda, intensive, broad and educative by our exhibition executive, and only by the latter rising to the opportunity and making the most possible out of it, will the institution continue to justify its existence as a factor in our national upbuilding.

WAR PROFITS

NOT all war profits can be footed up in a ledger, this being indicated in the conclusions arrived at by Herbert Corey, war correspondent of a Chicago paper, after extended study and investigation. While the references are particularly addressed to the people of the United States, we in Canada cannot fail to note their equal applicability in our own case.

War has forced us to make use of our own raw resources. It has made us manufacture things we formerly bought abroad. It has sent our bankers to other countries to get us trade. It has taught us to diversify and intensify our crops. It has opened a thousand avenues for our trade chemists. It has pushed our goods through doors that once were barred. It has awakened our manufacturers to export trade possibilities. It is forcing us to build ships to carry our goods. It has made us raise our eyes and look at the world.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

CLEANING OIL FROM BRASS SOCKETS FOR SHELLS

By C. T. R.

WILL you permit me to offer a further suggestion in connection with your answer to the second question on page 12 of your January issue, namely, that regarding the process of cleaning oil from brass sockets previous to inspection?

In the United States the practice of electric cleaning on brass work has been very largely superseded by the use of soap compounds such as the No. 6 Cleaner of Munning-Loeb Co., Matawan, N. J. Grease and oil are removed from brass in a bath of this cleaner by an immersion not exceeding 30 seconds, without the use of current with its attendant necessity for careful suspension from conducting rods, etc. I am inclined to question the possibility of cleaning by the electric method in so short a time as 30 seconds. The general practice is to allow from two to five minutes for this process with, as you say, a materially lengthened period for alkali cleaning without the aid of the electric current.

I recognize the field for the electric cleaner and the alkali cleaner but believe that the removal of grease and oil from brass, copper and the like can be accomplished far more readily with a properly made soap cleaner containing suitable agents for emulsification and deoxidization.

The same cleaning compound referred to above would also be found useful by the writer of the third question in your January issue, who complains of the introduction of a soap compound into his potash tank. The soap compound generally used is a rosin lard oil combination which would quite possibly give trouble in a potash solution. If your inquirer will use a short dip in the No. 6 solution and thence into the potash kettle he will have no further trouble. We do not think a hot water rinse will satisfactorily remove the soap compound used in turning.

DEPOSITED COPPER PARTS

THERE are many parts that are generally made from sheet copper in which the presence of a seam of any kind is undesirable, but in methods of manufacture that have been commonly employed—particularly in the case of tapered parts or pieces where one tube surrounds another—the presence of a seam in the work is a practical necessity. In attempting to develop a method of manufacture that would avoid the necessity of having a seam in the work, it became evident that the development of some method of depositing the copper electrolytically would constitute an ideal means of overcoming the difficulty.

The method employed by pioneers in this work consisted of making a wax core of the shape and size of the interior of the part that it was desired to make. This core was then made one of the terminals of an electrolytic cell containing a solution from which copper would be deposited on the core. A film of any desired thickness could be obtained by continuing the operation for a sufficient length of time. Although the method just described afforded a means of producing seamless parts, the use of the wax core had two serious drawbacks. First, it was found difficult to deposit the copper uniformly on the core; in many cases the metal was found to vary considerably in thickness, and in extreme cases there were small holes extending right through the metal. Second, it was found that the copper deposited on the wax core possessed a relatively low tensile strength.

These limitations of the process suggested the possibility of further improvement and the Cobal Co., Inc., 29 Thirteenth St., Long Island City, N.Y., has developed a method by which the objectionable features of depositing the copper on a wax core have been eliminated. It consists of employing a die-cast white metal core in place of wax, the results of experiments having shown that copper deposited on the metal core will be of uniform thickness and that the strength of the metal will be materially greater than in cases where the deposit is made on wax.

In all cases, after the copper has been deposited, the work is put in a heating furnace where its temperature is raised sufficiently to melt the white metal core so that it may be poured out of the copper tube. As the melting point of white metal is approximately 600 degrees F. while that of copper is 1981 degrees F., it will be evident that it is an easy matter to melt the white metal without bringing the copper anywhere near the melting temperature.

Among the parts of products which the Cobal Co. is making by this method, the following may be mentioned: Water jackets for gas engines, water-jacketed gas intakes for gas engines, tapered fittings, elbows, copper-coated steel wire and rollers, announcer horns, fittings and tubing for phonographs, incubator parts, etc.—Machinery.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers:

President—John A. Magill, 591 St. Clarens Ave., Toronto.

Vice-President—William Salmon, 48 Oak Street, Toronto.

Secretary—Ernest Coles, P.O. Box 5 Coleman, Ont.

Treasurer — Walter S. Barrows, 628 Dovercourt Road, Toronto.

PLACE AND DATES OF MEETING.

The Occident Hall, corner of Queen and Bathurst Streets. Fourth Thursday of each month, at 8 p.m.

CORROSION OF IRON PANS FOR ZINC-MELTING.

OWING to a regrettable conservatism in terminology, engineers will speak of galvanised iron in two different senses—when iron has been coated with zinc, either by being dipped into a bath of molten zinc, or by some galvanic process, as a rule electrolysis of zinc-sulphate. We wish to refer to the former, hot zinc process. The zinc is generally fused in iron pans, and the iron pans are attacked by the fused zinc. If that were not so, mechanical galvanising would hardly be efficient; for the zinc is to adhere to the iron, and it does adhere because it alloys to a certain extent with the iron. The iron pans in which the zinc is fused hence suffer, and the practice considers certain kinds of iron especially suitable for making iron pans. Two years ago the well-known establishment of Julius Pintsch, of Furstenwalde, observed to its surprise that an iron pan, supplied by an English firm of repute, which had always given satisfaction, was more quickly corroded by the zinc than lower-grade iron pans. The fact was ascribed to a certain peculiarity in the iron, but a more thorough investigation of the problem was deferred. The results of the subsequent investigation were published last May in the Zeitschrift des Vereines Deutscher Ingenieure. Sheets of ten different kinds of iron were supplied by Krupp in Essen; after having been analysed and examined metallographically, they were cut up into plates, and pairs of these plates were suspended for eight hours in molten zinc at different temperatures. All the plates lost in weight by being kept in contact with the molten zinc, the loss amounting to about 20 grammes of iron per hour, per square metre of iron surface in the well-hot bath; and as long as the temperature was not raised materially, the composition of the iron did not appear to make much difference. An increase in the carbon percentage did not favour the corrosion, nor did a change in the manganese proportion. A rise in the phosphorus percentage from 0.025 to 0.090 did not effect the corrodibility either, though the introduction of phosphorus into the zinc bath is, of course, undesirable. An increase in the silicon percentage did increase the solubility of the iron, noticeably, however, and want of homogeneity in the structure of the iron had the same effect. But these influences were not important, and the temperature of the bath proved of much greater consequence. Zinc melts at 419.4 deg. Cent. As the temperature of the bath was slowly raised from about 437 deg. Cent., at which the first observations were taken, the loss of iron increased slowly at first, but much more rapidly afterwards, when the temperature exceeded 500 deg. Cent. In one case the losses of weight were:— 20 grammes at 437 deg., 23 grammes at 467 deg., 28 grammes at 486 deg., 41 grammes at 495 deg., 68 grammes at 500 deg., and 288 grammes at 532 deg., the loss being understood as before, per hour per square metre of iron surface. This was not the worst case; one iron lost over 500 grammes, another 800 grammes in the eighth hour. At higher temperatures, moreover, the differences between the different sorts of iron became much more pronounced. The chief thing to guard against, then, is an unduly high temperature of the zinc bath. It was further observed that it is advisable to keep the pan, so far as possible, at fairly even temperatures, and to avoid repeated complete cooling and reheating, lest crusts of hard zinc peel off and impair the iron.—Engineering.

NICKEL REFINING IN CANADA

STEPS are being taken, we understand, as a result of the recent visit to Ottawa of Ambrose Monell, creater of the International Nickel Co., for the establishment in Canada of a nickel refining plant, for the treatment of nickel ore and matte. The arrangements are as yet incomplete, but it is believed that comparatively little remains to be settled before the new industry becomes an accomplished fact.

The project is being advanced by private interests with large financial backing. The matter has also been taken up with the Government, and is believed to be looked upon by them with favor as providing a means for the treatment within the Dominion of the world's largest nickel output. The present plan is to locate the big plant at Cape Breton. N. S. The industry will probably be operated under some form of Government supervision, and with the definite stipulation that the Imperial Government shall have the first call on as much of the output as it shall require.

Refining Accessories Feature

The establishment of a plant in Canada will be a considerable economic problem, as it will entail increased cost of sulphur, free oils, coke, nitre cake, fire brick, fire clay, magnesite brick, and coal. Until now the refining has been done at Bayonne, New Jersey, adjacent to the great oil refineries and chemical plants. In the ordinary process the ore mined in the Sudbury district is transported to the smelter at Copper Cliff, and is there smelted by successive stages into a product known as copper-nickel matte, containing approximately 55 per cent. nickel 25 per cent. copper, and 20 per cent. sulphur. All of this matte has in the past been shipped to the Bayonne refinery, where the nickel and copper have been separated from each other.

When the war broke out, the Dominion Government took prompt steps to prevent the nickel produced in Canada and refined in the U. S. from reaching enemy destinations. Canada produces about eighty-five per cent. of the nickel supply of the world, chiefly from the Sudbury district of Ontario, the nickel being exported in the form of matte and refined in the United States and Great Britain. The danger that some of this Canadian product might find its way to the armament plants of enemy countries led the Canadian Government to take the matter up with the refining company in the United States, and a representative of the Government was given access to the company's books for the purpose of maintaining a check on exports. This plan had the full approval of the British War Office, and has worked out satisfactorily, but the establishment of a refining plant in Canada, which will take care of the Canadian raw product, will go even farther than such an arrangement.

New York Comment

New York official comment on the proposed refining of Canadian nickel matte within the Dominion indicates that the International Nickel Co., New York, will when the time is ripe undoubtedly acquiesce in the wishes of the Canadian people. However, it does not anticipate, in view of the vast interests involved and the importance to the war trade, that the Government will, for the present, cripple the industry in New Jersey, where plants worth millions have been erected, employing more than 1,000 men.

The International Nickel Co., capitalized at $62,000,000, treats three-fourths of the nickel matte produced in Canada, and 80 per cent. of the world's supply is obtained from Canada. The patented nickel lands of the International Nickel Company in Ontario cover 100,000 acres. The company owns the town of Copper Cliff, where it has erected an up-to-date smelting plant. It also owns the shares of the Societe Miniere Caledonienne of New Caledonia, which possesses extensive nickel lands. Its output since the war began has increased 25 per cent.

Questions and Answers

Question.—We plate steel articles in a double nickel salt solution, using one-half ampere per piece at a tension of two and one-half volts. With these conditions we can get out a batch in forty-five minutes. If we increase the voltage the work burns badly. We are forced to work overtime to produce the outfit required. If we could use three-fourths of an ampere per piece we believe we could reduce the time of each run to thirty minutes and dispense with overtime. We have tried small baths of several rapid plating solutions, but the plates obtained are too hard and brittle for our purpose, and we believe the double salt solution to be the only solution capable of yielding a plate soft enough. Do you think we can operate this bath in a more efficient manner, or obtain a greater output by harmless additions of any kind?

Answer.—Rapid plating nickel solutions are usually composed of a large percentage of single nickel salts and heavy deposits from such baths are liable to be harder than heavy deposits from the double sulphate bath. The single salt deposit is not necessarily more brittle. A properly balanced single salt bath yields very tough plates, and owing to the very close grained formation of the plates a single salt deposit of less thickness is usually as efficient as thicker double salt solution deposits.

If your nickel solution is one containing only double salts, you can increase the rate of deposition in the following manner:—We assume you already have an effective anode surface, which equals or is greater than the largest cathode surface treated in the bath. Transfer a few gallons of the solution to a clean crock and raise the temperature to the boiling point. Now add to this hot solution enough single nickel salts to total four ounces per gallon for the plating bath. Continue the boiling until the salts are completely dissolved; stirring will assist in reducing the time required. After the solution is complete, add sufficient boracic acid in the powdered form to total two ounces per gallon for the plating bath. Stir the boracic powder well into the nickel solution, and then filter the whole into the plating tank. Stir the plating solution well during the

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey Forge, Pittsburg	$18 45	
Lake Superior, charcoal, Chicago	19 25	
Michigan charcoal iron	28 00	
Ferro Nickel pig iron (Soo)	25 00	

	Montreal.	Toronto.
Middleboro, No. 3	$24 00	....
Carron, special	25 00	....
Carron, soft	25 00	....
Cleveland, No. 3	24 00	....
Clarence, No. 3	26 00	....
Glenarnock	28 00	....
Summerlee, No. 1	33 00	....
Summerlee, No. 3	32 00	....
Victoria, No. 1	27 00	24 00
Victoria, No. 2X	27 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

METALS.

Aluminum	$ .68
Antimony	.45
Cobalt 97% pure	1.50
Copper, lake	30.00
Copper, electrolytic	30.00
Copper, casting	29.50
Lead	.08
Mercury	100.00
Nickel	50.00
Silver	.48
Tin	.46
Zinc	.21

Prices Per Lb.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$16 25	$16 25
Copper, crucible	19 50	19 50
Copper, unch-bled, heavy	19 25	19 25
Copper wire, unch-bled	19 25	19 25
No. 1 machine, compos'n	15 00	15 00
No. 1 compos'n turnings	12 50	12 50
No. 1 wrought iron	11 75	11 75
Heavy melting steel	9 00	9 00
No. 1 machin'y cast iron	14 75	14 75
New brass clippings	12 25	12 25
New brass turnings	10 00	10 00
Heavy lead	6 00	6 00
Tea lead	5 00	5 00
Scrap zinc	13 50	13 50
Aluminum	32 00	32 00

COKE AND COAL.

Solvay foundry coke, on application	
Connellsville foundry coke	$7.02
Yough steam lump coal	....
Pittsburgh steam lump coal	4.30
Best slack	3.87

net ton f.o.b. Toronto.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	33 00
Open-hearth billets, Pittsburgh	34 00
Forging billets, Pittsburgh	55 00
Wire rods, Pittsburgh	45 00

PROOF COIL CHAIN.

1/4 inch	$9.00
5-16 inch	5.90
3/8 inch	4.95
7-16 inch	4.55
1/2 inch	4.30
9-16 inch	4.20
5/8 inch	4.10
3/4 inch	3.95
7/8 inch	3.80
1 inch	3.70

Above quotations are per 100 lbs.

MISCELLANEOUS.

Solder, half-and-half	$0.25
Putty, 100-lb. drums	2.85
Red dry lead, 100-lb. kegs, p. cwt.	11.45
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.28½
Benzine, single bbls., per gal.	0.28
Pure turpentine, single bbls.	0.87
Linseed oil, raw, single bbls.	1.02
Linseed oil, boiled, single bbls.	1.05
Plaster of Paris, per bbl.	2.50
Plumbers, oakum, per 100 lbs.	5.00
Lead wool, per lb.	0.11
Pure Manila rope	0.20
Transmission rope, Manila	0.24
Drilling cables, Manila	0.22
Lard oil, per gal.	1.28

SHEETS.

	Montreal.	Toronto.
Sheets, black, No. 28	$3 60	$3 75
Canada plates, dull, 52 sheets	3 60	3 60
Canada plates, all bright	4 60	4 75
Apollo brand, 10¾ oz. galvanized)	6 50	6 50
Queen's Head, 28, B.W.G.	6 75	7 00
Fleur-de-Lis, 28 B.W.G.	6 40	6 75
Gorbal's best, No. 28	6 50	6 50
Viking metal, No. 28	6 10	6 10
Colborne Crown, No. 28	6 20	6 50
Premier, No. 28 B.G., U.S.	6 50	6 50
Premier, 10¾ oz.	6 75	6 75

ELECTRIC WELD COIL CHAIN B.B.

1/8 in.	$12.75
3-16 in.	8.85
1/4 in.	6.15
5-16 in.	4.90
3/8 in.	4.05
7-16 in.	3.85
1/2 in.	3.75
5/8 in.	3.60
3/4 in.	3.60

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped union, 65.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.07
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy.	.35
Copper sulphate	.22
Cobalt Sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide substitute	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 129-130 per cent.	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	4.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.25
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.32 to .33
Tin	.48 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck	.90
Emery in kegs	.07 to .08
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .07
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

introduction of the concentrated solution, and the bath may be used as soon as it becomes settled.

Supposing that your bath contains 100 gallons, and 120 pieces of steel are plated per batch with 60 amperes of current, you will be able to employ at least 90 amperes of current with the same number of pieces and with less tendency to burn than when 60 amperes were used in connection with the purely double salt solution. We believe you will find that a twenty or twenty-five minute plate will be adequate for your requirements.

* * *

Question.—Can you inform me of the relative conductivity of a hot brass solution compared to a cold brass solution? I wish to have a coil placed in my brass solution, but the manager is not convinced of the extra efficiency of a hot brass solution.

Answer.—If your manager is willing to listen to reason, you should have no trouble convincing him of the fact that hot brass solutions possess several advantages over cold solutions. A brass solution at 120 degrees has over fifty per cent. greater conductivity than at 70 degrees, or about one per cent. for each degree rise in temperature. It is well known that the quantity of brass deposited in one second is proportionate to the number of amperes flowing; or, in other words, a current of ten amperes will deposit twice the amount of brass in one second that is deposited by 5 amperes in same time; therefore, with a 50 per cent. increase in conductivity a brass solution at 120 degrees Fahr. will plate 50 per cent. more brass at a given voltage than a brass solution at 70 deg. F.

It would not be prudent to expect this increase in actual practice, but by reducing the voltage a marked increase in production would be quite practicable. Brass deposits from hot solutions are closer grained than deposits from cold solutions better adhesion is obtained, and the color is brighter and more uniform. A hot solution covers deep recesses or pockets to better advantage, and, as in the case of hot cyanide copper solutions, a hot brass solution has the property of removing appreciable films of grease or oxides from the surface of the work being plated.

Brass solutions used at 100 degrees or more should not be maintained in working condition by the use of ammonia. White stick caustic potash should be used instead. Hot solutions require more frequent attention with reference to cyanide and for all ordinary lines of work a maximum excess of cyanide is advantageous. Hot solutions are seldom if ever, altered to be used cold, for the simple reason that the many advantages of a hot solution offset the few disadvantages easily, and all progressive platers realize the value of the extra efficiency.

* * *

Question.—I wish to obtain a color resembling dark gilt on brass plate by dipping.

Answer.—Clean the brass and dip from the hot potash to sulphuretted dip. If color is not dark enough, repeat the treatment, dry and lacquer.

* * *

Question.—We temper fine wire springs and remove the resulting scale and oxide by pickling in sulphuric acid and water. This pickle attacks the steel and, unless carefully handled during the pickling operation, we lose many through breakage and over-pickling. Is there any other process we could adopt for this purpose?

Answer.—Try pickling the steel springs in a solution of water, 1 gallon; citric acid, 8 oz.; caustic soda, 1 grain. Use the solution at about 200 degrees Fahr. One minute immersion should suffice, and the steel will not be injured either in strength or appearance, while the scale and oxide is removed and the surface left clean.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Toronto, Ont., Feb. 10.—The news that an order for eight hundred thousand 18-pound shrapnel shells has been placed with the Imperial Munitions Board by the British Ministry of Munitions will be received with considerable satisfaction in machinery circles. This will allay fears expressed in some quarters that no more orders for shells were probable. While this is true of 18-pdr. H. E. shells it does not apply to shrapnel as enough orders for the latter have already been distributed to keep the shell plants busy until the fall, if not longer. This order will revive interest in the shell industry and also stimulate the machine tool business.

The Dominion revenue from customs in January showed an increase of more than 100 per cent. over the corresponding month of last year while for the ten months of the fiscal year the Customs collections decreased by nearly 18 million dollars. These figures confirm the expectation that the special war taxation will be sufficient to bring the revenue up to the required total. The estimates tabled in the House recently by the Minister of Finance show that heavy reductions have been made in both ordinary and capital expenditure on public works, and in capital expenditure on railways and canals. The policy of retrenchment inaugurated at the outbreak of the war will be continued this year for public works. Appropriations for works already under construction have been made but no expenditures on new works have been authorized.

Steel Market

The market continues strong and price very firm with an upward tendency. As was anticipated last week, prices of cold rolled steel shafting have advanced, the new discounts being 20 per cent. at mill and 10 per cent. at warehouse. There is no abatement in the heavy demand in the primary market for shafting, the mills being sold up for several months ahead. Specifications are running much beyond the capacity of the makers to supply their customers.

The new prices on wrought iron pipe in connection with the advance announced last week are given in the selected market quotations. A change has been made in the arrangement, resale prices being now given instead of discounts as formerly. Wire nails have advanced 10c and are now quoted at $3.15 base per keg, while cut nails are 20c higher, being quoted at $3.20. The advance in wire nails is due to the scarcity and high price of wire rods which are being quoted at $50 to $55, four to six weeks delivery. Stove bolts have advanced, the new discount being 75 per cent. The extraordinary activity at the mills shows no sign of abatement, and the recent order for shrapnel shells will give additional tonnage for the mills to take care of and keep the forging plants busy.

The galvanized sheet market is very firm and higher prices are looked for in the near future. There is no improvement in the situation, and less than 50 per cent. of the galvanized plants in the States are in operation. Black sheets are higher and deliveries getting more backward, while spelter is also higher in price. The high-speed tool steel situation shows no improvement and future prices are very uncertain. All prices are subject to change without notice and higher levels are very probable. The British Government have fixed the maximum price of 18 per cent. tungsten steel at 75c per pound for home trade with slightly higher prices for export. Extras are allowed for certain shapes and sizes. The demand for tool steel has outstripped the output to such an extent that almost fabulous prices are being paid in England for prompt delivery.

The market in the States is strong as ever and prices continue to advance. Orders for bars for munitions show no signs of diminishing, large export orders having being booked recently. Steel bars are now being quoted at 2.25c; tank plates 2.40c and shapes 2.00c Pittsburgh. Billets are scarce and higher. Bessemer billets are now quoted at $33.00 and open hearth billets at $34.00 per ton, Pittsburgh. The ferro-manganese situation is acute and extraordinary prices are being paid for spot shipments, as high as $200 per ton seabord has been offered for prompt delivery ferro-manganese.

Pig Iron

The pig iron situation is unchanged and the market is strong with prices firmly held. There has been an increase in the demand for foundry iron from agricultural implement makers, the prospects for this industry being considerably brighter.

Old Metals

The market is firm with higher prices for all grades of copper and brass. The demand is fairly good for scrap copper but the strength of the copper market is affecting prices of scrap. Prices now range from 1c to 1½c per pound higher. Aluminum is strong and a little higher but lead and zinc are stationary. There is no change in heavy melting steel and wrought iron scrap.

Supplies

A number of price changes have been made during this week, Manila rope, transmission rope and drilling cables have again advanced; this time 1½c per pound. The market is very strong on account of the shortage and high prices of raw materials. Higher prices for dry red lead have been announced due to the increase in cost of pig lead. Prices of pure white lead are also higher being now quoted at $11.45 per 100 pounds. Gasoline and benzine are unchanged but the market is very strong and higher prices are looked for in the near future. Lard oil has advanced and is now quoted at $1.28 per gallon. Union thread cutting oil and Imperial quenching oil have also advanced and are being quoted at 54c and 38c per gallon expectively. The linseed oil market is weaker and prices have dropped to $1.02 and $1.05. Turpentine is stationary at 87c per Imperial gallon.

Metals

The metal markets are steady and prices generally unchanged with the exception of antimony which is higher. The copper market continues to attract considerable attention, and prices have advanced, being also higher in London. The tin market is quiet but the possibility of shipments being lost is helping to keep prices up. Spelter market is quiet but firm with prices unchanged. There is no change in the lead market which continues strong. A scarcity of spot antimony has caused higher prices with a strong market. The aluminum market is firmer but unchanged.

Copper.—The market is strong with supplies of metal scarce for early deliveries. The copper situation is very strong and shows no sign of any change for months to come. The demand for copper for munitions has been, and still is, far greater than was ever anticipated, and if maintained prices will remain at the present high level with the possibility of an advance. Quotations locally are firm and higher at 30c per pound.

Tin.—The market is quiet but firm. The outlook for the market is rather uncertain as the visible supplies continue to increase which would ordinarily lead to a decline in price. There is however the possibility of shipments of tin being lost or restrictions applied, and this is helping to keep prices up. Quotations are firm but unchanged at 46c per pound.

Spelter.—The market is quiet but firm. There is a heavy demand for spelter from the brass mills but the de-

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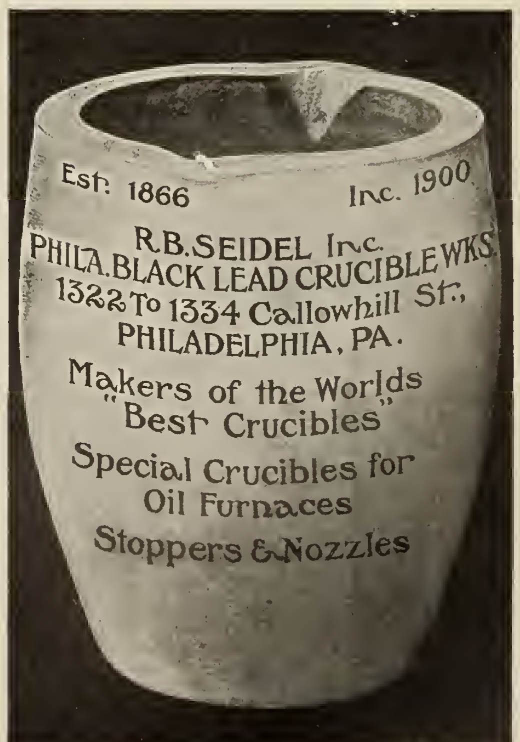


mand from the galvanizing trade has fallen off owing to the high price. Zinc ore is higher being quoted at $110 to $120 per ton Joplin, Mo. Spelter is unchanged locally at 21c per pound.

Lead.—The market is firmly held, but London is weaker. Lead is quoted locally at 8c per pound.

Antimony.—The market is strong and higher. The spot market is practically nominal on account of the scarcity of metal available for immediate delivery. Antimony has advanced 2c and prices are nominal at 45c per pound.

Aluminum. — There is no improvement in the situation, supplies still being very scarce. The spot market is firmer but quotations are unchanged at 68c per pound.

Foundry and Plating Supplies

The demand for foundry supplies is showing some improvement and prices of a number of lines continue to advance. The increase in cost of raw materials and scarcity of many raw products is affecting the market which is very firm. There is a serious scarcity of Turkish emery as supplies are of course cut off from that country, and prices are gradually getting higher. Emery is now quoted at 7c to 8c, emery composition 8c to 9c, adn crocus composition 6c to 7c per pound. The extraordinary high price of copper has caused an advance in copper anodes, which are now quoted at 33c per pound. Nickel anodes are a shade higher at 48c to 52c, and tin anodes at 48c to 50c per pound.

Many chemicals are still very scarce and there is no improvement in the situation. Sulphuric acid being used extensively in the manufacture of explosives is difficult to obtain for any other purpose. A scarcity of copper sulphate or blue stone is reported, but whether this is actually the case is difficult to determine. The price has advanced rapidly and copper sulphate is now quoted at 22c per pound. Copper carbonate has also advanced, and is being quoted at 35c per pound. Sodium hyposulphite is much higher, and is quoted at $4.00 per 100 lbs. Zinc chloride and zinc sulphate have both advanced and are quoted at 25c and 8c per pound respectively. Hydrofluoric acid is also higher at 7c per pound.

Trade Gossip

Hamilton, Ont.—The Burlington Steel Co. will make an addition to their plant, to cost about $5,000.

Hon. Col. Frederic Nicholls has resigned as acting president of the Dominion Steel Corporation.

Trail, B.C.—It is reported that the Consolidated Mining and Smelting Co. will establish a copper refining plant here.

Dartmouth, N.S.—Contracts are being awarded for the Williston Steel & Foundry Co. new plant.

Ottawa, Ont.—The Ottawa Brass Mfg. Co., are considering the erection of an addition to their factory.

Toronto, Ont.—Wright & Co., 30 Mutual Street, is in the market for an electro-plating dynamo.

Pembroke, Ont.—The Pembroke Iron Works have taken over the Lee Manufacturing Co., and will make stoves.

Ottawa, Ont.—The Ottawa Brass Foundry Co. have purchased a property, and will make extensive improvements.

Toronto, Ont.—The Canada Metal Co. have been granted a permit to build a $4,000 shot-tower at their factory on Fraser Avenue.

William J. Coates of Halifax, N. S. has opened an electro-plating plant here. Mr. Coates was for many years employed by the Starr Mfg. Co.

Owen Sound, Ont.—The Owen Sound Iron Works which was recently offered for sale will probably remain under the control of local capitalists.

Mark Workman a prominent financier of Montreal, Que., has been appointed president of the Dominion Steel Corporation in succession to J. H. Plummer who has resigned.

The Canadian Steel Foundries, Ltd., of Montreal, has added one 30-ton acid open-hearth furnace at its Longue Pointe Works, and is preparing to erect others in the very near future.

Collingwood, Ont.—The Northern Iron & Steel Co's old plant is being re-fitted and it is expected that the plant will be operating by March. D. J. Kennedy of Owen Sound is interested in the new enterprise.

Thomas Gibson, president of the Lake Superior Corporation, Sault Ste. Marie, Ont., and head of the legal firm of Gibson & Gibson, of Toronto, has thrown up his business duties to accept a majority in the 168th (Oxford) Overseas Battilion. He is taking a training course at London, Ont.

J. H. Plummer for the past six years president of the Dominion Steel Corporation has retired from the active management of the company in order to take an extended holiday in Europe for the benefit of his health.

John B. McDonald, who conducted a foundry at Tiverton, Ont., for many years, died there on January 31. The deceased was born at Ross Mull, Argyleshire, Scotland, 78 years ago, and settled in Tiverton at the age of 18.

Mineral Output of British Columbia.—The annual mineral output of British Columbia is valued at approximately $30,000,000. The figures for 1913 exceeded that amount, while the product last year was some $4,000,000 short of that of the previous year. The decrease in the value of minerals produced in the province last year, as compared with 1913, was due to the European war, which disturbed the metal markets throughout the world, producing a depressing effect on the industry in British Columbia.

France Buying Copper.—A New York despatch of January 28 states that a million pounds of copper, part March and part April delivery, sold in New York two days previously for 26½ cents a pound. The sales of nearby copper at higher figures have not resulted in any change in the quotations of the larger interests, who continue to ask 25½ cents for May and forward months. Domestic inquiry is steady from day to day, and the foreign demand is far from being satisfied. France is buying as far ahead as June and paying 25½ cents.

Iron, Copper and Zinc Ores in 1915.—Iron-ore shipments from the mines of the United States in 1915, according to the usual preliminary estimates of the U. S. Geological Survey, are estimated to have exceeded 55,000,000 gross tons, an increase of more than 38 per cent. over 1914. The pig-iron increase is put at 6,500,000 tons, the output for 1914 having been 23,332,244 tons. The copper mines surpassed all records, the 1915 output having an estimated value of $236,000,000 or $83,000,000 more than the 1914 production. The output of zinc from domestic ores is estimated as larger than ever before, being about 425,000 tons, worth $120,000,000 as compared with 343,418 tons in 1914.

Catalogues

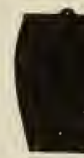
The Electric Furnace Bulletin No. 1030 published by the Snyder Electric Furnace Co., Chicago, Ill., describes fully the "Snyder" electric furnace, its construction and method of operation. The bulletin is fully illustrated and includes views of a number of installations.

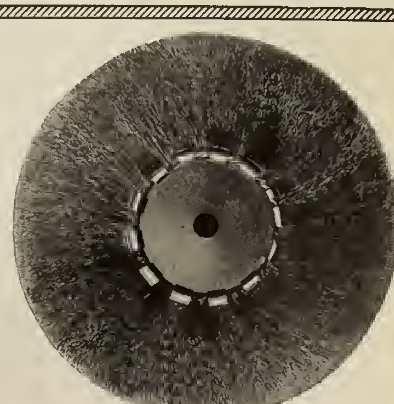
Sand Blast Equipment is the subject of a catalogue being distributed by the American Foundry Equipment Co., New York. The Equipment covered in the catalogue consists chiefly of sand blast tumbling barrels, rotary table sand blast rooms, sand blast cabinets and sand blast outfits. The equipment is fully described and illustrated.

Sand Blast Barrels—Model A. "New Haven" self contained sand-blast barrel is the subject of a bulletin issued by the New Haven Sand Blast Co., New Haven, Conn. The construction and principal features of this sand-blast barrel and method of operation are described in detail. The illustrations show exterior and interior views and also construction of details.

Foundry Equipment. — "Buckeye" Catalogue C, issued by the MacLeod Co., Cincinnati, Ohio, deals with an interesting line of foundry equipment and oxy-acetylene apparatus, etc. The various lines are fully described and illustrated, and the essential particulars are given for the different sizes. Particulars regarding the work for which the different equipment is best suited are also included. The illustrations in a number of cases show the equipment in operation.

Chain Hoists.—Hoist catalogue No. 7 issued by the Wright Mfg. Co., Lisbon, Ohio, deals with chain hoists, steel trolleys and hand cranes. The essential parts of the hoist are illustrated and described in detail with price list covering all the different parts. A table is included giving particulars and prices of steel hoists of various capacities all of which are illustrated. The catalogue also contains particulars of the "Wright' screw hoist with price list for parts. Plain and geared trolleys are also described with tables of dimensions for the various capacities. The concluding pages are devoted to a description of hand operated traveling crane.





Patented April 4, 1911.

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

TO OUR READERS--Use this Directory when seeking to buy any foundry or pattern-shop equipment. You will often get information that will save you money.
TO OUR ADVERTISERS—Send in your name for insertion under the headings of the lines you make or sell.
TO NON-ADVERTISERS—A nominal rate of $5.00 per line a year is charged to non-advertisers.

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Berkshire Mfg. Co., Cleveland, O.
Osborn Mfg. Co., Cleveland, O.
Smart-Turner Machine Co., Hamilton, Ont.
A. R. Williams Machy. Co., Toronto.

Abrasive Materials
Can. Hart Wheels, Ltd., Hamilton Ont.

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Ajax Metal Co., Philadelphia, Pa.
Frederic B. Stevens, Detroit.
Webster & Sons, Ltd., Montreal.

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Tallman Brass & Metal Co., Hamilton, Ont.
W. W. Wells, Toronto.

Ammeters.
Chas. J. Menzemer, Niagara Falls.

Babbitt Metal
Ajax Metal Co., Philadelphia, Pa.

Barrels, Tumbling.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Frederic B. Stevens, Detroit.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Barrows, Foundry
Sterling Wheelbarrow Co., Milwaukee, Wis.

Boiler Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.
Webster & Sons, Limited, Montreal.

Blowers.
Can. Buffalo Forge Co., Montreal.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. S. McCormick Co., Pittsburg, Pa.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
P. H. & F. M. Roots Co., Connersville, Ind.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Blast Gauges—Cupola.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
H. S. Carter & Co., Toronto.
Sheldons, Limited, Galt, Ont.
Frederic B. Stevens, Detroit.
Whiting Foundry Equipment Co., Harvey, Ill.

Boxes, Tote
Sterling Wheelbarrow Co., Milwaukee, Wis.

Brake Shoes, Wheel Trueing
Can. Hart Wheels, Ltd., Hamilton, Ont.

Brass Melting Furnaces.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Bricks, Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.

Bricks, Rubbing
Can. Hart Wheels, Ltd., Hamilton, Ont.

Brushes, Foundry and Core.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Manufacturers' Brush Co., Cleveland, Ohio.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.

Brushes, all Kinds.
Manufacturers' Brush Co., Cleveland, Ohio.
Osborn Mfg. Co., Cleveland, O.
Sleeper & Hartley, Worcester, Mass.
Ford-Smith Machine Co., Hamilton.

Buckets, Grab
Pawling & Harnischfeger Co., Milwaukee, Wis.

Buffing and Polishing Machinery.
W. W. Wells, Toronto.

Buffing and Polishing Compositions.
W. W. Wells, Toronto.

Buffs.
W. W. Wells, Toronto.

Burners, Core Oven.
Webster & Sons, Ltd., Montreal.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
Frederic B. Stevens, Detroit.

Cars, Core Oven.
H. S. Carter & Co., Toronto.
Osborn Mfg. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.
Monarch Eng. & Mfg. Co., Baltimore.

Cars, Sand Blasts.
Pangborn Corporation, Hagerstown, Md.

Castings, Brass, Aluminum and Bronze.
Tallman Brass & Metal Co., Hamilton, Ont.

Cast Iron.
Frankel Bros., Toronto.

Castings, Aluminum and Brass.
Tallman Brass & Metal Co., Hamilton, Ont.
F. W. Quinn, Hamilton, Ont.

Castings, Nickel.
W. W. Wells, Toronto.

Cars, Foundry.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Monarch Eng. & Mfg. Co., Baltimore.
Frederic B. Stevens, Detroit.
Whiting Foundry Equipment Co., Harvey, Ill.

Chain Blocks.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
John Millen & Son, Ltd., Montreal.

Chaplets.
Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.
Wells Pattern & Machine Works Limited, Toronto.

Charcoal.
Webster & Sons, Ltd., Montreal.
Frederic B. Stevens, Detroit.

Chemists.
Toronto Testing Laboratory, Ltd., Toronto.

Chemicals.
W. W. Wells, Toronto.

Chippers, Pneumatic
Independent Pneumatic Tool Co., Chicago, Ill.

Clay Lined Crucibles.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.

Clamps, Core Box
National Clamp Co., Chicago, Ill.

Clamps, Flask
National Clamp Co., Chicago, Ill.

Copper, Phosphorized
Ajax Metal Co., Philadelphia, Pa.

Core Binders.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
J. W. Paxson Co., Philadelphia, Pa.
Robeson Process Co., New York City.

Core Box Machines.
Webster & Sons, Ltd., Montreal.
J. S. McCormick, Pittsburg, Pa.
J. W. Paxson Co., Philadelphia, Pa.

Core Cutting-off and Coning Machine.
Brown Specialty Machinery Co., Chicago, Ill.
H. S. Carter & Co., Toronto.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.

Core Compounds.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
J. W. Paxson Co., Philadelphia, Pa.
Robeson Process Co., New York City.
Frederic B. Stevens, Detroit.

Core Machines, Hammer.
H. S. Carter & Co., Toronto.
Brown Specialty Machinery Co., Chicago, Ill.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.

Core-making Machines.
Berkshire Mfg. Co., Cleveland, O.
Mumford Molding Machine Co., Chicago, Ill.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Frederic B. Stevens, Detroit.
Tabor Mfg. Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

Core Oils.
Cataract Refining Co., Buffalo, N.Y.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.

Core Ovens.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
Oven Equipment & Mfg. Co., New Haven, Conn.
Sheldons, Limited, Galt, Ont.
Frederic B. Stevens, Detroit.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Wash.
Joseph Dixon Crucible Co., Jersey City, N.J.
Webster & Sons, Ltd., Montreal.

Core Wax.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
United Compound Co., Buffalo, N.Y.

Cranes
Northern Crane Works, Ltd., Walkerville, Ont.
Pawling & Harnischfeger Co., Milwaukee, Wis.

Cranes, Travelling and Jib.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Webster & Sons, Ltd., Montreal.
Northern Crane Works, Ltd., Walkerville, Ont.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Electric and Hand Power.
H. S. Carter & Co., Toronto.
A. R. Williams Mach. Co., Toronto.
Dominion Bridge Co., Montreal.
Webster & Sons, Ltd., Montreal.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Ltd., Walkerville, Ont.
Smart-Turner Machine Co., Hamilton, Ont.

Cranes, Hydraulic.
Webster & Sons, Ltd., Montreal.

Crucibles, Reservoir, Tilting Furnace, Bottom Pour, Etc.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Seidel, R. B., Philadelphia.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.

Cupolas.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
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J. W. Paxson Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola Blast Gauges.
Webster & Sons, Ltd., Montreal.
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Cupola Blocks.
R. Bailey & Son, Toronto.
Webster & Sons, Ltd., Montreal.
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Stevens, F. B., Detroit, Mich.

Cupola Blowers.
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Monarch Eng. & Mfg. Co., Baltimore.
Sheldons, Limited, Galt, Ont.
Stevens, F. B., Detroit, Mich.

Cupola Linings.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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Whitehead Bros. Co., Buffalo, N.Y.

Cupola Twyers.
Webster & Sons, Ltd., Montreal.
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Stevens, F. B., Detroit, Mich.

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W. W. Wells, Toronto.

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Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

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W. W. Wells, Toronto.

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Dryers, Sand.
Pangborn Corporation, Hagerstown, Md.

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Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Emery Stands.
Ford-Smith Machine Co., Hamilton.

Emery Wheels
Can. Hart Wheels, Ltd., Hamilton, Ont.

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Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Webster & Sons, Ltd., Montreal.
Stevens, F. B., Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Sheldons, Limited, Galt, Ont.

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H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Shelton Metallic Filler Co., Derby, Conn.

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H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.

Fire Brick and Clay.
R. Bailey & Son, Toronto.
H. S. Carter & Co., Toronto.
Gibb, Alexander, Montreal.
Hamilton Facing Mill Co., Ltd. Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.
Whitehead Bros. Co., Buffalo, N.Y.

Fire Sand.
Webster & Sons, Ltd., Montreal.
Whitehead Bros Co., Buffalo, N.Y.

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Guelph Pattern Works, Guelph, Ont.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Tabor Mfg. Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

Foundry Coke.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

Foundry Equipment.
H. S. Carter & Co., Toronto.
A. R. Williams Mach. Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
E. H. Mumford Co., Elizabeth, N.J.
Mumford Molding Machine Co., Chicago, Ill.
Northern Crane Works, Walkerville, Ont.
Osborn Mfg. Co., Cleveland, O.
Pangborn Corporation, Hagerstown, Md.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Foundry Parting.
H. S. Carter & Co., Toronto.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.
Whitehead Bros. Co., Buffalo, N.Y.

Foundry Facings.
Joseph Dixon Crucible Co., Jersey City, N.J.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd. Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.

Furnace Lining.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Eng. & Mfg. Co., Baltimore.
Webster & Sons Ltd., Montreal
Whitehead Bros. Co., Buffalo, N.Y.

Furnaces.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

Furnaces, Brass.
H. S. Carter & Co., Toronto.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

Goggles.
Tilghman-Brookshank Sand Blast Co., Philadelphia, Pa.

Graphite Products.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Jonathan Bartley Crucible Co., Trenton, N.J.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Webster & Sons, Ltd., Montreal.

Graphite, Anti-Flux Brazing.
Joseph Dixon Crucible Co., Jersey City, N.J.

Grinders, Disc, Bench, Swing.
Ford-Smith Machine Co., Hamilton Ont.
Perfect Machinery Co., Galt, Ont.

Grinders, Chaser or Die.
Geometric Tool Co., New Haven, Conn.

Grinders, Electric
Independent Pneumatic Tool Co., Chicago, Ill.

Grinders, Pneumatic, Portable.
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

Hammers, Chipping
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

Helmets.
Tilghman-Brookshank Sand Blast Co. Philadelphia, Pa.

Hoisting and Conveying Machinery.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Hoists, Electric, Pneumatic.
A. R. Williams Mach. Co., Toronto.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Walkerville.
Pawling & Harnischfeger Co., Milwaukee, Wis.
E. J. Woodison Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

Hoists, Hand, Trolley.
Webster & Sons, Ltd., Montreal.
Northern Crane Works, Walkerville.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

Hose and Couplings.
Can. Niagara Device Co., Bridgeburg, Ont.
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

Iron Cements.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
J. W. Paxson Co., Philadelphia, Pa
Smooth-On Mfg. Co., Jersey City.
Stevens, F. B., Detroit, Mich.

Iron Filler.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
J. W. Paxson Co., Philadelphia, Pa.
Smooth-On Mfg. Co., Jersey City.
Stevens, F. B., Detroit, Mich.

Kaolin
Whitehead Bros. Co., Buffalo, N.Y.

Ladles, Foundry.
Joseph Dixon Crucible Co., Jersey City, N.J.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd. Hamilton, Ont.
Northern Crane Works, Walkerville, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Ladle Heaters.
Hawley Down Draft Furnace Co., Easton, Pa.
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CANADIAN FOUNDRYMAN

AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields.

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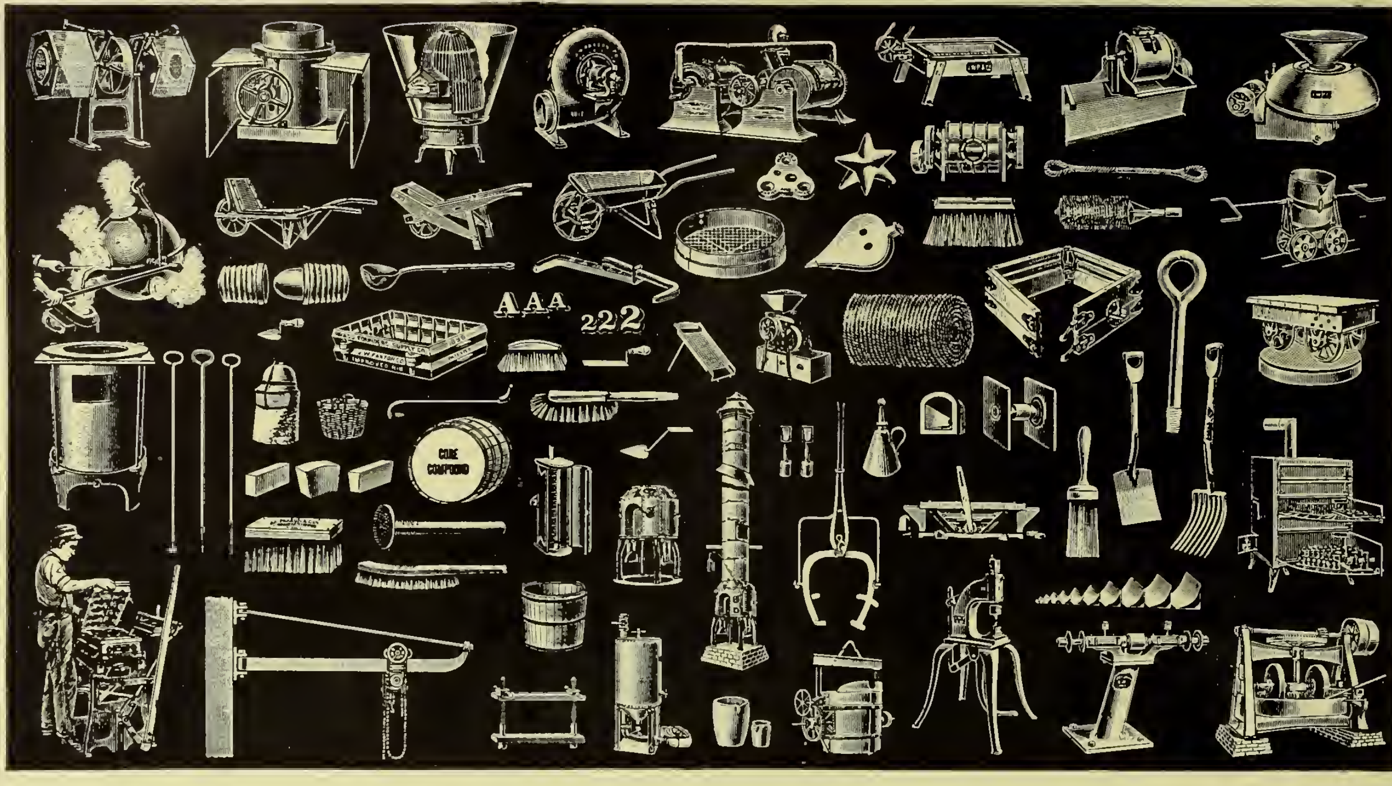
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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company Limited, Toronto, Montreal, Winnipeg, and London, England

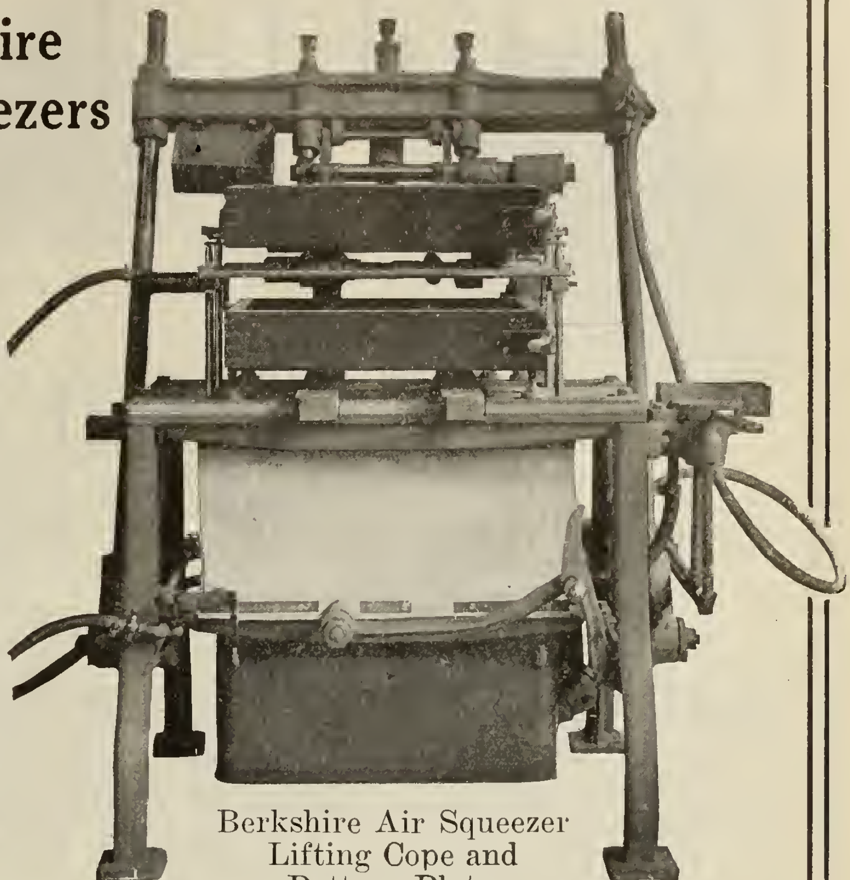
VOL. VII. PUBLICATION OFFICE, TORONTO, MARCH, 1916 No. 3

Berkshire Vibrators
½" to 2"

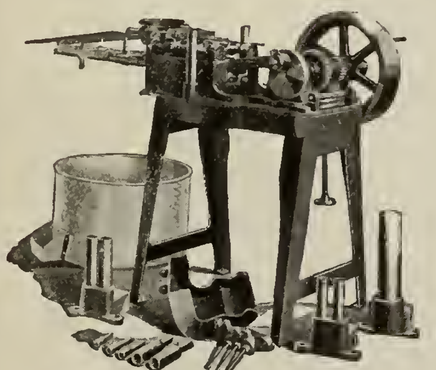
Berkshire Air Squeezers

The machine you are looking for. It has no equal. This is a plain statement of facts. Hundreds of users are proving this every day in the most progressive foundries in the world.

All the features which have made the Berkshire Squeezer famous are embodied in this machine.



Berkshire Air Squeezer Lifting Cope and Pattern Plate.



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No screws to wear or grind out. Uses multiple dies. Three cores at same time on all sizes up to and including 1". Two cores from 1" to 1½". Makes any shape core that will pass through a die. The faces of the plungers are cupped, so that they fill with sand which becomes the ramming face.

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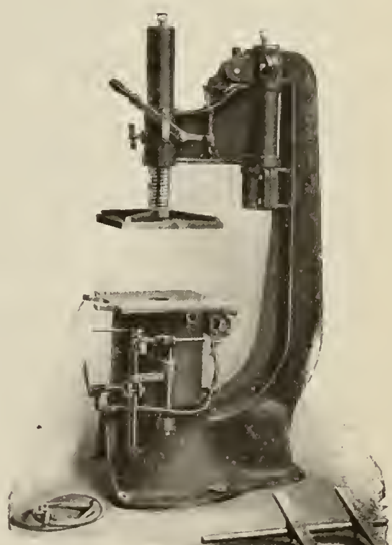
Universal power molding machine for Malleable, Gray Iron or Brass foundries. Split patterns, match plates or plain gates. All molds exactly alike. Anyone can operate it. A powerful, convenient, well-built power molding machine.



The Berkshire Manufacturing Company Cleveland, Ohio

The Publisher's Page

By B.G.N.

Why I Read the Ads

By a Reader

I read the advertisements in Canadian Foundryman because advertising to-day is educative to a high degree. My business is to know foundry equipment and to know the newest; I realize I must read the ads.

I study the ads because I consider an advertisement a personal message to me from the advertiser who pays good money for space in which to tell ME about his line.

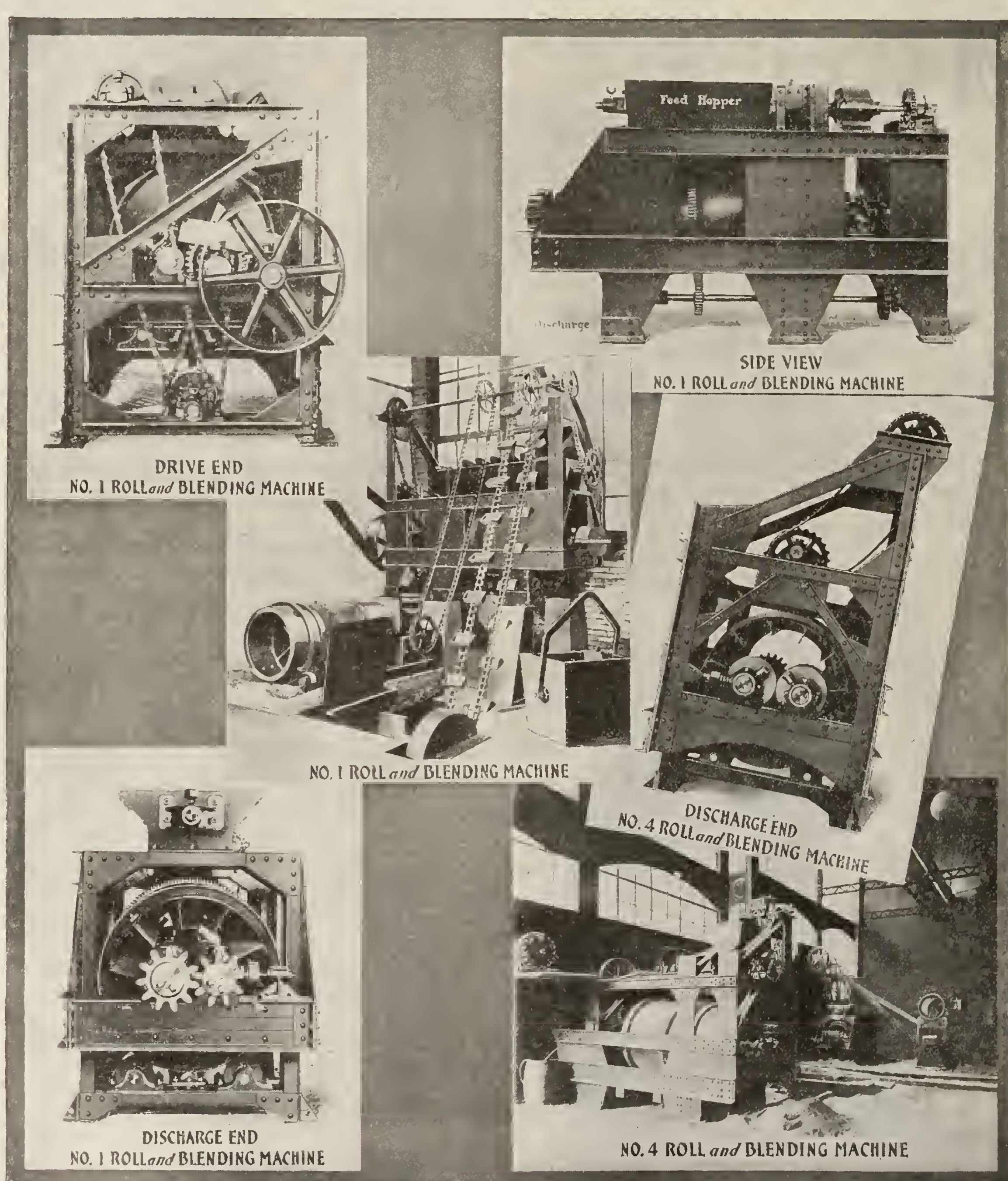
Aside from securing information regarding some special machine or supplies, the advertising pages frequently contain valuable data of a general nature and I have secured many a splendid idea in this way.

To me a study of the advertising pages is the next best thing to a visit to some warehouse where I could find grouped for inspection the same equipment which I find listed in Canadian Foundryman.

STANDARD

SAND MIXING and CONVEYING MACHINERY

Is being widely copied, which proves its established record of fifteen years in the foundries.



Don't worry about the scarcity of labor to handle your raw and finished material. DO IT MECHANICALLY. Our Engineering Department will gladly show you how.

The E. J. WOODISON CO., Canadian Agents

The Standard Sand & Machine Co., Cleveland, Ohio

A PRODUCER OF SMALL CASTINGS

Davenport

This squeezer used with a match plate will make a surprising increase in the output of small castings.

It does not require a skilled man to operate this machine. It is simple and durable in construction. All parts are accessible and speedy to operate.

Write us for prices and full particulars.

Davenport Machine & Foundry Co.
Davenport, Iowa, U.S.A.

TABOR

10" POWER SQUEEZER

We have had 92 of these machines operating in one shop for over nine years and the total cost of repair parts ordered has been less than $10.00 — a striking tribute to TABOR QUALITY.

SEND FOR BULLETIN M-R

There Is No Faster Machine Made

THE TABOR MANUFACTURING CO., PHILADELPHIA, U.S.A.

Concerning the Metal Constituent of German Shells*

By J. E. Stead, D.Sc.

Dr. Stead expresses the opinion that if the mechanical tests on shell steel are found to be conclusive, it would be something in the nature of a national crime to reject on any mere chemical specification before submitting the steel in question in the form of a finished shell to the more convincing mechanical test. In normal times, shell steel is made under such rigid specifications that few firms undertake its production. Meantime conditions are otherwise.

As a result of the raid on the North East coast of England on December 16, 1914, by enemy warships, many German shells—whole or in part, became available for analytical investigation, by British steel interests.

The pieces analyzed in most cases were small fragments, and it was consequently impossible to determine the dimensions of the shells of which they formed a part. Judging from information received from Hartlepool and other places, it is certain that there were shells of many sizes from 11.2 in. armor-piercing shells down to 4 in. high-explosive shells.

Description of Shells

Many of the larger shells had not burst, and it was possible to measure them. Shrapnel shells do not appear to have been used. The shells used may be divided into two classes, namely: 1—Armour-piercing shells; 2—high-explosive shells. The armour-piercing shell fragments were easily detected by the presence of nickel and chromium—elements universally added to steel employed in that connection. The Germans had affixed to these armour-piercing shells the soft nose pieces which are invariably used with shells of this description. The analyses of fragments of these were as follows, namely:—

	Per cent.	Per cent.
Iron (by difference)	91.862	.....
Carbon	0.840	0.50
Manganese	0.381	——
Silicon	0.401	0.42
Sulphur	0.033	0.028
Phosphorus	0.032	....
Nickel	3.100	....
Chromium	3.351	....
	100.000	

The several analyses and their sources are given in the following table:

What the Shell Fragments Show

Most of the fragments examined were small, and the fractures generally indicated material of very high tenacity. There were a few large pieces, and these had a much coarser crystalline structure than the smaller ones. It is well known that the appearance of the fractured surfaces of metals broken by sudden shock is a very useful guide in forming a correct judgment of the physical character of the material. If the surfaces are more or less coarsely granular, and the fracture has travelled in straight planes, the material is usually relatively weak. Such fractures somewhat resemble the fractures of lump sugar. If they are more finely granular the surfaces are not usually flat, and frequently have tongues or pointed strips of metal attached to the fracture, suggesting a tearing action and tough material. Some of the inner and outer surfaces of the shell fragments were fissured by a multitude of fine cracks, generally parallel to the vertical axis of the shell. The flat surfaces of one of the base plugs where it came into contact with the explosive charge were similarly broken up into fissures, but these did not extend to the outside of the plug. The force must have been of such violence as to tend to tear the metal to pieces.

One writer in describing the German shell fragments says: "We can have little conception of the terrible nature of these until they are handled. They bristle all over with horrible points and edges—some as keen as a razor." One peculiarity is the manner in which the fragments broke, leaving what may be described as "shear fractured surfaces," with sharp knife-like terminations. The tracks of the fractures were often at angles of 35 deg. to 45 deg. to tangents of the shells, and the broken surfaces of many of them had a somewhat fibrous appearance characteristic of great toughness. Tests made on the fragments of both the coarsely granular and fibrous varieties confirmed the conclusion that the former were brittle and the latter extremely tough.

The fragment corresponding to analysis No. 13 was particularly interesting. It had "shear fractures" on both its sides, was of fine crystalline structure, and evidently ideal in its character, yet this contained about 0.07 per cent. sulphur and the same amount of phosphorus. Moreover, it contained 0.011 per cent. nitrogen; an indication that it was made by the Bessemer process, for no open-hearth steel, so far as is known, contains nearly so much of that element. As acid Bessemer converters are rare, if not non-existent, in Germany, it is justifiable to conclude that the steel is basic Bessemer. This fragment showed a fine micro-structure with practically no free ferrite, due to the exceedingly high proportion of manganese present. In metallographical terms, the steel was sorbitic, consisting of unsegregated pearlite. On reheating to about 800 deg. Cent. and cooling in about half an hour to 400 deg. Cent. and then to 15 deg. Cent., its original structure and hardness were reproduced. The Brinell hardness number was 255 deg., equal to about a tena-

Where found		C %	Mn. %	Si. %	S. %	P. %	Cu. %	N. %	Tenacity	Analysis
West Hartlepool	1	0.60	0.73	—	0.062	0.085	—		--	Wilson
" "	2	0.70	0.80	0.35	0.027	0.043	—	—	55	Pattison and Stead
"	3	0.670	0.515	0.336	0.037	0.048	0.083	—	62	Pattison and Stead
"	4	0.870	1.094	0.252	0.037	0.028	0.080	—	65	Pattison and Stead
" "	5	0.465	0.794	0.324	0.038	0.028	0.090	—	55	Pattison and Stead
" "	6	0.600	0.655	0.597	0.046	0.051	--	—		F Saniter
" "	7	0.820	1.266	0.186	0.048	0.052		—		F Saniter
" "	8	0.765	0.655	0.364	0.030	0.045	--	—	--	F Saniter
" "	9	0.630	0.550	0.400	0.042	0.077	—	—	—	F Saniter
" " (8 in. sh.)	10	0.86	1.03	0.186	0.053	0.045	—	—	—	F Saniter
" "	11	1.12	1.00	0.23	0.054	0.038	—	—	—	Bainbridge
Whitby and Scarborough	12	0.850	1.330	—	0.080	0.105	—	—	—	Wilson
" " "	13	0.60	1.21	0.334	0.071	0.069	—	0.0112	59	Pattison and Stead
" " "	14	0.74	1.170	0.261	0.044	0.064	—	—	62	Pattison and Stead
Dunkirk	15	0.675	0.380	0.078	0.083	0.043	--	—	—	Bainbridge
Ypres	16	0.700	1.108	0.221	0.041	0.079	—	—	—	Pattison and Stead
Flanders	17	0.98	1.05	—	0.055	0.086	—	—	—	Wilson and Bainbridge
"	18	0.93	0.98	—	0.059	0.065	—	—	—	Wilson and Bainbridge
"	19	0.74	0.98	—	0.054	0.050	—	—	—	Wilson and Bainbridge
German	20	0.393	1.400	0.210	0.035	0.041	--	—	—	Sillars
France	21	0.930	0.970	0.164	0.032	0.048	—	—	—	Sillars

*From a paper read before the Cleveland, England, Institute of Engineers.

city of 56 to 57 tons per square inch. What the elongation was could not be determined, but it certainly would not exceed 12 per cent.

Little comment is necessary on the armour-piercing shells. A broken piece from the point was exceedingly hard, as indicated by the Brinell machine. The shell had evidently exploded on coming into contact with something not hard enough to damage the point itself. The projectile is 3 ft. long, 11.2 in. diameter and weighs 7½ cwt. For obvious reasons one cannot compare the shells produced by the Germans with those produced by the Allies, although, no doubt, the enemy knows all about the latter.

High Explosive Shell Analyses

On examining the analyses of the high explosive shells, one cannot help being struck with the very wide range in the composition. Placing side by side the maximum and minimum amount of each element, we have:—

	Per cent.
Carbon	0.393 to 1.12
Manganese	0.380 to 1.40
Silicon	0.078 to 0.597
Sulphur	0.027 to 0.083
Phosphorus	0.028 to 0.105

Out of the twenty-two analyses, nine show more than 1 per cent. manganese, seven show more than 0.3 per cent. silicon; twelve more than 0.2 per cent. silicon; three show more than 0.07 per cent. sulphur; five more than 0.06 per cent. phosphorus. The average per cent. of carbon is 0.75 per cent. What is the reason for these great variations? One cannot, of course, say with certainty, but there are only two explanations one can offer:

1.—That the German authorities have been careless in their selection of the steel. That the occasional premature bursting of a shell in a gun and the consequent destruction of the gun and gunners did not matter, as they had so many guns and men to spare, a suggestion actually made, hut which is obviously absurd.

2.—That the German experts have found that provided the steel is suitable for the purpose required, a great latitude in the composition and physical properties is permissible.

I think the first hypothesis may be dismissed without much consideration, for the very shells sent into our towns, varying greatly in composition, did not burst in the gun, and also because the Germans have devoted more time and money and thought to the preparation for this war than any other people. We must admit they know what they are doing, at least as well as we do.

Shell Deformation In Gun

An examination of the larger fragments of German shells did not lead to the discovery of anything in the nature of rokes or surface flaws, and the very high percentages of silicon and manganese in most of them suggest that soundness was considered as of primary importance. The fact that nitrogen was found in a relatively large quantity in one of the best specimens, leads to the conclusion that nitrogen is not harmful, and that probably basic Bessemer steel has been found quite suitable, provided a sufficient quantity of silicon and manganese is present to ensure soundness. Any intelligent person with no engineering or special knowledge of the subject would tell us at once that the stresses put on a shell in the gun are compressive not tensional. That if the shell were made of lead instead of steel, the sudden compressive force applied to the base would cause the shell walls to bulge outwards, and to become reduced in length, and that very soft steel would probably behave in the same manner. Therefore, the Germans were careful to avoid this, and made steel strong enough to resist deformation by compression in the guns.

We may conclude, therefore, that what was feared was bulging more than breakage by shock. It cannot be denied by anyone who knows that steel containing 0.75 per cent. carbon and above 1.2 per cent. manganese is brittle to shock, and that if such material were made into a rail and were tested in the usual way, it would fly to pieces under falling weight test, yet steel shells of that description did not burst in the German guns, but burst on us. Every rail maker knows that a shell containing 0.10 per cent. sulphur and phosphorus, 0.45 per cent. carbon and 0.8 per cent. manganese would be less liable to break under shock than such steel if sulphur and phosphorus were entirely absent.

Premature Explosion

What must be avoided is anything at all likely to cause explosion of the shell whilst in the gun itself. There are several conditions which might lead to premature explosion.

(1)—Defective fuses.

(2)—The possible formation of sensitive compounds, such as picrate of lead and other metallic picrates, due to the accidental presence of particles of lead, etc., which on being acted on by picric acid might lead to the formation of the sensitive salts referred to.

(3)—Gross porosity of the base of the shell sufficient to admit hot gases from the ignited propellant.

(4)—Allowing the shells to rest for a long period in a very hot gun tube, whereby the detonator explodes and the charge is fired.

(5)—Shells made of steel of too soft a character, causing bulging and excessive friction between the shell walls and the sides of the gun tube, leading to the accentuated pressure of the propellent gases exceeding the bursting pressure.

(6)—Excessive brittleness of the steel.

It is obvious that when a gun has burst it is impossible to say whether the fuses have been defective or whether the cause has been the presence of explosive picrates, or if the steel has been porous. It might be possible to determine whether the shell jammed or the steel was excessively brittle. Those who loaded the shells and fixed the fuses, of course, could not be convicted no matter how badly their work was done. Yet I, myself, have seen a shell burst directly it left the gun tube, a happening which could only be explained on the assumption that something was wrong other than the steel itself. The officer in charge concluded that the fuses were at fault.

Mechanical Test vs. Chemical Analyses of Shell Steel

The analyses of the German shells naturally makes us question our own practice and specifications, which lead to the rejection of material such as would be accepted in Germany. Our authorities may have proofs I do not know of, justifying their specifications, but to say a shell has burst in a gun, therefore the steel is at fault, is not justifiable, neither is it justifiable to form any dogmatic conclusion without ample proof. We have the highest respect for the systematic and most careful methods our authorities use to guard the lives of our gunners and guns, and their conscientious adherence to what they consider to be the right thing. It would be morally criminal if they were to allow unsuitable steel to be made into shells. The only question is, and we are justified in asking it, whether they are certain as to what is suitable and what unsuitable material. It must be obvious that it is only by mechanical testing that one can find out. For reasons I need not mention, the methods or method of testing shells cannot be discussed here. One method gives conclusive proof that steel of a certain origin which is not at present admitted by our authorities, is quite suitable for high-explosive shells. Further trials are in course of execution, which it is proposed to ask some of the gentlemen responsible for our specifications to witness. One thing we must admit, and that is that if a steel is proved by suitable mechanical testing to be satisfactory, on no account should it be rejected on chemical analyses, for one remembers that mechanical testing is the base on which rests all chemical specification. As you know, I am an analytical chemist, and it is not to my interest to make that statement, but long experience, actual knowledge, common sense, and my country's welfare force me to state what I believe to be the truth.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

MOLDING A PULP DRIER RING

By J. H. Eastham

THE angle ring casting shown in plan and section by Fig. 1, forming part of a pulp drier contract, measured at working size, 8 feet 3 inches

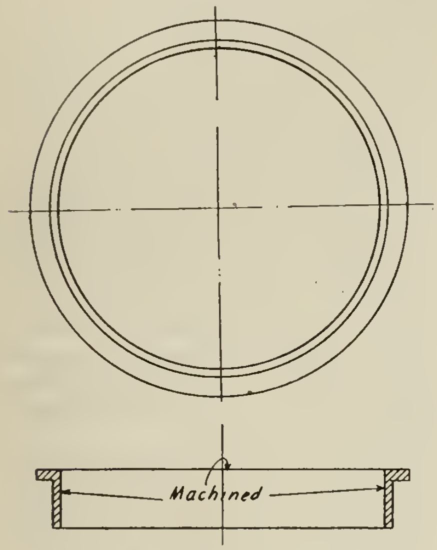


FIG. 1.

extreme diameter, 7 feet, 3 inches, inside diameter, 12 inches deep, and in the rough weighed approximately 3,400 pounds. As the chances of a repeat order were very remote, coupled with the fact that low competitive prices necessitated economical production in every de-

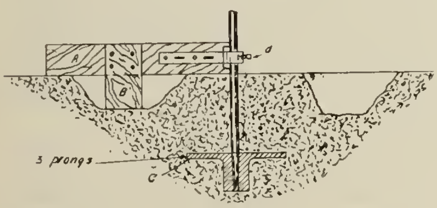


FIG. 2.

partment, a complete pattern was considered out of the question. The method of moulding determined upon was as follows:—

The spindle socket indicated at C, Fig. 2, of type used in loose and swept-up work, was bedded in the foundry floor with its upper face about 12 inches below the mean working level A 2-inch spindle was inserted, and after ramming-

FIG. 3.

up the hole tightly to prevent tilting or subsidence the sweep board A, with bed strickle B attached, was bolted to the spindle arm, and a circular hole 14 inches deep opened up a sufficient area to allow free working space, as shown at Fig. 2.

A bed was next swept up 12 inches below the extreme lower edge of the horizontal board A, the bed board B being then removed, and replaced by the one-sixth pattern section illustrated in plan at Fig. 3, due allowance being made for contraction and machining. Extreme care was necessary at this point; correct dimensions being imperative with a view to keeping machining costs at the lowest figure compatible with a number one finish.

The pattern was now rammed up as shown to the right of sketch, Fig. 4, the set screw (a) slackened to permit of pattern and board being drawn up together, moved round and lowered again. About 8 inches of the pattern was left in the first mould impression to prevent "ramming in." This operation was repeated several times until the circle was completed. The board, pattern and spindle were next removed, and the open mould

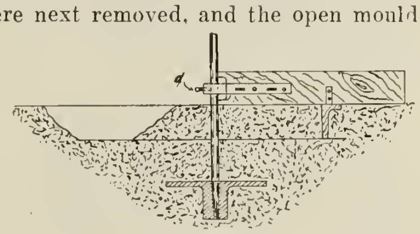


FIG. 4.

covered with interlocking sections of slab cores pierced at various points with 1 in. holes to serve as runners and risers. These cores are shown heavily outlined in black at Fig. 5, and in plan in the composite view of the assembled mould, Fig. 6.

After all the core joints were waste padded to avoid entry of loose sand into the mould, a ten-feet square cope plate

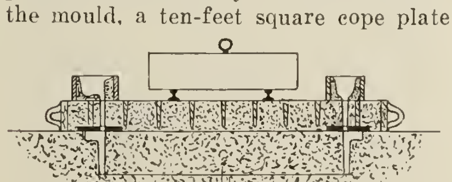


FIG. 5.

was lowered to place, gate pins inserted, and the wedges lightly driven between the lower edges of the cope bars and the upper faces of the cover cores, this being done to prevent strain when pouring. The cope was next rammed full, the runner boxes lined, and cope weighted previous to pouring.

Aside from the very considerable saving in lumber and in patternmaker's time, a careful checking of the foundry costs, including labor, material, and all overhead charges, showed the productive cost of this casting to be 1.75 cents per pound.

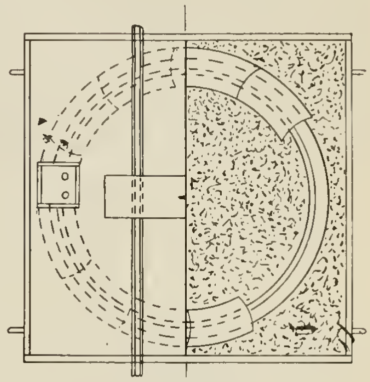


FIG. 6.

NOTES ON PATTERN-MAKING

By J. N. Hill

NO proof is needed of the fact that pattern-making, being the first step in practical engineering work, is of such importance that if faulty castings are obtained it can most probably be traced to the patterns. To ensure sound castings several points must be borne in mind, and some of these should be the care of the designers. In the writer's experience many vital principles are often overlooked, perhaps owing to many designers being trained machinists and fitters but untrained in the production of castings, as is sometimes the case in small shops.

To take just one instance, the bosses of pulley patterns, which require strengthening pieces round the keyway, seldom have the metal properly proportioned. The usual way is to provide a swelling like Fig. 1, which really defeats its purpose as it introduces weakness at X, across which a fracture will occur, if at all, as broken pulleys often prove. If the strengthening piece is made as Fig. 2, then the weak place is avoided, as the metal crystals are more evenly distributed.

Defects such as these can be readily seen by a patternmaker, and are quickly rectified, whereas afterwards it would be difficult. It is essential, therefore, that such matters be looked into, and what follows will deal with some such phases of patternshop practice.

Of course, all drawings or blue prints provided have to be worked to, especially in a shop where direct communication with the designer is impossible, but designers should always remember that the foundryman abominates a pattern that provides for metal of great variation in thickness. Patterns of this sort give a lot of trouble when casting, owing to the metal always flowing towards the heavier parts, leaving blow holes in the lighter parts. Even when good castings are obtainable, and this by running in several places, they are much weaker than castings of a more uniform thickness.

Another point to ensure strength is to provide where possible for the rounding, however small, of all sharp corners, and likewise filleting of sharp angles, for although this adds to the cost of the patterns, it lessens the risk of breakdowns and future expense, besides adding to the general appearance of the castings.

The moulding of patterns, which directly concerns the patternmaker, is of

Fig 1

Fig. 2.

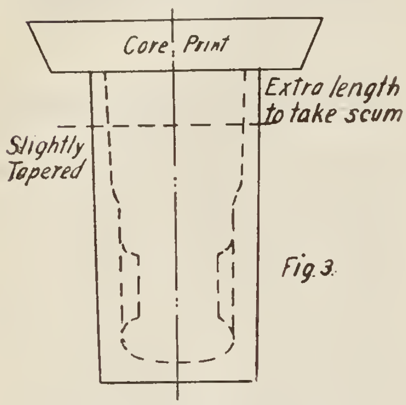


Fig. 3.

NOTES ON PATTERNMAKING.

importance. Tapers should be provided where necessary and as much as convenient, sufficiently large bottom box prints to support cores, and well tapered steadying or top box prints. Always make patterns to mould as far as possible in the bottom box or, in other words, taper the patterns and prints up, so that the joint line shall be along the top edge wherever it can be arranged. This will avoid a big lift of top box and also bad joint marks, consequently less cleaning up is necessary.

To illustrate an excellent method of moulding, a sketch (Fig. 3) is given of a piston pattern which is made to mould "end down," preventing scum in the head of pistons, thus giving strength and soundness where most needed. In Figs. 4 and 7, a dove-tailed bearing cap for white-metal liner and core box are shown. The dovetails are cored out in the very simple manner shown to give the moulder less work, as moulders hate a lot of fragile loose pieces which soon get broken or lost, resulting in scrappy castings.—Foundry Trade Journal.

SEMI-STEEL

IN a recent paper by J. E. Hurst, read before the Manchester branch of the British Foundrymen's Association, it was pointed out that the steel should be added in the cupola, and that, since the melting point of steel scrap was rarely reached in the ordinary cupola, it was evident that the steel absorbed carbon which lowered the melting point. The necessity of melting hot was, therefore, evident.

The author had met with a good deal of trouble in the matter of pin-holes

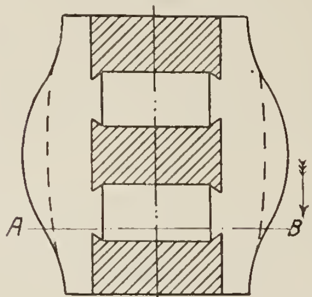


Fig. 4.

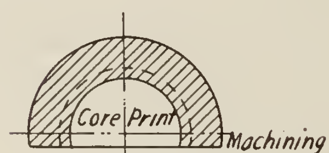


Fig. 5. Section A-B

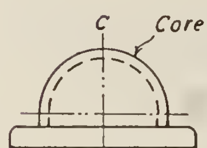


Fig. 6

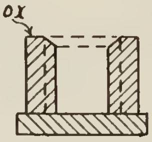


Fig. 7 Section C-D

when adding the steel in large pieces, but the trouble was less when the steel was added in the form of borings; it might be added, however, that this trouble can be overcome by watching the melting heat. An ingenious method of adding steel to cast iron in the ladle was referred to, steel in the form of punchings or turnings being placed in the bottom of the ladle together with some thermit, and as a molten cast was poured upon it, the action of the thermit gave sufficient heat to melt the steel. In the course of the discussion several interesting points were brought out. It was stated that the proportion between the sizes of the pieces of cast iron and of steel was of importance, and should be at least 3 to 1. With respect to obtaining strength in the bar, 35 per cent. of steel was given as the most suitable proportion. The occurrence of hard spots is, of course, a general trouble, and is more frequent when low silicon mixtures are used.

CARE OF CRUCIBLES

A HANGER issued to brass foundries by the Joseph Dixon Crucible Co., Jersey City, N.J., contains suggestions for the care and treatment of crucibles in foundry operations. On its reverse side is given a table containing specific gravities and melting points of various metals, as well as a number of low fusion alloy mixtures. The suggestions, all of which are valuable, follow:

Refit tongs and shanks to crucibles every 30 days.

Keep fuel in a dry place, as damp or wet fuel causes scalped crucible.

Don't wedge the metal in the crucible.

There should be about 3 inches of coke space on the sides and 6 or 10 inches of fuel under the crucible, depending upon the size of the latter.

Keep an accurate record of heats.

Store crucibles in a warm, dry place about two weeks, then anneal by heating very slowly and gradually—upside down, preferably—to 250 degrees Fah. or over.

Where oil or forced draft is used, be careful about too much air pressure which produces an oxidizing flame, thereby eating away the plumbago in crucible.

Set the crucible in a bed of dry sand when removing it from the furnace and be sure there are no clinkers left on the bottom or sides of the crucible.

Don't leave the crucible in the fire after the metal is ready to pour.

If possible, recharge the crucible and put it back into the fire before allowing it to cool if an after-heat is to be run.

Don't leave metal in the crucible to cool.

Have shanks fit the crucible, but if clips have to be used be sure that they are sufficiently wide. Better use two sizes of shanks and don't use gates as clips.

Avoid hard, sharp pieces of coke under the crucible.

Be careful with the use of the poker; it is easy to punch a hole through a hot crucible.

Place the crucible in the centre of the furnace so as to give equal fuel distribution all around.

Don't set the crucible in a cold draft or near an open door in the winter.

Avoid fluxes unless absolutely necessary.

Don't drop heavy pieces of metal into the crucible from a distance.

Don't drop large pieces of cold metal into a crucible containing molten metal, without first heating it, or it will chill back.

The top of the crucible should not be hole at the beginning of the heat.
set higher than the bottom of the flue

NEW PROCESS DEVELOPMENTS

Inventive Genius and Research Operate to a Dual End — They Aim to Improve What We Now Possess and Bring to Our Service Commodities Before Unknown

COMPOSITION OF FILLING MATERIAL A FACTOR IN AUTOGENOUS WELDING

By C. Royer.

WHEN a boiler maker manufactures a tank by oxy-acetylene welding, or a machine shop has a broken piece repaired by this process, they are directly interested in the strength of their welds and wish them to stand up as well as the rest of the piece. Outside of suitable equipment and skill of the welder, the results obtained depend largely on the selection of the welding material which has been fused in the weld. It is desirable that everybody doing welding should know in what way the filling material affects the results of a weld, and the reasons which guide the choice of a suitable material.

It is well, first, to mention that in welding the metal is fused drop by drop, and is subjected to a tremendous temperature, to the action of the gases of the flame and of the air, and that chemical action is liable to take place independently of the skill of the welder, and consequently it is difficult to expect the metal fused in the weld to be as sound as the metal of the piece to be welded, which metal has been prepared in large quantities in a furnace made for the purpose, and which has been subjected to mechanical and thermal treatment to improve its qualities.

In order, then, to obtain the best efficiency in a weld, it is necessary to choose welding material purer than the piece to be welded—that is to say, free as much as possible from impurities liable to be injurious to the weld, and to such pure material should be sometimes added elements capable of combating the ill-effect of the influences of the fusion under the blowpipe. Very small quantities of impurities are liable to destroy the mechanical properties of a weld, and it is the effect of these impurities we are going to consider.

Welding of Iron and Mild Steel

For welding plates and boilers, the welding material should be as pure as possible—that is to say, should contain the least carbon, sulphur and phosphorus obtainable. The best quality of Norway or Swedish iron as a rule fulfils these conditions.

Influence of Carbon

Though carbon increases the tensile strength of iron in a weld, it decreases its elongation, and as any weld always shows a decrease in elongation, it is well to keep the carbon low in order to avoid any reduction in elongation. Moreover, carbon increases the tendency of steel to crystallize under the influence of alternate expansion and contraction as in boiler work, or under shocks and vibration, etc.; also mild steel at 200 degrees C. temperature loses some of its property of elongation with increased carbon. Consequently, in boiler work it is absolutely necessary to use a welding material very low in carbon in order to decrease the tendency of the metal to crystallize under working stress and produce cracks and break later on.

Influence of Sulphur

Sulphur, which is found in almost every welding material, combines with the iron and makes an eutectic (ferrite and sulphur), which becomes isolated between the molecules of metal and renders the metal brittle when hot.

This eutectic becomes liquid at cherry red and surrounds the solid molecules of iron. For this reason, welding material which contains any quantity of sulphur cannot be hammered without developing cracks, which will spread between the solid molecules of iron.

Influence of Phosphorus

Phosphorus in the welding material induces, during crystallization, the formation of large crystals, which considerably increase the brittleness, and are liable to prove dangerous in the welding of pressure tanks and reservoirs.

For the welding of boiler plates and plate work, use Swedish or Norway iron of good quality to obtain the soundest weld possible with the maximum elongation. There is no doubt that the tensile strength of the weld will be lower than in using mild steel, but the elongation will be better and possibility of breaking after a period of use will be eliminated.

It is well to add here that one of the greatest evils in welding is the formation of oxide of iron, which dissolves in the molten iron, and which decreases the elongation and reduces the tensile strength, but up to now no sufficiently tried element has been found which, added to the welding material, will eliminate the ill-effect of the oxidation produced. It is to be hoped that filling material containing a harmless deoxidizing element will be manufactured in the near future, but at the present time the best thing to do is to use good quality Swedish and Norway iron, which at the present time are known as the purest iron, containing the least amount of carbon, sulphur and phosphorus. Beware of material sold as Swedish or Norway iron which has none of the qualities of these materials, but the name only, or which contains too much slag.

The increase of price for a good welding material should be of small consideration, as the percentage of it in the cost of a weld is too small to justify the risk of turning out poor work; consequently, for boiler plate and mild steel work, use the purest iron possible to be obtained, free, as far as possible, from carbon sulphur, phosphorus and slag, and which flows well when melting.

Welding Material for Steel Pieces

The remarks above in regard to sulphur and phosphorus apply just as well for the welding material used for steel pieces. Generally, for such pieces the quality of elongation is not such a requisite as for plate work, and, therefore, the presence of carbon will not be objectionable, and will, on the contrary, increase the tensile strength and the toughness of the weld. In such a case, steel containing as little as possible of sulphur and phosphorus should be selected, and the amount of carbon should correspond to the amount of carbon in the piece to be welded, or be slightly above.

Welding material, such as vanadium steel, chrome steel and nickel steel has been proposed for such work, but experiments so far do not seem to be sufficiently conclusive to justify any superiority for either of these materials. There is no doubt that almost any well-made weld will withstand the stresses it has to support, and mild steel rods of good quality have given very good satisfaction.

In regard to high carbon steel, it is well to mention here, that although it can be welded under the flame of the blowpipe, the results are not very good compared with the strength of the material itself. This is due not so much to the weld itself, but that under the high temperature of the flame of the blowpipe, the parts adjacent to the weld begin to segregate, therefore, the structure of the metal is affected and its properties decreased. Consequently, when high carbon pieces are subjected to heavy stresses, it will not be satisfactory to try to weld them.

In the welding of cast iron the welding material should not contain an excess of sulphur which, under the flame of the blowpipe, will tend to the formation of blowholes which will decrease the strength of the weld. The manganese should also be low, as it will tend to increase the amount of combined carbon in the weld which will render the weld hard to machine. On the contrary, cast iron filling rods should contain a larger amount of silicon than ordinary cast iron, as this silicon will help to produce a grey cast iron easily machineable.

Cast iron rods should be made with new material altogether without any scrap, should contain no sand, and about 2½ to 4 per cent. of silicon, with less than 0.5 per cent. manganese and sulphur. It is poor economy to try to obtain filling rods made in an ordinary foundry without special care and attention to the percentage of elements contained, just for the sake of a few cents and take the risk of making unsatisfactory work. Experience has shown that such manufacture, by an ordinary foundry, is not satisfactory, except if this manufacture be made a specialty, and in that case, the cost of filling rods will be proportional to the purity and the care required to obtain good material

Welding of Brass

To obtain a satisfactory weld in brass, it is essential that a welding material made of absolutely new metals should be used, the composition should be similar to the metal to be welded, and a very small amount of aluminum should be incorporated in the welding material, just in sufficient quantity to destroy the oxide formed during welding and prevent the vaporization of the zinc. The mixing of this small quantity of aluminum is a delicate operation and cannot be performed properly except by specialists.

Welding of Bronze

The above remark will apply also to the welding of bronze, though the element incorporated in the welding material to insure soundness should be phosphorus instead of aluminum. It is well to remark here that the percentage of phosphorus should be exactly verified and homogeneously incorporated in order to obtain good results. No scrap material should be used for making such welding rods so as to avoid absolutely the introduction of any trace of lead or zinc in the metal which would disturb the fusion and produce blowholes.

Welding of Copper

A satisfactory weld in copper, i.e., showing sufficient tensile strength, malleability and elongation cannot be obtained without using a specially prepared copper filling rod. This is due to the fact that copper being heated oxidizes readily and the oxide of copper produced, is dissolved readily in the molten copper, reducing considerably the strength and the ductility, thus rendering the metal brittle.

Provided, that a welder knows how to weld copper and has a suitable equipment, he may obtain very satisfactory results in using a copper filling rod which contains a certain pre-determined quantity of phosphorus which serves as a deoxidizer. To have a suitable copper welding material, it is not sufficient to use any quality of phosphorus copper, but the amount of phosphorus should be accurately controlled and evenly distributed throughout the material. The making of such material is difficult and increases the cost of the products, but enables one to obtain a sound weld, otherwise impossible to produce. Such material permits the manufacture of practically seamless copper articles, instead of apparent brazing, which may become faulty after a period of use.

Welding of Aluminum

Filling material for the welding of pure aluminum should be composed of pure aluminum wire free from silicon which destroys the strength of the weld. For the welding of cast pieces of aluminum, a welding material made of absolutely new metals and about the same composition as the piece to be welded will give the best results. Scraps should be entirely avoided in the making of such material in order to avoid impurities, principally copper and silicium.

Summary

To summarize, we may say that, as under the flame of the blowpipe the metals are liable to be altered, it is absolutely necessary, in order to obtain the maximum results, to use either pure metal or pure metals to which some special beneficial elements have been added. The manufacture of filling material has become a special industry, and consequently, it is recommended that such metals be obtained from firms making a specialty of them, and who are ready to spend the time and money to insure the supply of good products. Even in the case of reliable firms, jealous for their reputation, it is well, if any doubt arise as to the quality of the products they sell, to have same analyzed.

Finally, it is very poor policy to buy welding material as regards price alone, as instead of economizing a few cents on the cost price, one takes a chance, by obtaining poor welds, of losing all the money invested in labor and welding gases, which items are really the main expenses of the cost of welding.

ELECTRIC PRODUCTION OF STEEL DIRECT FROM IRON ORE

THE production of steel direct from iron ore has been the subject of considerable experiment during recent years, and the measure of success which has attended various efforts indicates the probability of successful commercial development when normal conditions return.

The Tivani Electric Steel Company has been operating an electric smelter at Belleville, Ont., for some months, and their results have demonstrated the practicability of smelting suitable ores directly into tool steel.

The principal item of the plant is the furnace, which is operated on two-phase current. Threaded electrodes are used, 3 in. dia. arranged to feed continuously, and can be almost entirely consumed with little waste. A feature of the furnace is the provision of a preheater for utilizing waste heat from the gases given off by the furnace during smelting. This device is formed of two wrought iron pipes, about 8 ft. in length x 14 in. dia. at one end, increasing to 18 in. at the other. This inverted funnel shape facilitates the downward progress of the charge during heating. A suitable stack encloses the preheater, baffles being arranged so that the gases pass over the surface of the preheater in the most efficient manner.

Charging is done from the upper floor; iron ore, limestone, and charcoal being fed into the upper end of the preheater. The ore smelted is specially selected for freedom from sulphur and phosphorous, only a trace of the former and 0.004 per cent. of the latter appearing in the analysis. The average analysis of the ore shows small quantities of chromium and manganese and 50 per cent. iron, with 7.5 per cent. titanium, 0.11 per cent. vanadium, and 0.34 per cent. nickel.

This titaniferous ore has been used for the production of a tool steel, which is reported to show up well against high-speed steel. Tests have shown that for turning cast iron and 0.90 per cent. carbon steel, tools made of this material would stand up at the same speed as high-speed steel, although attempts to machine low carbon steels at a higher speed were not so successful.

By mixing crude chrome ore with titaniferous ore a fair quality of chrome steel has been produced. Future developments, which include the erection of a 3-ton furnace for the production of tool steel and steel castings, are awaited with considerable interest.

New Process With Steel.—A new process of coating structural steel or any other exposed metal with zinc is being introduced to those who are interested in such matters, and it is attracting considerable attention because of the ease and thoroughness with which the operation is performed, even after the metal has been put in place. Powdered zinc, compressed air and heat are the three elements which are used in the process, the zinc being driven through a gas burner by the air, where it is instantly reduced to a liquid state, and, as it strikes any surface capable of sustaining the force, it adheres and cools at once.

NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

PORTABLE COMBINATION WOOD-WORKER

THE advantages to be obtained through the use of what is termed a combination woodworker, are such that without one a modern pattern or carpenter shop may find itself somewhat seriously handicapped. Possibly the chief value of such a tool lies in the fact that its scope of application is wide and diversified.

Machines of this class have been on the market for some time, and each has its own special features which go towards making it a valuable asset to the shop or mill in which it may be operated.

An excellent idea of the portable combination woodworker being manufactured by the Hutchinson Woodworker Co., Sherbourne Street, Toronto, may be obtained by referring to the accompanying cut, Fig. 1. It will be seen that its attractive features lie in compactness and rigid, self-contained construction. The table is of cast iron with a maple top, the whole being securely braced, thus doing away with abnormal vibration.

The main supporting column is made of extra heavy steel tubing, which is supported on a suitable cross piece by means of clamps placed beneath the table as shown. To this column is fitted a heavy cast iron bracket, which supports the two steel rods carrying the motor and the saw mandrel. The motor is secured to a base plate, which in turn is bolted to the back end of the steel rods by means of countersunk head, set screws.

The saw mandrel is supported in a suitable casting, secured to the front end of the steel rods. An idea of the construction of this casting may be readily obtained by referring to Fig. 1. At the top of the casting is a horizontal handle, by means of which the workman is enabled to draw the saw through the work. It may also be stated that the mandrel is fitted with self-oiling boxes which from their design prevent oil from running on to the finished work.

An interesting feature of the machine is the ball-bearing rollers which carry the steel rods, thus insuring an easy horizontal motion. A sketch of the arrangement showing the manner of adjustment is shown in Fig. 2. The roller is counterbored at both ends and the two ball-races are fitted therein. The supporting spindle is turned eccentrically as shown, permitting any adjustment which may be necessary. Thus, if the rods bear too heavily, or too lightly on the rollers, the set screws which hold spindle in place are loosened, and the spindle is turned in the direction which may be necessary to raise or lower the roller.

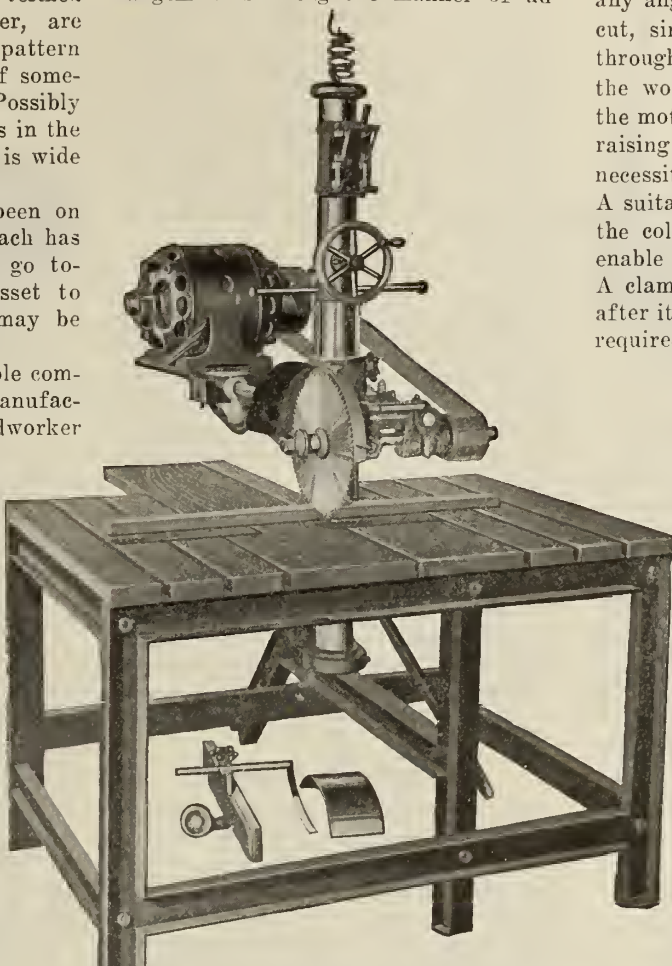
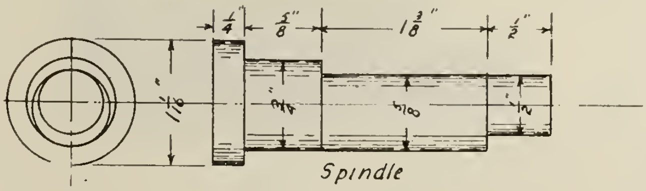


FIG. 1. PORTABLE COMBINATION WOODWORKER.

The saw can be made to operate at any angle and also to take any depth of cut, since it can be raised or lowered through a space of eight inches to suit the work. Further, the fact that both the motor and saw move as one piece, the raising or lowering of the saw does not necessitate any adjustment of the belt. A suitable clamp is provided for locking the column after it has been turned to enable the saw to cut the desired angle. A clamp also locks the bracket in place after it has been raised or lowered to the required height. The method of adjusting the depth of the cut is by means of the handwheel shown. This operates a pair of mitre gears and a suitable square threaded spindle; the latter engaging with a bronze nut held in the bracket.

The range of work, as previously mentioned, is practically unlimited; cross-cutting, ripping, dadoeing, sandpapering and boring being accomplished with the least amount of labor. For sandpapering, a special cast iron disc is provided, to the face of which is secured the paper. Boring is accomplished by means of a special chuck secured to the pulley end of the mandrel.

The machine is driven by means of 1½ h.p. single phase, 25-cycle motor, or through a 2½ h.p. single phase, 60-cycle motor, with swivel placed conveniently at top of column. The length of drive is 46 inches, and 3 in. balata belting is used. The speed of the saw is 2,500 r.p.m. Another advantage of this machine is the fact that by means of a cone pulley, the motor can be made to drive both the saw and a pony jointer at the same time. An interesting type of the latter machine is also manufactured by the Hutchinson Woodworking Co.



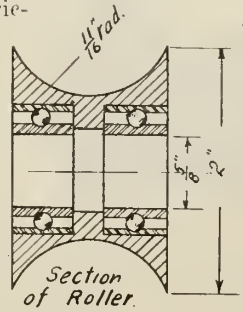


FIG. 2. ADJUSTABLE BALL-BEARING ROLLER AND SPINDLE.

M. Gorman, proprietor of the Gorman Foundry Petrolia, Ont., died on Feb. 13.

TRANSFER TRUCKS

IN order to meet the demand for a thoroughly efficient transfer truck of low cost, the George P. Clark Co., Windsor Locks, Conn., have placed on the market the two models illustrated.

Type WN30 shown in Figs. 1 and 2 is adapted for loads from 500 to 1,000 lbs. The frame is made of channel steel, is designed to raise 1⅞ in., and is fitted with three wheels 6 in. diameter by 2 in. face, having roller bearings and steel axles.

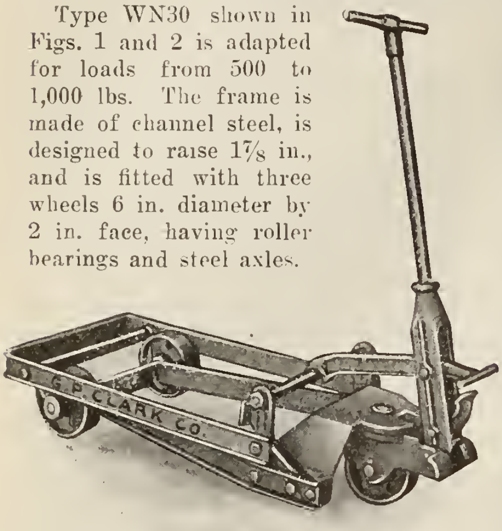


FIG. 1. TYPE WN30 TRUCK FRAME DEPRESSED

Fig. 1 shows the truck with the top frame in its lowest position with the lifting link resting on the front rod ready to elevate the frame. When the handle is pulled forward the top frame is swung upwards on the supporting links to its maximum elevation, when the lifting link can be unhooked from the rod by pressure of the operator's foot on the front end of the link which projects forward of the handle.

The platform which straddles the frame in the usual manner may now be transported to its destination and lowered by reversing the operations. This type is made in two sizes, each having a capacity of 1,000 lbs., and taking a maximum size platform of 32 x 32 inches, and 42 x 32 inches respectively. These trucks weigh 130 lbs. and 140 lbs., the minimum height from floor to top of frame being 6 inches in both sizes.

FIG. 3. TYPE YN10 TRUCK FRAME DEPRESSED

A heavier type of truck for maximum loads of 2,200 lbs. is shown in Figs. 3 and 4. These are of substantial construction being built of malleable iron and steel, and of such proportions as will insure rigidity in use. The axles are of steel, the iron wheels 6 in. x 2 in. with dust proof roller bearings, and hardened and ground rolls and sleeves.

The elevating gear consists of combination cam-gears, the necessary movement being obtained by means of an anti-friction rack connected to the neap swivel and operated by the handle of the truck. The rack in the neap swivel moves only when the handle is swung away from the anti-friction roll, consequently the neap swivel can be turned completely around, which is of advantage when it is desired to move the truck with frame depressed.

The combination cam-gears provide a rolling lift which reduces lifting stress to a minimum. When elevated, the upper frame is positively locked in position by the sliding bolts, either of which is sufficient to hold the load elevated, while they cannot be disengaged except by raising the handle and again lowering it. All work of elevating or moving the truck is performed by the handle which is rigidly pivoted to the neap swivel.

This truck type YN10 is built in four sizes, all having a minimum height of 6 inches with a lift of 2 inches. The maximum platform sizes vary from 32 x 32 inches to 52 x 38 inches, and the weights from 225 to 275 lbs. respectively.

ALUMINIUM FURNACE

THE application of aluminium and its alloys to industrial purposes has extended so considerably in recent years, that the subject of their melting is bound to appeal to a large number of manufacturers. Generally, melting has been effected in open crucibles, which allow atmospheric oxygen to attack the molten metal, with the consequent formation of dross. A gas fired furnace on entirely new principles, for melting aluminium and its alloys has been evolved after many experiments by the Monometer Manufacturing Co., Whitehouse street, Aston, Birmingham, and in which the usual difficulties met with, have, it is claimed, been overcome.

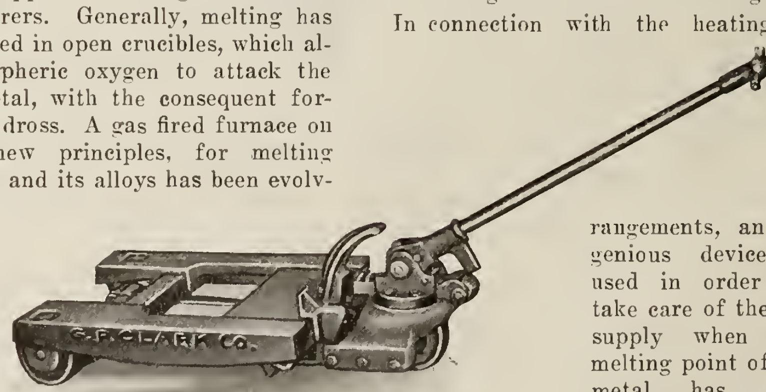


FIG. 4. FRAME ELEVATED

Melting pots made of metal are subject to the objection that the reaction which takes place between the molten aluminium and the impurities in the metal of which the pot is composed spoils the aluminium. In the furnace in question, this reaction is eliminated by the employment in the parts subject to attack of a special composition of metal which extended experience has shown to be immune from the action of impurities.

FIG. 2. FRAME ELEVATED

It is well known that a considerable portion of the molten metal goes to waste as oxide, and to prevent this deleterious action the melting pot is installed in a chamber containing inert gases incapable of oxidizing the molten metal. As there is no oxidation, it follows that there is no dross, and hence a considerable saving of material. The method of constantly replenishing the enclosed melting chamber with inert gases consists in causing the products of combustion to traverse the melting chamber on their way to the outlet flue. This sealing of the melting chamber also precludes the ingress of dirt and other foreign matter in the melting pot.

In connection with the heating arrangements, an ingenious device is used in order to take care of the gas supply when the melting point of the metal has been reached. The thermostat of the patented regulator, termed by the makers a "Monometer" controls and governs the quantity of gas supplied to the burners, so that immediately the aluminium is melted the quantity of gas used by the burners is reduced, and the uniform heat essential to aluminum melting is automatically maintained.

The Bunsen burners under the melting pot have contracted nozzles of such a design that a proper admixture of the gas and air takes place, resulting in perfect combustion and the full utilization of the heat in the fuel. The heat obtained by these low pressure atmospheric burners, which are coupled to the ordinary town supply, is stated to be comparable with that attained by high pressure gas, but without using compressors or fans.

The equipment of the furnace is completed by a central cone valve seated in the bottom of the melting pot and controlled by a conveniently arranged handwheel, by which the molten metal issuing from the pouring spout can be regulated or entirely shut off. At the top of the furnace are located two doors through which the swarf or metal is introduced into the melting pot, these doors being balanced so that they remain either in the closed or in the open position without being held by the operator. Casting is facilitated by mounting the furnace on a wheeled carriage which can readily be moved on rails from one part of the foundry to another, flexible gaspipes providing the means for allowing for this movement of the furnace.

LABOR BRANCH, ONTARIO PUBLIC WORKS DEPARTMENT

THE labor branch of the Public Works Department, Province of Ontario, which will be established, is to be constructed on the lines suggested by the committee on unemployment in their report, according to the Hon. Finlay G. Macdiarmid, Minister of Public Works. Mr. Macdiarmid intends appointing a superintendent to preside over the branch, and it is understood that he has the man in mind. The salary will not be less than $2,500. Mr. Macdiarmid introduced his bill last week. The principal work of the department will be to:

Duties Outlined

Collect such statistical and other information respecting trades and industries in Ontario as may be deemed necessary or expedient from time to time.

Ascertain the localities in which mechanics, artisans, or workmen in any particular trade or industry are required, and, where practicable, assist in supplying the demand for such work or labor.

Ascertain and report upon sanitary and other conditions relating to the health ,comfort, and well-being of the industrial classes.

Establish, and maintain in the various centres of population throughout Ontario, employment bureaus and similar agencies for obtaining suitable employment for working men.

Ascertain and report upon the rates of wages paid to employees in the various trades and industries carried on in Ontario.

Inquire and report as to the establishment of new industries in Ontario, particularly in cases where, by reason of the production of raw material for such industry in Ontario, or the immigration of persons skilled in the particular industry or other circumstances, it appears that such industry can profitably be carried on.

Report on Laws

Inquire into, consider, and report upon the operation of laws in force in other parts of the Empire and in foreign countries having for their objects the protection, technical training, and welfare of the industrial clases, and make such recommendations and suggestions thereon as may be deemed advisable.

Consider and report upon any petition for, or suggestion of a change in the laws of Ontario relating to labor and wages, or any matter affecting the industrial classes presented or made by any Trades and Labor Council or other organization representing those classes, or by any other person.

Prepare and transmit to the Lieut.-Governor-in-Council annually a report containing the reports of the officers employed in the administration of the various Acts assigned to the branch, and upon the work of the branch during the preceding year, together with such statistical and other information as may have been collected in the branch.

CHAINS AND OTHER LIFTING APPARATUS

A MEMORANDUM by G. S. Taylor, H. M. Inspector of Factories, entitled Chains and other Lifting Apparatus, has recently been issued by the British Home Office. The author deals with the causes of and possible means of preventing accidents arising from the fracture or failure of chains and such metal appliances as rings, hooks, shackles, eye-bolts, and swivels used for lifting purposes. The whole of the fifty-two pages are full of information, and a valuable feature of the work is a bibliography containing forty references.

Amongst the subjects considered may be mentioned the following:—Legislation; types of appliances; materials; methods of manufacture; kinds and proportions of links, hooks, shackles, eyebolts and swivels; use and wear of chains, slings, and other lifting appliances; testing; annealing; examination; marking; records; failures of chains and other lifting appliances; accidents and dangerous occurrences. In addition there are eight plates of illustrations and five appendices.

FOUNDRYMEN'S CONVENTION AND EXHIBITION

WE are advised that C. E. Hoyt, of Chicago, formerly secretary of the Foundry & Machine Exhibition Co., has been appointed manager of the exhibit of foundry equipment and supplies, which will be conducted under the auspices of the American Foundrymen's Association and the American Institute of Metals, concurrent with the conventions of these two organizations at Cleveland during the week of September 11. Mr. Hoyt has had a wide experience in exhibition work, having taken an active part in the conduct of foundry shows at Cincinnati, Detroit, Pittsburgh, Buffalo and Chicago.

The exhibition will be in charge of a committee of eight, composed jointly of representatives of the American Foundrymen's Association and the exhibitors. This committee is constituted as follows: R. A. Bull, chairman and president, the American Foundrymen's Association, and of the Commonwealth Steel Co., Granite City, Ill.; Major Jos. T. Speer, past president of the American Foundrymen's Association, and of the Pittsburgh Valve Foundry & Construction Co., Pittsburgh, Pa.; Alfred E. Howell, past president of the American Foundrymen's Association, of the Phillips & Buttorff Mfg. Co., Nashville, Tenn.; J. P. Pero, senior vice-president, the American Foundrymen's Association, of the Missouri Malleable Iron Co., East St. Louis, Ill.; A. O. Backert, secretary of the American Foundrymen's Associa-S. Obermayer Co., Chicago; V. E. Minich, of the Sand Mixing Machine Co., New York City, and H. S. Covey, Cleveland Pneumatic Tool Co., Cleveland.

The exhibition will be held at the Cleveland Coliseum, which has an available floor area on one level of 60,000 square feet. It is located within one block of the Hotel Statler, where the meetings of the American Foundrymen's Association and the American Institute of Metals will be held. The same prices will be charged for floor space as has prevailed heretofore. Although no floor plan of the building has yet been prepared, a large number of applications for space have already been received, and the indications are that the Coliseum will be inadequate to provide for all of the exhibits, necessitating the erection of a temporary building on an adjoining lot.

At a recent meeting of the executive board of the American Foundrymen's Association it was decided to incorporate, and this will be effected in the near future.

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WHAT IS SUITABLE SHELL STEEL?

DISCUSSIONS in contemporary journals indicate that English investigators and manufacturers are not disposed to rest satisfied with the Government's seeming indifference toward the question of suitable shell material. Up till now the War Office has successfully resisted all efforts to have shells made of other material than forged or rolled steel, meeting all arguments and proposals with the stereotyped reply that in the opinion of its advisers it would not be expedient otherwise. Without in any way detracting from the prestige of the War Office experts or questioning in any way their knowledge of what is suitable shell steel, it might be pertinent to inquire of them what is not suitable shell steel.

The aim of Britain's munitions makers is to largely exceed Germany's reported shell output of one and three-quarter millions per week. Whether that has been done, or will be done is beside the point, but severe official specifications should not be allowed to exercise a restrictive effect on the output and prevent due consideration of other grades of material already in use by certain Powers. That eminent authority, Dr. Stead, in a recent paper, discusses actual variations in German shell composition as learned by analysis of actual pieces. Where steel is required to possess great fatigue resisting properties, combined hardness and toughness, or be specially suitable for machining or drawing in presses, the importance of chemical composition is recognized because actual mechanical tests have instituted the basis of comparison, and afforded physical proof of the influence of various substances.

The importance of this fact is recognized by Dr. Stead, and his position as an analytical chemist adds weight to his statements—"If a steel is proved by suitable mechanical testing to be satisfactory, on no account should it be rejected on chemical analyses. . . If the results of my mechanical tests are confirmed, then the obvious thing to do is to alter the specifications forthwith. If the mechanical tests are found to be conclusive, then it would be a national crime to reject material on any chemical specification before submitting the steel in question in the form of a finished shell to the more convincing mechanical test."

INTER-EMPIRE TRADE

AS a result of her development as a manufacturing country, Canada, at the present moment, is probably the most highly favored of all the British Colonies with respect to future participation in inter-Empire trade. South Africa and Australia are so isolated geographically that their progress in manufacturing has heretofore been limited. In addition, the smallness of their home markets, the high cost of factory equipment, and the comparative scarcity of raw materials and fuel, have militated against their industrial upbuilding. There has, however, always been available to our manufacturers, all the materials and conditions necessary to the development of a manufacturing industry on permanent healthy lines.

Manufacturers throughout Canada are alive to the importance and desirability of securing a share of the Empire's requirements in manufactured products, commensurate with our now proven ability to produce. The present stages of development attained by the two colonies mentioned, closely parallel the state of Canadian development some years ago, when agricultural and allied interests overshadowed all other activity. There, as well as here, however, the war has stimulated home production in many lines to a degree which must not be overlooked by our people in the near future.

The President of the Johannesburg Chamber of Commerce, Ernest Chappell, recently said: "Generally speaking, the condition of affairs at present prevailing.... provides a strong stimulus to all South African manufacturers already established, and is giving them an impetus which cannot fail to be of the greatest service to them when they will again have to face competition from outside sources. It may fairly be stated that in this respect the war has constituted the finest assistance for our local manufacturers that they could possibly have had."

Such a statement from such an authority should receive careful attention by prospective exporters, not as a deterrent, but rather as an indication of future opportunities. For many years to come Canadian conditions will favor the production here of many articles, affording our manufacturers the opportunity of building their reputation on solid foundations. What these foundations consist of must be clearly recognized by us, even as they are beginning to be recognized by competitors abroad.

THE NEW TAXATION FOR WAR PURPOSES

THE changes in the original war taxation proposals of Canada's 1916 Budget which Sir Thomas White, Finance Minister, announced in the House of Commons on March 2, are such as to merit and receive to a large extent the whole-hearted approval of the parties interested, the retroactive and capitalization features having been modified and brought to a more equable basis of assessment respectively.

The retroactive period has been advanced to January 1, 1915, tax payments falling thereby in the individual years 1916, 1917 and 1918. Capital will be taken as the actual unimpaired reserves of each company or corporation, and watered stock will be eliminated for taxation purposes by taking the cost value of the stock on January 1, 1915, and deducting from same the liabilities of the company or corporation on that date.

Other modifications are, that holding companies will not be taxed on profits received from their subsidiaries when the latter pay under the Act, and all concerns who may make tax payments to Great Britain or her Allies will have the amount of same deducted from that otherwise payable to the Dominion Government. As regards non-Canadian concerns, the capitalization basis of assessment will be such portion of the amount paid upon their entire capital stock as the value of the Canadian assets bears to the total assets.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

MODERN ACID-DIPPING, ELECTRO-PLATING AND JAPANNING PLANT—I*

By H. N. Trumbull**

IN the case of perhaps the majority of electroplating establishments the general conditions in vogue certainly leave much to be desired from several standpoints. A description of a modern plant, which in completeness of working equipment and means of safeguarding the health of employees is unsurpassed, will be of interest.

This plant is a part of the Switchboard Department of the General Electric Co., and is centrally located with regard to the various manufacturing sections of the department from which it receives its work. The building is a one-storey brick structure and is divided into three rooms; one for acid dipping, one for electroplating, and one for japanning and enameling. It is lighted through a large amount of window space located both on the sides and top of the building. To aid the lighting system the interior of the building, with the exception of a five-foot border around the wall at the floor line which is treated with asphaltum, is finished with ecru paint.

The floors are of concrete and are kept dry by draining into sewer inlets. The floors of the dipping and plating rooms are, in addition, treated with asphalt and granite dust to make them acid proof.

The means of heating and ventilating these rooms is quite unique. For heating, what is known as the direct-indirect system is employed. Air enters the building through the several openings near the ground line and then passes up through steam radiators, which are of course heated in cold weather only. The radiators are located in the interior of the building against the wall and above the air entrances.

The vitiated air is removed by a 35 h.p. motor-driven fan through a particularly effective system of hoods, flues and ducts. Over the dipping tank and over the cleaning tank a specially designed hood extends out from the wall at an angle of 60 degrees. Gases, fumes and steam from the tanks, together with air from the room, are drawn up into the hoods through slots 12 inches long, ranging from 1¼ to 1¾ inches wide. These hoods are divided into six sections, corresponding to the six sections of the tanks, and each section of hoods is provided with five slots or vents. From the vents the air is drawn through flues into the main duct which leads to the intake of the fan.

Any section of the hoods may be shut off from the main duct by slides in the flues, to economize power when all sections of the tanks are not in use. The fan is located outside the building, rotates at a speed of 800 r.p.m., and develops a pressure of 3¼ oz. per sq. in. It forces the exhaust of the building up a steel stack, which is higher than the surrounding buildings. The fan, motor and stack are treated with acid-proof paint.

The combined volume of the two rooms is 51,100 cu. ft.; and the ventilating system removes the steam and acid fumes above the dipping and cleaning tanks immediately and completely changes the total volume of air once every minute and a half. Thus the atmosphere in the room is kept fresh and pure, so that all danger to occupants from breathing impure air is avoided. The painting and baking room is heated by radiation from steam pipes and is ventilated by means of tilting-sash windows in the cupola.

The work of acid dipping is carried on in the usual manner, the dipping solutions being in removable earthen vats placed in reinforced concrete tanks along the wall. Running water and steam is piped to these tanks which are connected to sewer drains.

Next to the dipping room is the plating room, on a balcony of which are located three motor-generator sets. These furnish current at 5 or 10 volts for plating. Two of these sets are of 837 amperes capacity. They are supplied with double commutators which may be connected in parallel for 5 volts or in series for 10. The third set has a 600-ampere, 10-volt generator. The generators are separately excited from the factory power system.

Below the balcony is the three-panel switchboard which controls the motor-generator sets and the three main feeder lines. The feeders carry current at either 5 or 10 volts, depending upon the position of the three lower switches on the right-hand panel. On the lower section of each panel is a twin pull-button control switch which controls contractors for starting or stopping the motor-generator sets. A circuit breaker is provided for each motor armature circuit and each generator field circuit. In case of overload, series overload relays in the generator circuit trip the generator field breakers. The switchboard is so arranged that all generators may be operated in multiple or any generator may supply any feeder.

Instead of obtaining the desired voltage by means of bulky rheostats mounted at each plating tank, sets of contactors are used, these being mounted on pipe framework suspended from the ceiling. One set is provided for each tank. At the tank is a pedestal on which are mounted a voltmeter, a clock dial, and a series of push-button switches. These push-button switches operate the contactors. For each tank there are six contactors, with resistances arranged in parallel, which give a control equal to a dial rheostat of thirty-six contact points.

Plating Room

In the plating room, silver, nickel, copper, brass and zinc plating and oxidizing are done. The equipment includes cleaning tanks, two spiral conveyor plating machines, four rotary-barrel plating machines and four still plating tanks. All plating machines are motor-driven, the motor being run from the factory power system; all plating tanks are made of reinforced concrete.

The tanks for the two spiral conveyor plating machines are each three feet wide, three feet deep, and twenty-four feet long (inside dimensions). The walls are four inches thick and the top surface of the tank is thirty inches above the floor level. These two tanks are equipped with spiral conveyor plating machines.

A worm in the casing, extending along the end of the tank, is belted to a motor. This worm is geared to two long spiral conveyors which extend the length of the tank above the solution. These conveyors are connected at the farther end by

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PLACE AND DATES OF MEETING.

The Occident Hall, corner of Queen and Bathurst Streets. Fourth Thursday of each month, at 8 p.m.

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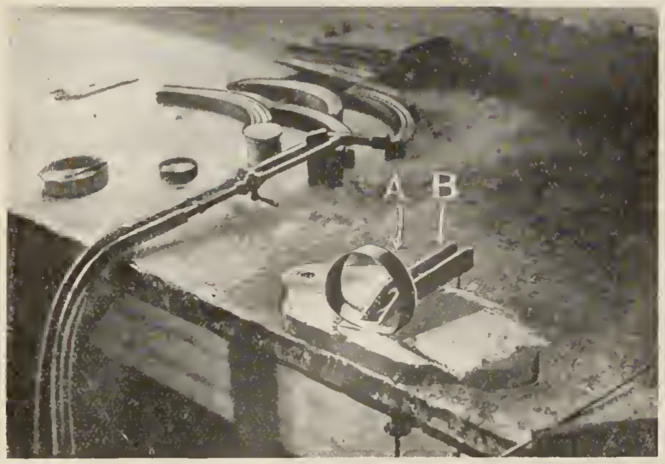
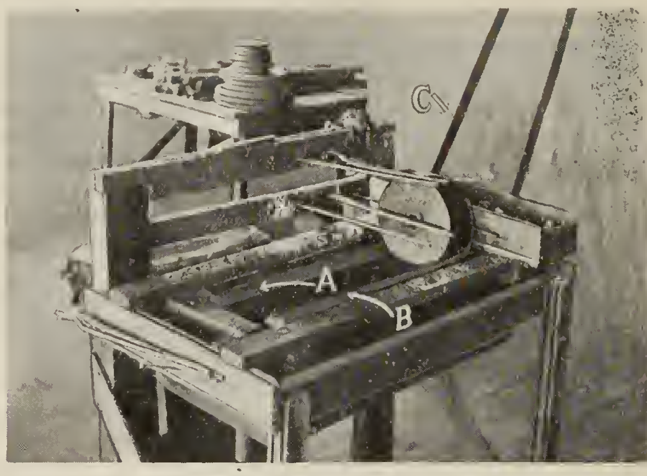
*From General Electric Review.

**Switchboard Sales Department, General Electric Co.

a U-shaped rod over which rotates a disc with fingers that slide on the rod. The work to be plated in this machine is hung on the lower end of S-shaped hooks. The upper end of each hook is hung on the continuous groove of the conveyor.



A BRAZING CLAMP.



SOAKING WORN POLISHING WHEELS.

As this conveyor revolves, the hooks advance along the groove or thread and draw the work through the plating solution. When the hooks reach the end of the first conveyor they are mechanically transferred to the beginning of the second conveyor, by being pushed along the U-shaped rod by the fingers on the rotating disc. The work is thus moved through an arc of 180 degrees, then caught by the thread of the second conveyor, and in time is returned to the starting end of the tank.

Work may be continually supplied to and removed from the machine by one man, and a large quantity completed in a short time. As this plating machine is run by a variable speed motor, the time of travel through the solution may be regulated to suit the conditions of various kinds of electroplating, the time to complete the travel varying from half an hour to an hour and a half.

There are two large and two small rotary plating barrels to accommodate work so shaped that it cannot easily be hung on conveyor hooks. The rotary plating barrel consists of an octagonal cage on a shaft and a concrete tank. After loading, the cover is replaced and the cage lowered into the tank where its supporting shaft fits in bearings. The cage is then revolved in the plating solution by a motor located outside the tank. As the cage revolves, the work is tumbled, which facilitates the plating. For assistance in loading and unloading the plating barrels, two air hoist equipments are provided. Very large or special work is plated in the still tanks.

No hot plating solutions are used, as baths have been developed which, when cold, plate as quickly as the old hot processes. All water used for plating solutions is distilled, and all water for cleaning is filtered. The still and filter are mounted on the wall above the cleaning tanks.

The cleaning tanks are similar in construction to the acid dipping tanks. The cleaning compounds that are used hot are heated by steam coils. In place of the old method of stirring cleaning solutions by means of flappers run by rods from eccentrics on a line shaft, the solutions are agitated by admitting jets of compressed air into the bottom of the tanks from a pipe having a number of small holes. The air bubbles up through and thoroughly agitates the solution, giving excellent results. An air compressor furnishes air for the agitators and the air hoists.

A BRAZING CLAMP

THE clamp shown is used for holding small bands or hoops while brazing the ends together. The hoop is placed as shown at A, with the ends overlapping and the clamp B holding them down. The brazing is then done with the torch shown at the left. The clamp is held down by means of a spiral spring underneath the bench, and, when the work is to be released a foot treadle is pressed which pulls on a wire fastened to the back end of the clamp. This tips it up in front and releases the hoop

SOAKING WORN POLISHING WHEELS

By G. Lock

IT is often a nuisance to properly soak the old abrasive off worn polishing wheels. preparatory to recoating, without soaking the whole wheel, which in many cases is undesirable. The device shown obviates this, and the soaking is done automatically after the wheel is placed in the machine. Two rollers A and B are provided for the wheel to rest on as shown. The roller A is driven by means of a pulley from the belt C. It revolves slowly and the water is high enough in the tank to just submerge the lower rim of the wheel as it revolves. A number of wheels can be placed in the tank at once, as holes are bored in the brackets at the back into which rods are thrust for guides.

Questions and Answers

Question.—I have been using a nickel-plating solution every day for two years, and have added nothing to it except a few pounds of nickel salts about once each month. Owing to difficulty in getting supplies at present, I have not made the usual additions of salts for several months. Recently the solution began to foam, and this condition has grown worse, until now it is very bad. I was told that I used an excessive current, but the foaming results with a very weak current. Please tell me what the trouble is.

Answer.—Evidently you have reduced the metallic content of your bath to a very low point. It is quite probable that the anode surface is much less than you believe it to be. Nickel solutions foam when extremely acid. If you have not added acid, the nickel has been removed from the bath more rapidly than it has dissolved from the anode, and the bath has accumulated sulphuric acid until foaming resulted. Look to your anodes, equip the bath with sufficient metal in the anode form, then neutralize the free acid in the solution with plastic carbonate of nickel by suspending the carbonate in the solution over the week-end if possible, and bear in mind that a liberal supply of metal in the anode form kept constantly in the bath is an economic safeguard against many similar troubles which thoughtless men operating plating baths encounter almost daily.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey Forge, Pittsburg	$18 45	
Lake Superior, charcoal, Chicago	19 25	
Michigan charcoal iron	28 00	
Ferro Nickel pig iron (Soo)	25 00	

	Montreal.	Toronto.
Middleboro, No. 3	$24 00	.....
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Glenarnock	28 00	.....
Summerlee, No. 1	33 00	.....
Summerlee, No. 3	32 00	.....
Victoria, No. 1	27 00	24 00
Victoria, No. 2X	27 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

METALS.

Aluminum	$ .68
Antimony	.48
Cobalt 97% pure	1.50
Copper, lake	30.00
Copper, electrolytic	30.00
Copper, casting	29.50
Lead	.10
Mercury	100.00
Nickel	50.00
Silver	.48
Tin	.56
Zinc	.22

Prices Per Lb.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$17 75	$17 75
Copper, crucible	21 00	21 00
Copper, unch-bled, heavy	20 75	20 75
Copper wire, unch-bled	20 75	20 75
No. 1 machine, compos'n	16 25	16 25
No. 1 compos'n turnings	14 50	14 00
No. 1 wrought iron	11 75	11 75
Heavy melting steel	9 00	9 00
No. 1 machin'y cast iron	14 75	14 75
New brass clippings	12 25	12 25
New brass turnings	10 00	10 00
Heavy lead	7 00	7 00
Tea lead	6 00	6 00
Scrap zinc	15 50	15 50
Aluminum	34 00	34 50

COKE AND COAL.

Solvay foundry coke, on application	
Connellsville foundry coke	$7.02
Yough steam lump coal	....
Pittsburgh steam lump coal	4.30
Best slack	3.87

net ton f.o.b. Toronto.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	66 00
Wire rods, Pittsburgh	55 00

PROOF COIL CHAIN.

1/4 inch	$9.00
5-16 inch	5.90
3/8 inch	4.95
7-16 inch	4.55
1/2 inch	4.30
9-16 inch	4.20
5/8 inch	4.10
3/4 inch	3.95
7/8 inch	3.80
1 inch	3.70

Above quotations are per 100 lbs.

MISCELLANEOUS.

Solder, guaranteed	$0.31
Putty, 100-lb. drums	2.85
Red dry lead, 100-lb. kegs, p. cwt.	13.70
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls.	0.79
Linseed oil, raw, single bbls.	1.02
Linseed oil, boiled, single bbls.	1.05
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	6.00
Lead wool, per lb.	0.13
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23
Lard oil, per gal.	1.28

SHEETS.

	Montreal.	Toronto.
Sheets, black, No. 28	$3 90	$3 80
Canada plates, dull, 52 sheets	3 60	3 60
Canada plates, all bright.	4 60	4 75
Apollo brand, 10¾ oz. galvanized)	6 85	6 75
Queen's Head, 28, B.W.G.	6 75	7 00
Fleur-de-Lis, 28 B.W.G.	6 40	6 75
Gorbal's best, No. 28	6 50	6 50
Viking metal, No. 28	6 10	6 10
Colborne Crown, No. 28	6 20	6 50
Premier, No. 28, U.S.	6 90	6 90
Premier, 10¾ oz.	6 95	6 95

ELECTRIC WELD COIL CHAIN B.B.

1/8 in.	$12.75
3-16 in.	8.85
1/4 in.	6.15
5-16 in.	4.90
3/8 in.	4.05
7-16 in.	3.85
1/2 in.	3.75
5/8 in.	3.60
3/4 in.	3.60

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, 15 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 65; headers, 60; flanged unions, 65; malleable bushings, 65; nipples, 75; malleable, lipped union, 65.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.07
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy.	.35
Copper sulphate	.25
Cobalt Sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide substitute	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 129-130 per cent.	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	4.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.25
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.35 to .37
Tin	.50 to .52
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck	.90
Emery, in kegs, American	.03 to 0.4
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .07
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Toronto, Ont., March 21.—Industrial conditions continue satisfactory and as spring approaches activity in business circles increases. Many of the principal industries in Canada are experiencing a period of unusual prosperity owing to the large volume of business coming forward. Many factories are working at capacity and are unable to handle all the business offering. A shortage of labor is beginning to be felt which will no doubt become more serious in the course of a few months particularly with regard to skilled help. The activity is due largely to war orders but the domestic demand is steadily improving as the country becomes more prosperous and the financial situation easier.

Prices generally, particularly on iron and steel products, continue in an upward direction and there is no improvement in deliveries. Congestion of freight on the railways is causing considerable delay to shipments. It is reported that more ships will be put into service later on in the Spring and so relieve the situation in regard to ocean freights, but it is difficult to see how the ships can be spared from their present work. A sharp advance in lead is the feature of the ingot metal market.

Steel Market

The market is very strong and the upward movement in prices continues. The steel mills are working at overtaxed capacity, both domestic and export demand being exceedingly good. All indications point to the present activity lasting throughout the year as the mills are in a sold out condition. The scarcity of steel and shortage of tonnage is causing considerable anxiety to the steel companies, as there is every prospect of the scarcity of steel becoming more acute, while there is little hope of more ships being available to relieve the export situation. Prices of all steel products are very firm and some advances have been made this week.

The galvanized sheet market is strong and quotations on all brands are higher. An unusually heavy demand for black and blue annealed sheets has strengthened the market and quotations on these products are higher. The continued high price of spelter and uncertainty in the market is also affecting the galvanized sheet situation. Premier sheets No. 28 U.S. are quoted at $6.90. and 10¾ oz. at $6.95; other prices are given in the selected market quotations.

Prices of steel products in the United States continue to advance and there is no indication that the end of the upward movement is near; on the contrary higher prices are predicted. It is generally thought that prices have reached a dangerous level but the demand is as insistent as ever, being considerably more than the mills can produce. While this condition lasts there is no hope of prices being held in check. Bars, plates and shapes have advanced $5 per ton and are now quoted as follows at Pittsburgh. Bars 2.75c; plates 3c and shapes 2.50c. These figures are largely nominal as early deliveries bring premiums. The demand for billets is heavy and prices have again advanced. Bessemer and open hearth billets are now quoted at $45 and forging billets at $65 base per ton Pittsburgh. Open hearth sheet bars are higher at $45 base per ton Pittsburgh. Wire rods are unchanged at $65 per ton in Pittsburgh. The ferro-manganese situation is acute and unprecedented prices are being paid for this material, ranging as high as $350 to $400 for immediate delivery. Chicago warehouse prices on bars, plates and shapes are higher and are as follows: Bars and shapes, $3.10, and plates at $3.50.

Pig Iron

The pig iron situation is unchanged and quotations are about the same level as last month. Hamilton and Victoria brands are quoted at $24 per ton with a strong market.

Old Materials

The market is firm for all kinds of old metals but quotations are practically unchanged with one or two exceptions. The domestic demand continues light, most of the business being for munitions. Lead has made a slight advance and No. 1 wrought iron is also higher. Shafting rails, and tires have advanced slightly, but malleable scrap and heavy melting steel are weaker.

Supplies

Steady business is reported in machine shop supplies, the ordinary demand as well as that for shell plants showing considerable improvement. Prices on practically all lines are very firm but there are few changes to announce this week. Turpentine is higher being now quoted at 79c per gallon. Prices of white lead have been withdrawn temporarily and an advance is expected any time on account of the pig lead situation. Gasoline is unchanged but higher prices are inevitable as crude is advancing steadily; Pennsylvania crude being now quoted at $2.60 a barrel. Linseed oil is firm and unchanged. Lead sheets have advanced $2 per 100 lbs.

Metals

The feature of the metal markets this week is the continued upward movement of lead in New York due to the scarcity of supplies, however, the London market is quieter but firm with quotations nominal. There is no change in the copper situation and the market is dull. There is no indication of any falling off in the demand for copper and the position of this metal is a good one. Spelter has recovered and the market is strong again, heavy buying having had the effect of advancing prices in New York. Little interest has been shown in antimony lately, and the situation is unchanged. The aluminum market is easier but prices are unchanged. There has been no change in the price of solder this week.

Copper. — The market is dull and prices unchanged. Consumers are well covered for early needs and what demand exists is for the far off positions. Indications point to a steady market for some time to come as it seems hardly probable that quotations will go much higher or that there will be any marked decline. Quotations are nominal at 30½ cents per pound.

Tin.— The scarcity of spot tin in New York and the great difficulty to obtain licenses to ship from London have been the controlling factors in the market for several days. The supplies of tin are increasing but the consumption seems to be able to take care of all of it. Quotations are unchanged and nominal at 56c per pound.

Lead. — The situation in the lead market appears to be getting more acute. The large export demand is still the disturbing feature in New York and producers seem to be unable to figure on even a small fraction of the enquiries which are in the market. The scarcity of supplies is not temporary but extends for several months. The "Trust" have advanced their price to 7c New York but outside prices range from 7.87½c to 8.12½c, all prices being entirely nominal. Lead has advanced 1½c locally and is nominal at 10½c per pound, the highest price touched since the war began.

Spelter.—The market is strong in New York and a buying movement appears to be in progress. In London the upward movement has been well sustained on good demand. Spelter has advanced 1c locally and is quoted at 22c per pound.

Antimony.—The market is quiet and lacking in interest. The situation is un-

changed and quotations are nominal at 48c per pound.

Aluminum.—The market is a shade easier and demand dull. Quotations are unchanged at 68c per pound.

Solder. — Prices are firm and unchanged. Guaranteed is now quoted at 31½c and strictly at 29¼c per pound.

Foundry and Plating Supplies

Business conditions are about the same, yet the continued advance in prices and growing scarcity of many raw materials used in the manufacture of foundry and plating supplies are causing considerable anxiety to these trades. Turkish emery is practically unobtainable and American emery is being generally used instead. The latter is cheaper but not so satisfactory. All ingot metals are high in price and there is little indication of any marked decline anywhere. Copper, tin and zinc have all reached new high levels recently and prices of anodes are consequently very strong with a decided upward tendency. Aluminum is still very scarce and high in price with no promise of any relief in the situation for some time to come. An advance in prices of polishing and buffing wheels may be expected as leather, felt, and cloth have all increased in cost.

There is no improvement in the situation regarding chemicals. The shortage of some chemicals is acute and is causing considerable inconvenience in plating circles. Prices of many chemicals are practically nominal owing to the scarcity. Copper sulphate has advanced and is now quoted at 25 cents per pound. Other prices are unchanged but as already stated are in many cases purely nominal.

Trade Gossip

Joliette, Que. — The Joliette Steel Co., are making extensions to their plant.

Three Rivers, Que. — The Canadian Iron Corporation will build an addition to its plant.

London, Ont.—The London Foundry Co., contemplate making an extension to their plant.

Montreal, Que.—The Steel Company of Canada will build an addition to its plant here to cost $24,000.

Carter Welding Co., Toronto, have recently been appointed sales agents for oxygen made by Lever Bros., Toronto.

New Toronto, Ont.—The Brown Brass Rolling Mill Co. will make an extension to their plant at a cost of about $25,000.

G. S. Kilbourn, of Calgary, Alta., has accepted the position of managing director of the Canadian Malleable Iron Co., Owen Sound, Ont.

Ottawa, Ont.—The Ottawa Steel & Iron Co. will rebuild their plant, which was recently damaged by fire.

J. W. McCallum, for many years superintendent of the Amherst branch of the Canadian Car & Foundry Co., died at Amherst, N.S., on Feb. 16.

Toronto, Ont.—White & Thomas, 212 Simcoe Street, are building an addition to their plant for the manufacture of galvanized iron products.

Sault Ste. Marie, Ont.—It is reported that the Algoma Steel Co. will extend their plant by the addition of a building 350 feet long by 120 feet wide.

The International Acheson Graphite Co., Ltd., Niagara Falls, N.Y., has changed its name, and hereafter will be known as Acheson Graphite Co.

Vancouver, B.C.—The Canadian Consolidated Mining and Smelting Co. have started work on the construction of a large copper refinery at Trail.

Montreal, Que.—The plant of the Canadian Metal Manufacturing Co. was recently damaged by fire to the extent of $15,000.

Belleville, Ont. — Word has been received here that the rolling mills which have been idle for some time, will resume work immediately.

The Canadian Brakeshoe Co., Sherbrooke, Que., is operating four 2½-ton basic-lined 3-phase electric furnaces. The furnaces run continuously and turn out four heats each every 24 hours.

The Steel Foundry of Quebec, Ltd, Quebec., has been incorporated with a capital stock of $49,000 by J. A. Larue, E. Massicotte, E. Trudel, and others, to manufacture machinery, iron, steel, etc.

Welland, Ont. — The Canadian Steel Foundries Ltd., have started operations at their plant here. The 12 in. mill is now in operation and the 22 in. mill will be started very shortly.

Thomas Tomlinson, head of the firm of Thomas Tomlinson & Son, iron founders, Frederick Street, Toronto, died on Feb. 22 in the Western Hospital, following an accident. The deceased was 45 years of age.

The Electric Steel & Metals Co., Welland, Ont.—The following directors have been appointed for the year:—E. Carnegie, president; W. L. Renton, vice-president; Sir Charles Ross, Col. R. W. Leonard, and William Carnegie.

The Sudbury Nickel Co., has been incorporated at Toronto with a capital of $100,000 to develop mineral lands and refine copper and other minerals. Head Office at Sudbury, Ont. Incorporators, T. E. Smith, W. N. Smith and R. T. Smith, all of Sudbury.

Arthur P. Scott, well-known in engineering circles in Montreal, died in that city on Feb. 17, aged 39. Mr. Scott was a graduate of McGill University and for the past year had been connected with the Snyder Electric Co., of Chicago, Ill.

The Hare Engineering Co., builders of rolling mill machinery, steel heating furnaces and mechanical stokers, are moving to offices at their new shop, 99-101 King Street West, Toronto, Ont., where enlarged facilities have been provided.

The Callander Foundry & Manufacturing Co., has been incorporated at Toronto with a capital of $40,000 to carry on a general foundry and machine shop business. Head Office at Guelph. Incorporators, J. M. Ferguson, J. P. Walsh and A. C. Rutherford, all of Toronto

D. H. McDougall, superintendent of the iron ore mining operations of the Dominion Steel Corporation, Sidney, N.S., has been appointed to the position of general manager of the company. Mr. McDougall, who is a Nova Scotian, is 36 years of age, and has been associated with the Corporation for a number of years.

Moncton, N.B.—Fire on Feb. 20 destroyed the main building of the Record Foundry & Machine Co. The loss on the building and plant is estimated at $100,000, which is covered by insurance. In the part of the plant destroyed were the sales and shipping rooms, fitting and nickel finishing departments.

The Stanley Steel Co., has been incorporated at Ottawa with a capital of $250,000 to carry on the business of iron and steel makers, smelters, engineers, sheet metal and rail rollers, etc. Head office to be situated at Hamilton, Ont. Incorporators, A. F. Hatch, F. M. Hatch and T. C. Haslett, all of Hamilton.

Charles Sellers, president of the Peerless Furnace Co., Toronto, which he founded over twenty-five years ago, died on March 20, aged 82. Mr. Sellers was a native of Glasgow, Scotland, but had resided in Toronto for over 60 years. He was superintendent of the Gurney Foundry Co. for more than 20 years.

Vancouver, B.C.—Reports are current here that two large syndicates in the East are to send engineers to the Coast to inquire into the iron ore deposits and the opportunities which exist in respect to water power, etc., with the idea of putting up a modern steel producing plant. A sufficient amount of ore is thought to be available for the purposes of the new industry in the iron ore deposits on the Mainland and on Vancouver Island.

The Burrows Refining Co., has been incorporated at Ottawa, with a capital of $1,500,000, to carry on the business of producing, reducing, and refining ores, metals, oils, etc. Head office to be situated at Ottawa. Incorporators, W. C. Perkins, and W. D. McCormick of Ottawa, Ont.

Catalogues

Optical Instruments.—The Bausch & Lomb Optical Co., Rochester, N.Y. Have issued a catalogue describing an interesting line of optical instruments for the inspection and testing of materials. The principal apparatus dealt with includes various types of microscopes and attachments, photomicrographic apparatus, are lamps and viscosimeters etc. Each type of apparatus is fully described and illustrated.

Air Hoists.—Catalogue No. 119, issued by the Whiting Foundry Equipment Co., Harvey, Ill., illustrates and describes an interesting and varied line of air hoists for different classes of work. The special features of the various types are dealt with in detail, and a table is included giving capacities and other data covering the standard sizes of hoists. A copy of this catalogue will be sent free on request.

The Monometer Mfg. Co., Birmingham, England, have sent us a series of bulletins dealing with a metal melting furnace, automatic heat control and an aluminum melting furnace. The metal melting furnace is designed for handling ingot metals and metal alloys. The automatic heat control is done by means of a self-acting heat regulator used in conjunction with the furnaces. The third bulletin describes a specially designed furnace for melting aluminum without oxidation. The bulletins are fully illustrated and printed in two colors.

Grinding and Polishing Machinery.—The Builders' Iron Foundry, Providence, R.I., has published a new 104-page catalogue describing its complete line of "Builders'" grinding and polishing machinery and patented "Pull" countershafts, which are well known as a safety device. The catalogue is 6 in. x 9 in., and bound in myrtle green antiquarian stock, and contains altogether 48 different half-tone illustrations. Both halftones and printed matter are set off by a green tinted background. The catalogue is conspicuous because of its careful arrangement and the high grade of printing and engraving which it represents. Copies will be forwarded upon request.

Anodes and Plating Salts made by the Munning-Loeb Co., Matawan, N.J., are dealt with in bulletin No. 300. The bulletin contains much interesting information covering the manufacture of anodes and quality of raw material employed. Several different types of anode made of various metals are illustrated and described, while the sizes and approximate weights are also included. The concluding pages deal with various kinds of plating salts and their principal features.

Magnetic and Other Properties of Iron-Silicon Alloys, Melted in Vacuo, is the title of bulletin No. 83 by Trygve D. Yensen, issued by the University of Illinois, Price 35c. The bulletin contains the investigations of Mr. Yensen in connection with a new material discovered by him. This material possesses properties particularly valuable in electrical industries and these properties are fully and carefully described in the bulletin accompanied by full particulars of tests and data obtained. This material is an iron-silicon alloy melted in a vacuum and annealed. It possesses remarkable magnetic properties which, are claimed to make it superior to any known metal for use in the manufacture of transformers, dynamos and electromagnetic machinery. The bulletin contains a number of tables giving results of tests, several diagrams, and also over 50 photomicrographs of this iron-silicon alloy. Copies of the bulletin may be obtained from the Engineering Experiment Station, Urbana. Ill.

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

TO OUR READERS—Use this Directory when seeking to buy any foundry or pattern-shop equipment. You will often get information that will save you money.
TO OUR ADVERTISERS—Send in your name for insertion under the headings of the lines you make or sell.
TO NON-ADVERTISERS—A nominal rate of $5.00 per line a year is charged to non-advertisers.

Abrasive Materials
Can. Hart Wheels, Ltd., Hamilton Ont.

Air Compressors.
Berkshire Mfg. Co., Cleveland, O.
Osborn Mfg. Co., Cleveland, O.
Smart-Turner Machine Co., Hamilton, Ont.
A. R. Williams Machy. Co., Toronto.

Alloys.
Webster & Sons, Ltd., Montreal.

Anodes, Brass, Copper, Nickel, Zinc.
Tallman Brass & Metal Co., Hamilton, Ont.
W. W. Wells, Toronto.

Barrels, Tumbling.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Boiler Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.
Webster & Sons, Limited, Montreal.

Blowers.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
P. H. & F. M. Roots Co., Connersville, Ind.
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Blast Gauges—Cupola.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
H. S. Carter & Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

Brake Shoes, Wheel Trueing
Can. Hart Wheels, Ltd., Hamilton, Ont.

Brass Melting Furnaces.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Bricks, Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.

Bricks, Rubbing
Can. Hart Wheels, Ltd., Hamilton, Ont.

Brushes, Foundry and Core.
Webster & Sons, Ltd., Montreal.
Manufacturers' Brush Co., Cleveland, Ohio.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.

Brushes, all Kinds.
Manufacturers' Brush Co., Cleveland, Ohio.
Osborn Mfg. Co., Cleveland, O.

Buffing and Polishing Machinery.
W. W. Wells, Toronto.

Buffing and Polishing Compositions.
W. W. Wells, Toronto.

Buffs.
W. W. Wells, Toronto.

Burners, Core Oven.
Webster & Sons, Ltd., Montreal.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.

Cars, Core Oven.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

Castings, Brass, Aluminum and Bronze.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Aluminum and Brass.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Nickel.
W. W. Wells, Toronto.

Cars, Foundry.
Webster & Sons, Ltd., Montreal.
Monarch Eng. & Mfg. Co., Baltimore.
Whiting Foundry Equipment Co., Harvey, Ill.

Chaplets.
Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.
Wells Pattern & Machine Works Limited, Toronto.

Charcoal.
Webster & Sons, Ltd., Montreal.

Chemists.
Toronto Testing Laboratory, Ltd., Toronto.

Chemicals.
W. W. Wells, Toronto.

Clay Lined Crucibles.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.

Core Binders.
J. W. Paxson Co., Philadelphia, Pa.
Robeson Process Co., New York City.
Webster & Sons, Ltd., Montreal.

Core Box Machines.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

Core Cutting-off and Coning Machine.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.

Core Componnds.
J. W. Paxson Co., Philadelphia, Pa.
Robeson Process Co., New York City.
Webster & Sons, Ltd., Montreal.

Core Machines, Hammer.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.

Core-making Machines.
Berkshire Mfg. Co., Cleveland, O.
Mumford Molding Machine Co., Chicago, Ill.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Tabor Mfg. Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

Core Oils.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Webster & Sons, Ltd., Montreal.

Core Ovens.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Wash.
Joseph Dixon Crucible Co., Jersey City, N.J.
Webster & Sons, Ltd., Montreal.

Core Wax.
United Compound Co., Buffalo, N.Y.
Webster & Sons, Ltd., Montreal.

Cranes
Northern Crane Works, Ltd., Walkerville, Ont.

Cranes, Travelling and Jib.
Northern Crane Works, Ltd., Walkerville, Ont.
Smart-Turner Machine Co., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.

Cranes, Electric and Hand Power.
Dominion Bridge Co., Montreal.
Webster & Sons, Ltd., Montreal.
Northern Crane Works, Ltd., Walkerville, Ont.
Smart-Turner Machine Co., Hamilton, Ont.

Cranes, Hydraulic.
Webster & Sons, Ltd., Montreal.

Crucibles, Reservoir, Tilting Furnace, Bottom Pour, Etc.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Seidel, R. B., Philadelphia.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Webster & Sons, Ltd., Montreal.

Cupolas.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Northern Crane Works, Ltd., Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola Blast Gauges.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola Blocks.
R. Bailey & Son, Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.

Cupola Blowers.
Can. Buffalo Forge Co., Montreal.
Can Sirocco Co., Ltd., Windsor, Ont.
Webster & Sons, Ltd., Montreal.
Monarch Eng. & Mfg. Co., Baltimore.
Sheldons, Limited, Galt, Ont.
Stevens, F. B., Detroit, Mich.

Cupola Linings.
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Webster & Sons, Ltd., Montreal.
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Whitehead Bros. Co., Buffalo, N.Y.

Cupola Twyers.
Webster & Sons, Ltd., Montreal.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.

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Webster & Sons, Ltd., Montreal.

Cyanide of Potassium.
W. W. Wells, Toronto.

Dippers, Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.

Drying Ovens for Cores.
Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co. Harvey, Ill.

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W. W. Wells, Toronto.

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Pangborn Corporation, Hagerstown, Md.

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Webster & Sons, Ltd., Montreal.
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Tabor Mfg. Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

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Webster & Sons, Ltd., Montreal.

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Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Foundry Parting.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whitehead Bros. Co., Buffalo, N.Y.

Foundry Facings.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd. Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whitehead Bros. Co., Buffalo, N.Y.

Furnace Lining.
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Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Eng. & Mfg. Co., Baltimore.
Webster & Sons, Ltd., Montreal.
Whitehead Bros. Co., Buffalo, N.Y.

Furnaces.
Hamilton Facing Mill Co., Ltd. Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

Furnaces, Brass.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

Goggles.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.

Graphite Products.
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McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Webster & Sons, Ltd., Montreal.

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Perfect Machinery Co., Galt, Ont.

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Independent Pneumatic Tool Co., Chicago, Ill.

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Independent Pneumatic Tool Co., Chicago, Ill.

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Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

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Whiting Foundry Equipment Co., Harvey, Ill.

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Webster & Sons, Ltd., Montreal.

Hoists, Hand, Trolley.
Northern Crane Works, Walkerville.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

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Kaolin
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Osborn Mfg. Co., Cleveland, O.
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Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

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Webster & Sons, Ltd., Montreal.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
E. J. Woodison Co., Toronto.
Webster & Sons, Ltd., Montreal.

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Charles C. Kawin Co., Toronto.
Toronto Testing Laboratories, Toronto.

Miliville Gravel.
H. S. Carter & Co., Toronto.

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J. W. Paxson Co., Philadelphia, Pa.

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Wm. Dobson, Canastota, N.Y.
Stevens, F. B., Detroit, Mich.
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Webster & Sons, Ltd., Montreal.

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Berkshire Mfg. Co., Cleveland, O.
Cleveland Pneumatic Tool Co., of Canada, Toronto.
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E. H. Mumford Co., Elizabeth, N.J.
Midland Machine Co., Detroit.
Osborn Mfg. Co., Cleveland, O.
Tabor Mfg. Co., Philadelphia.
Webster & Sons, Ltd., Montreal.

Molding Sand.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Webster & Sons, Ltd., Montreal.

Molding Sifters.
Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.
Whitehead Bros. Co., Buffalo, N.Y.

Ovens for Core-baking and Drying.
Osborn Mfg. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

Oil and Gas Furnaces.
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Monarch Eng. & Mfg. Co., Baltimore.
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Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

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F. W. Quinn, Hamilton, Ont.
Wells Pattern & Machine Works,

Pattern Shop Equipment.
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Hamilton Pattern Works, Hamilton.
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F. W. Quinn, Hamilton, Ont.
Webster & Sons, Ltd., Montreal.

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Phosphorizers.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Whitehead Bros. Co., Buffalo, N.Y.

Plumbago.
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J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

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Osborn Mfg. Co., Cleveland, O.
W. W. Wells, Toronto.

Pyrometer Shields.
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Polishing Wheels.
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W. W. Wells, Toronto.

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Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.

Rammers, Pneumatic
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

Retorts.
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Jonathan Bartley Crucible Co., Trenton, N.J.

Riddles.
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Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

Rosin.
Webster & Sons, Ltd., Montreal.

Rouge.
W. W. Wells, Toronto.

Sand Blast Machinery.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

Sand Blast Rolling Barrels.
Pangborn Corporation, Hagerstown, Md.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.

Sand Blast Devices.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.

Sand Blast Sand
Whitehead Bros. Co., Buffalo, N.Y.

Sand Conveying Machinery
Standard Sand & Mach. Co., Cleveland, O.

Sand Mixing Machinery
Standard Sand & Mach. Co., Cleveland, O.
Vulcan Engineering Sales Co., Chicago, Ill.

Sand Molding.
Hamilton Facing [illegible] Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whitehead Bros. Co., Buffalo, N.Y.

Sand Sifters.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Standard Sand & Mach. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Sieves.
Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.

Silica Wash.
Webster & Sons, Ltd., Montreal.

Skimmers, Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.

Small Angles.
Dom. Iron & Steel Co., Sydney, N.S.

Soapstone.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.

Spelter Bowls.
Joseph Dixon Crucible Co., Jersey City, N.J.

Special Machinery.
Osborn Mfg. Co., Cleveland, O.
Wells Pattern & Machine Works, Limited, Toronto.

Sprue Cutters.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Osborn Mfg. Co., Cleveland, O.

J. W. Paxson Co., Philadelphia, Pa.
Vulcan Engineering Sales Co., Chicago, Ill.
Webster & Sons, Ltd., Montreal.

Squeezer Molding Machines
Mumford Molding Machine Co., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.

Squeezers, Power.
Davenport Machine & Foundry Co., Iowa.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Mumford, E. H. Co., Elizabeth, N.J.
Osborn Mfg. Co., Cleveland, O.
Tabor Mfg. Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

Steel Rails.
Dom. Iron & Steel Co., Sydney, N.S.

Steel Bars, all kinds.
Dom. Iron & Steel Co., Sydney, N.S.
Northern Crane Works, Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Stirrers, Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.

Stones, Rubbing and Oil
Can. Hart Wheels, Ltd., Hamilton, Ont.

Talc.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
E. J. Woodison Co., Toronto.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

Teeming Crucibles and Funnels.
McCulloch-Dalzell Crucible Company Pittsburg, Pa.

Track, Overhead.
Northern Crane Works, Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Tripoli.
W. W. Wells, Toronto.

Trolleys and Trolley Systems.
Can. Fairbanks-Morse Co., Montreal.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co. Harvey, Ill.

Trucks, Dryer and Factory.
Hamilton Facing Mill Co., Ltd. Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Tumblers.
Webster & Sons, Ltd., Montreal.

Turntables.
Northern Crane Works, Walkerville.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Vent Wax.
United Compound Co., Buffalo, N.Y.
Webster & Sons, Ltd., Montreal.

Vibrators.
Berkshire Mfg. Co., Cleveland, O.
Mumford, E. H. Co., Elizabeth, N.J.
Osborn Mfg. Co., Cleveland, O.
Tabor Mfg. Co., Philadelphia, Pa.

Wall Channels.
Dom. Iron & Steel Co., Sydney, N.S.

Wheels, Grinding
Can. Hart Wheels, Ltd., Hamilton, Ont.

Wheels, Polishing, Abrasive.
Ford-Smith Machine Co., Hamilton Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Osborn Mfg. Co., Cleveland, O.
United Compound Co., Buffalo, N.Y.
Webster & Sons, Ltd., Montreal.

Wire Wheels.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.
W. W. Wells, Toronto.

Wire, Wire Rods and Nails.
Dom. Iron & Steel Co., Sydney, N.S.
Osborn Mfg. Co., Cleveland, O.

CANADIAN FOUNDRYMAN

AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields.

Vol. VII. TORONTO, MARCH, 1916 No. 3

EDITORIAL CONTENTS

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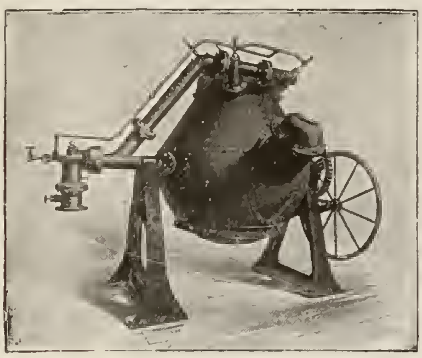
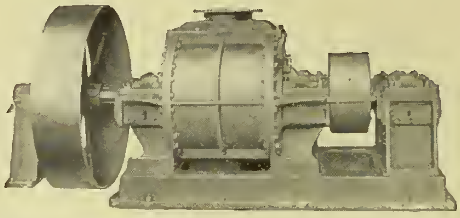


ADVERTISING INDEX



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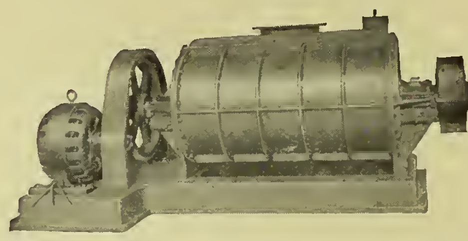

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Too little air means CO and sluggish iron, low efficiency of cupola. Too much air means free O and oxydization, consequently a higher melting temperature; therefore, dull iron and blow holes.

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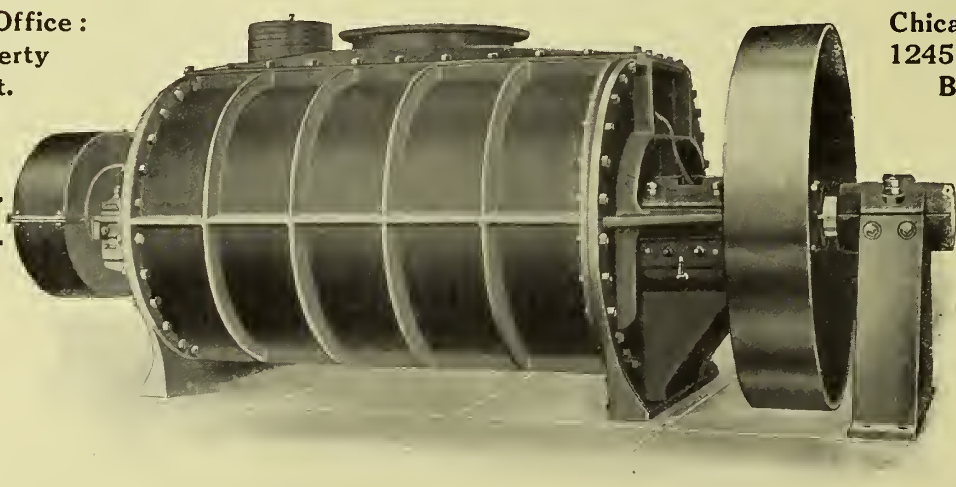


Belt-Driven Blower—Cupolas and Oil Furnaces

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company Limited, Toronto, Montreal, Winnipeg, and London, England

VOL. VII. PUBLICATION OFFICE, TORONTO, APRIL, 1916 No. 4

The Publisher's Page

By B.G.N.

Announcement

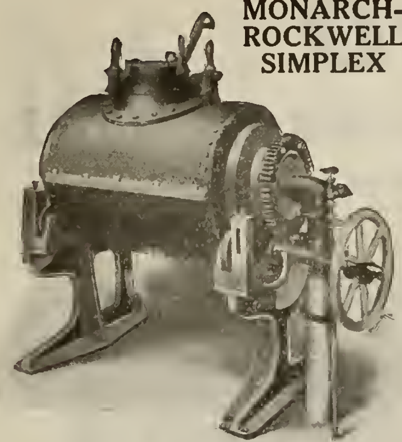
WE have pleasure in announcing to manufacturers, dealers and agents the arrival in Canada of our European Manager, Mr. E. J. Dodd.

Mr. Dodd, with headquarters in London, Eng., represents **Canadian Foundryman** and thirteen other journals published by The MacLean Publishing Company. He enjoys a very wide acquaintance among manufacturers, especially in Great Britain, and is recognized and consulted as a leading authority on matters pertaining to Canada and Canadian trade.

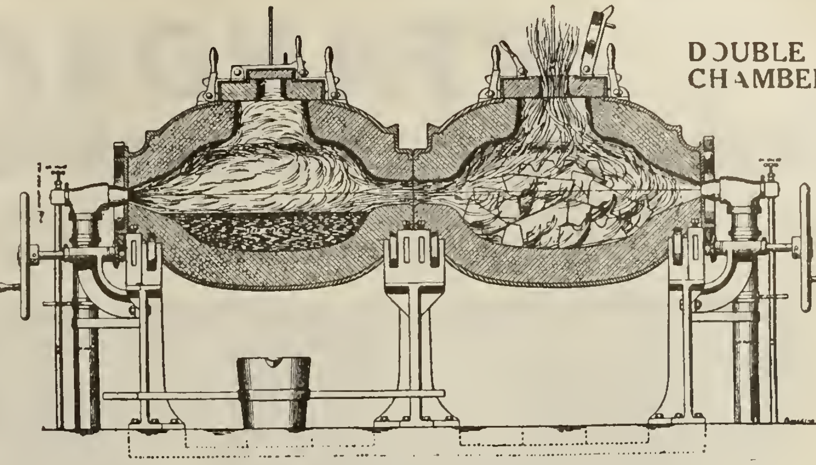
He is here to familiarize himself with the changed conditions which have been brought about by the war—to secure a first-hand knowledge of this prospering and progressive country, with its newly-acquired aggressiveness and confidence. He is at the service of our friends who may be desirous of securing information regarding British lines, and he is prepared to execute any reasonable commission upon his return to London in a few weeks' time.

We shall be glad to hear from interested parties, either by letter, telephone or telegraph, when an appointment can be arranged with Mr. Dodd, who will visit Toronto, Winnipeg, Montreal, Halifax, St. John and other cities.

It will be understood, of course, that whatever we may be able to do for our friends through the good offices of Mr. Dodd will not place them under obligation in any way—whatever we are privileged to do will be in line with our policy of rendering a *greater* service to our subscribers and advertisers.



Oil or Gas



ACTION OF HEAT
Double Chamber Melting Furnace—Oil and Gas

Certain to fatten your profit!

MONARCH FURNACES

are invaluable, because they cut melting costs nearly in two and greatly increase production.

The "Monarch" Double Chamber Melting Furnace makes melting practically continuous, permitting melts of various mixtures of metals to follow one another in rapid succession.

The two chambers can be used alternately. Simultaneously melting in one chamber, and heats the metal in the other chamber to very near the melting point with one furnace, and at no additional cost.

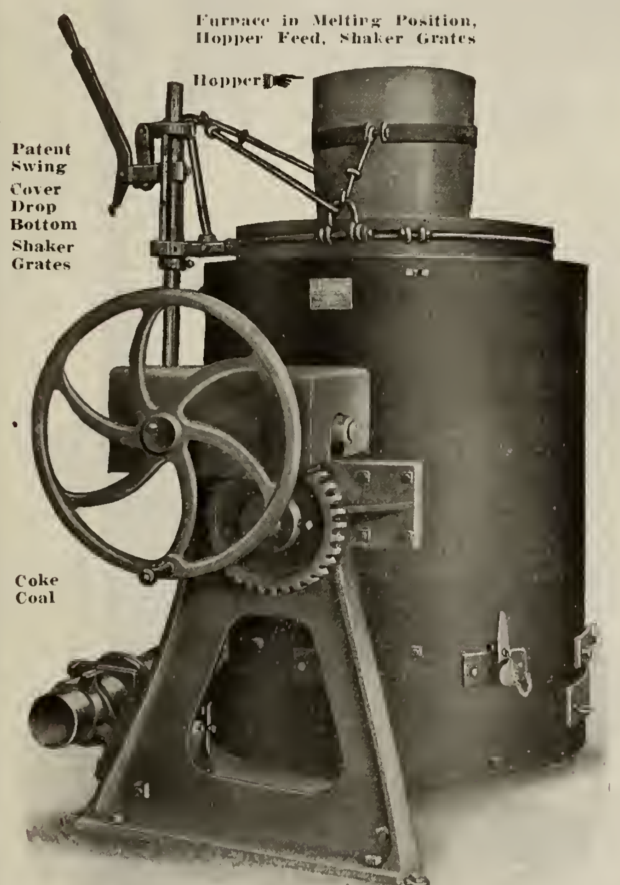
The flame is not directed against the metal, therefore no oxidation.

For copper, brass, bronze, aluminum, iron, steel, etc. Gold, silver, etc.

The Monarch-Rockwell Simplex or Single Chamber Furnace produces a quality of metal equal to that melted in crucibles in greater quantities in less melting time, without preparation, at a greatly reduced cost, both in fuel and labor, and entirely eliminating expensive crucibles.

For melting aluminum, brass, bronze, copper, gold, gray iron, semi-steel, etc., etc.

Furnace in Melting Position, Hopper Feed, Shaker Grates



MONARCH
CRUCIBLE
TILTING
COKE
FURNACE

This furnace is selling in **quantities** to munition manufacturers. Does this not show confidence in its merit?

MONARCH "ACME" COKE OVENS

All sizes—for all fuels—all hand made sheet steel—asbestos insulation—built up to 6 feet square, portable or bricked. None better.

An investigation of the complete Monarch line of furnaces and core ovens will prove valuable to you. It will pay you to make it now?

Write for detailed information and catalog C. F. 4-1916.

Monarch-Acme Double Track Core Oven, Coke Any Size. For All Fuels.

The Monarch Engineering & Manufacturing Co.

1206 American Building, Baltimore, Md., U.S.A.
Shops: Curtis Bay, Md.

Mineral Production of Canada for Calendar Year 1915--II.

By John McLeish, B-A. *

The accompanying statistics have become available through the issuance of a preliminary report by the Department of Mines, Ottawa. Although subject to slight additions or modifications of detail pending final compilation at a later date, we believe a more than ordinary interest will be taken in the data presented, particularly on account of the war-created activity which has marked almost every section of Canada's mineral resources development.

As a result of the demand created by the war, our metal mining industry has, in 1915, shown the highest production ever recorded and notwithstanding the greatly decreased production of materials of construction, such as cement, clay and stone quarry products, a very large increase is still shown in the total mineral output, over that of the previous year. The total value of the metal and mineral production in 1915, as shown in the preliminary report here presented, was $138,513,750, compared with $128,863,075 in 1914, and $145,634,812 in 1913, the latter being the highest production recorded. The increase in 1915 over 1914 was thus $9,650,675, or 7.49 per cent., but the output is still less than that in 1913 by $7,121,062.

Development Scope Enlarged

Without attempting to discuss at length the effect of the war upon the Canadian mining industry, it may be remarked that the demand for the metals, copper, lead, nickel and zinc, led to great activity in the operation of the already developed deposits of these metals, and also, later in the year, to the opening up of old and the exploitation of new deposits. The capacities of steel furnaces were taxed to the utmost to meet the demand for shell steel. The fact that under war conditions it was desirable that our metals should become available for commercial or national use entirely within the country, and that we should he less dependent, even upon a friendly neutral for their recovery in smelters and refineries, has stimulated the development of our smelting and refining operations.

Amongst non-metallic minerals the recovery of benzol and toluol in by-product coke oven operations was a direct result of the war, as was also the activity in the mining and shipment of magnesite and of chrome ores. The limitation placed by the Government upon the export of certain minerals and metals may have caused inconvenience and interruption to certain industries but these were usually adjusted by the issue of special licenses for export where it could be shown that such export was not for enemy destination but was in the interest of Great Britain and her Allies.

The mining and metallurgical industries include a great variety of products so that in dealing with the industry as a whole the total value presents the only means of comparison, nevertheless quantities of production and prices are at all times the items of essential importance.

Metals Production

There has been an increased production in all metals with the exception of silver. The total value of the metallic production in 1915 was $77,046,082 as compared with $59,386,619 in 1914, and $66,361,351 in 1913, the increase over 1914 being nearly 30 per cent., and that over 1913 the highest previous year, about 16 per cent. The production of nickel, copper and zinc are the highest that have been recorded in these metals. The quantity of nickel was 50 per cent. greater than in 1914, copper over 35 per cent. greater, lead nearly 25 per cent. greater, gold over 18 per cent. and pig iron nearly 17 per cent. The falling off in silver was only 48,000 ounces or less than two-tenths of one per cent. Owing to the high prices of copper and lead, the total values of these metals show increases of 72 per cent. and 56 per cent. respectively.

Although the prices of nearly all metals have been high they have in most cases been exceeded in comparatively recent years except possibly in antimony and zinc, and some of the rarer metals. Compared with 1914, the average price of copper shows an increase of 27 per cent., lead an increase of 27 per cent. spelter an increase of 154 per cent., antimony (ordinaries) an increase of 246 per cent., silver a decrease of 9.4 per cent. and tin an increase of 12.2 per cent.

Non-Metals Production

The total value of the non-metallic production in 1915 including clay and quarry products, etc., was $61,467,668 as against $69,476,456 in 1914; $79,273,461 in 1913. Compared with 1914 the decrease was $8,008,788, or 11.5 per cent., while compared with 1913 the falling off was $17,805,793 or 22.5 per cent. It will he seen that the largest decreases in 1915 occurred in materials of construction such as cement, clay products, lime, sand and gravel, and stone and quarry products, the falling off varying from 16 to nearly 34 per cent. There was, however, also a smaller production of coal, natural gas and gypsum. On the other hand there were increases in the shipments of asbestos, chromite, graphite, magnesite, pyrites and salt.

Mineral Production by Provinces

The record of mineral production by provinces shows the relative importance of the provinces in the same order as in the previous year with the exception that Quebec and Alberta change places, the former having the larger production in 1915. An increase in production is shown in the provinces of Nova Scotia, Quebec, Ontario, and British Columbia, and a decrease in New Brunswick, Manitoba, Saskatchewan, Alberta and the Yukon district.

Ontario again has the largest output with a value of $61,800,178, or 44.6 per cent. of the total, and showing an increase over 1914 of $8,765,501, or 16.5 per cent. British Columbia occupies second place with a value of $28,932,658, or 20.9 per cent. of the total and showing an increase of $4,768,619, or 19.7 per cent. over 1914. Nova Scotia is third with a production valued at $18,126,672, or 13.1 per cent. of the total and showing an increase of $542,033, or 3.1 per cent. over 1914. Quebec comes fourth with a value of $12,159,436, or 8.8 per cent. of the total, and an increase over 1914 of $322,507, or 2.7 per cent. Alberta occupies fifth place with a production of $9,915,282, or 7.2 per cent. of the total and showing a decrease of $2,768,952, or 21.8 per cent. compared with 1914. The Yukon district mineral production including copper and coal, as well as gold, is sixth, with a value of $4,915,863, or 3.6 per cent. of the total and a falling off from 1914 of $502,322, or 9.3 per cent. Manitoba's production was $1,351,604, a falling off of $1,061,885, or 44 per cent. New Brunswick's production was $916,329, a decrease of $98,241, or 9.7 per cent. and the production of Saskatchewan was the smallest, being $395,728, or less than that of 1914 by $316,585, or 44.4 per cent.

Gold

The total production of gold in placer and mill bullion and in smelter products in 1915 is estimated at 916,076 fine ounces valued at $18,936,971, as compared with 773,178 fine ounces valued at $15,983,007 in 1914, an increase of $2,953,964 or 18.5 per cent. Although

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the production has more than doubled since 1907 it has not yet reached the high mark attained during Klondike's best years. The 1915 output was exceeded during each of the four years from 1899 to 1902. Of the total production in 1915 about $5,550,987 was derived from placer and alluvial mining, $9,195,307 in bullion and refined gold, and $4,230,677 contained in matte, blister copper, residues and ores exported.

The production in Nova Scotia was about $137,178, or over twice the output of the previous year. The pyrites ores of Quebec carry small quantities of gold and silver, though the producers are not paid therefor. No placer recovery was reported from this province. Ontario has now become the largest gold producing province in Canada. the production in 1915 from fifteen properties being reported as $8,386,956, or 44 per cent. of the total production in Canada, as against a production in 1914 of $5,545,509, an increase of $2,841,447, or 51 per cent. The Hollinger and Acme Mines contributed about one-half of the output in 1915 and the Dome nearly one-fifth of the total. No production of gold has been reported in either Manitoba or Saskatchewan although some development work has been done. From Alberta record has been obtained of the recovery of about $4,000 of alluvial gold.

The production in British Columbia was $5,628,982, including $755,000 estimated by the provincial mineralogist as being the output of placer workings, and $4,873,982 recovered from milling and smelting ores. In 1914, the production was $5,224,393, including $565,000 from placer workings and $4,659,393 from milling and smelting ores.

The Yukon production in 1915, including a small recovery from copper ores, was $4,755,721, a decrease of $369,653 from the 1914 production. The amount of gold on which royalty was paid during the year 1915 according to the records of the Mining Lands and Yukon Branch, Interior Department, was 287,254.15 ounces, as against 309,691.17 ounces in 1914, and 352,900.04 ounces in 191^. For purposes of the royalty this gold is valued at $15 per ounce although the actual value is probably nearer $16.50. The receipts at the Dominion of Canada Assay Office, Vancouver, were 87,284.35 ounces, valued at $1,421,292.37 or an average of $16.28 per ounce. The exports of gold bearing dust, nuggets, gold in ore, etc., in 1915 are reported by the Customs Department as $16,528,143.

Silver

The production of silver was 28,401,735 ounces valued at $14,088,397, as against 28,449,821 ounces in 1914, valued at $15,593,630. Silver is the principal metal that did not show an increased production in 1915. The falling off in quantity was very small, however, amounting to only 48,086 ounces. Owing to the lower price of silver, the decrease in total value was $1,505,234 or over 9.6 per cent. Of the total production in 1915, 24,653,057 ounces, or about 86.8 per cent. is credited to Ontario.

The production from the ores of Cobalt and other silver camps was 23,568,147 ounces including 19,893,639 ounces in bullion recovered in smelters and cyanide plants in Canada and 3,674,508 ounces estimated as recovered from ores exported to United States smelters. The quantity credited to gold ores was 84,910 ounces. The total production in 1914 was estimated at 25,139,214 compared with which the 1915 recovery shows a decrease of 1,571,067 ounces. Of the silver in bullion, 10,623,307 ounces were produced in smelters in Southern Ontario, and 9,270,332 ounces in the mills at Cobalt, the total in bullion being over 84 per cent. of the production of the district.

The production in British Columbia, representing refined silver, silver contained in smelter products, and estimated recoveries from ores exported, was in 1915, about 3,628,727 ounces as compared with 3,159,897 ounces in 1914, an increase of 468,830 ounces, or over 14 per cent.

In Quebec province there is a small silver content in the pyrites ores shipped, while in the Yukon 58,382 ounces are estimated as being contained in the placer gold produced and recovered from copper ores. The exports of silver bullion and silver in ore, etc., as reported by the Customs Department, were: 27,672,481 ounces valued at $13,812,038.

Copper

The copper output in 1915 was the highest recorded. The production in smelters together with the estimated recoveries or amounts paid for in ores exported amounted to 102,612,486 pounds which at the average New York value of refined copper would be worth $17,726,307. The highest previous production was in 1912 when an output of 77,832,127 pounds was reached. Compared with the production in 1914 which was 75,735,960 pounds valued at $10,301,606, an increase is shown of 26,876,526 pounds or 35 per cent., and in total value of $7,424,701, or 72 per cent.

Of the total 1915 production, 42,050,347 pounds were contained in blister copper, 44,230,052 in copper and copper nickel matte, and 16,332,087 recovered from ores exported.

The production in Quebec from pyrites ores was 6,082,003 pounds as against 4,201,497 pounds in 1914. The Ontario production is derived chiefly from the nickel-copper ores of the Sudbury district and of the Alexo mine, although there is a small amount of copper contained in the silver ores shipped from Cobalt, some of which is paid for. There was also a small shipment from the old Massey mine which was re-opened during the year. The production in 1915 is reported as 39,303,279 pounds as against 28,948,211 pounds in 1914 an increase of 10,355,068 pounds or 35.7 per cent. Further detail respecting production will be found in the remarks on nickel.

British Columbia also shows a largely increased production in 1915, the total being 56,692,988 pounds as against 41,219,202 pounds in 1914, an increase of 15,473,786 pounds or 37.5 per cent. The 1915 production in this province included 47,064,234 pounds recovered in blister and matte, etc., and 9,628,754 recovered from ores shipped to smelters outside of Canada. The Coast mines including the Britannia, Texada Island and Anyox mines, etc., are credited with 33,980,508 pounds, and the Trail Creek and Boundary mines with 22,712,480 pounds. The Yukon production is reported as 534,216 pounds as against 1,367,050 pounds in 1914.

Exports of copper according to Customs records were:—Copper fine in ore, etc., and copper in pigs 102,729,579 pounds valued at $12,460,356; there were also exports of old and scrap copper amounting to 4,161,600 pounds valued at $616,553.

The total value of the imports of copper in 1915 are recorded as $3,467,586 as against $4,256,901 in 1914. The imports in 1915 included $16,818,116 pounds of copper in pigs, ingots and manufactures, valued at $3,104,382; other manufactures valued at $263,922, and copper sulphate 1,854,850 pounds, valued at $99,282. The imports in 1914 included 26,280,815 pounds crude and manufactured copper valued at $3,983,322, copper sulphate 1,143,039 pounds valued at $53,802, and other manufactures of copper valued at $219,777.

Nickel

Refined metallic nickel is now being recovered in Canadian refineries but only in small quantities and as a by-product in the smelting and refining of the silver-cobalt-nickel ores of the Cobalt district, nickel oxide having been recovered in these smelters for several years. The nickel-copper ores of the Sudbury district supplemented by a small tonnage of similar ores from the Alexo mine in Timiskaming, north of Cobalt are the main sources of nickel production which in 1915 increased nearly 50 per cent. as compared with 1914, and is greater than the production in 1913, the largest previous record, by over 37 per cent.

The nickel-copper ore, derived from 12 separate mines, is reduced in smelters and converters to a Bessemer matte containing from 77 to 82 per cent. of the combined metals and shipped in that form to Great Britain and the United States for refining, the product of the Canadian Copper Co. going to New Jersey, and that of the Mond Nickel Co. to Wales. A portion of the matte produced by the Canadian Copper Co., is used without the intermediate refining of either metal for the direct production of Monel metal, an alloy of nickel and copper.

The total production of matte in 1915 was 67,703 tons, containing 39,216,165 pounds of copper and 68,077,823 pounds of nickel and valued by the producers at $10,352,344. The tonnage of ore smelted (part being previously roasted) was 1,272,283. The production in 1914 was 46,396 tons of matte containing 28,895,825 pounds of copper and 45,517,937 pounds of nickel and valued at $7,189,031. The reported recovery of nickel from the ores of the Cobalt district was 55,325 pounds of metals and 200,032 pounds of nickel oxide. The recovery in 1914 was 392,512 pounds of nickel oxide.

The exports of nickel are reported by the Customs Department as 66,410,400 pounds valued at $7,394,446 or an average of 11.13 cents per pound. Since about 80 per cent. of the Canadian nickel production is exported to the United States, it may be of interest to add to the Canadian statistics a record of the imports (eleven months only in 1915) of nickel into and the exports from the United States.

The exports of nickel from the United States during the eleven months ending November were 24,503,585 pounds valued at $9,299,234 or an average of 37.95 cents per pound. More than 50 per cent of these exports went to the United Kingdom. The value of the United States exports in 1914 ranged from 31 to 39 cents per pound and averaged about 34 cents. It will be noted that a larger quantity of nickel finds its way to the United Kingdom through United States refineries than is exported directly from Canada.

Lead

Although there was an increase of nearly 25 per cent. in the production of lead, the 1915 output has been exceeded in six of the past 15 years. The production of lead in 1915 was 45,377,065 pounds, which valued at 5.60 cents per pound, the average price of pig lead in Montreal for the year, would be worth $2,541,116. The production in 1914 was 36,337,765 pounds valued at $1,627,568, or an average of 4.479 cents per pound. The 1915 production consists chiefly of pig and manufactured lead produced at Trail, B.C., but includes also an estimate of the lead probably recoverable from ores shipped to smelters outside of Canada. The entire output of the Surprise mine in the Slocan District, B.C., was shipped to the United States, refined in bond, and sold in London.

The exports of lead in ore, etc., in 1915 are recorded by the Customs Department as 1,845,100 pounds valued at $40,273, and of pig lead 2,066,929 pounds valued at $79,067. Exports in 1914 were 246,100 pounds of lead in ore and 510,573 pounds of pig lead.

The total value of the imports of lead and lead products in 1915 was $2,479,261 as against $1,042,538 in 1914. The 1915 imports included 42,616,200 pounds valued at $2,010,006, manufactured lead 3,102,838 pounds valued at $184,581, other manufactures valued at $102,439, litharge 1,579,800 pounds valued at $89,232 and lead pigments 1,709,035 pounds valued at $93,003. The imports of litharge and pigments would contain approximately 1,565 tons of metallic lead and the total import of lead would therefore exceed 24,425 tons as shown by this record. The imports in 1914 were equivalent to about 10,869 tons.

Zinc

Complete returns of zinc shipments have not yet been received but the tonnage is estimated at 15,553 tons containing 12,400,000 pounds of zinc. Shipments include several hundred tons from Notre Dame des Anges, Quebec, but the greater part is from fifteen properties in British Columbia. Zinc shipments in 1914 were reported as 10,893 tons containing 9,101,460 pounds of zinc.

The Consolidated Mining & Smelting Co., at Trail, B.C., after successful experimental development has installed at Trail a zinc recovery plant, having an initial daily capacity of 35 tons of refined zinc, and has entered into a contract with the Shell Committee for a considerable tonnage of zinc to be delivered during 1916. A small quantity of zinc was recovered during 1915 in connection with the experimental work. The Electric Zinc Co. has constructed a plant at Welland, Ont., for the recovery of refined zinc from zinc oxide. It is intended eventually, to treat the zinc ores from Notre Dame des Anges, Quebec, at this plant. At Silverton, B.C., a demonstrating plant, using the French process for the recovery of zinc, was operated during 1915 and satisfactory results are claimed.

Other Metals

Antimony.—After several years of no production the demand and high prices in 1915 caused a renewal of activity in mining antimony ores at West Gore, Nova Scotia, and Lake George, New Brunswick. About 1,288 tons of concentrates were shipped to England from the former locality. The antimony smelter at Lake George was operated toward the end of the year with a small production of refined antimony, and there was also some recovery of refined antimony at the lead refinery at Trail, B.C. Antimony ores are also reported to have been shipped from Carpenter Creek, Slocan, from Bridge River District, Lillooet, B.C., and from the Yukon but no record has been obtained. The total production reported is estimated at about 961,040 pounds of antimony refined and in concentrates. The recorded exports of antimony ore in 1915 were 1,149 tons valued at $82,990, while the imports included antimony or regulus of, etc., 1,962,194 pounds valued at $344,918 and antimony salts 67,956 pounds valued at $10,320.

Cobalt.—Metallic cobalt is now being recovered as well as cobalt oxide at the smelters at Deloro and Thorold. The silver-cobalt-nickel ores of the Cobalt district are reduced in these smelters, silver being the principal product with arsenious oxide, metallic cobalt and nickel, cobalt oxide and nickel oxide as by-products. Returns received show a production in 1915 of 211,610 pounds of metallic cobalt and 379,219 pounds of cobalt oxide, equivalent to a total of 477,063 pounds of metal. In 1914 the production was reported as 899,027 pounds of cobalt oxide and 242,572 pounds of cobalt contained in residues sold outside of Canada or equivalent to a total of 871,891 pounds of cobalt. The price of cobalt is seldom qr ' ·d.

Molybdenum.—A production has been reported of about 28,600 pounds of molybdenite valued at $28,460, including cobbed molybdenite and molybdenite contained in ore shipped to concentration plants. There were also about 50 tons of low-grade ore sent to the Mines Branch Ore Testing laboratories for experimental concentration. The export of molybdenite was prohibited to other than British destinations except under license, and from September 23rd the British Government requisitioned all molybdenite arriving in the United Kingdom at a price of 105 shillings per unit of MoS_2, C.I.F. Liverpool and appointed H. A. Watson & Co., Liverpool, as buyers.

Platinum.—Efforts are being continued to recover platinum from the gravels on the Tulameen river in the Similkameen district of British Columbia, and there is also occasional recovery of small quantities from the gold gravels of Quesnel division, Cariboo district. A recovery of about 20 ounces is reported in 1915. There was no recovery of platinum from the Sudbury nickel-copper mattes. Customs records show an export of platinum of 236 ounces valued at $11,052, but this may possibly include old metal.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

REPAIRING A HOISTING ENGINE DRUM

By H. C. F.

THE class of work with which repair shops have to contend is of such a nature that ingenious methods must be devised in order that a particular job may be finished as quickly as possible, with at the same time attainment of the best possible results, an example of how a small shop successfully dealt with a seemingly hard job is indicated as follows:

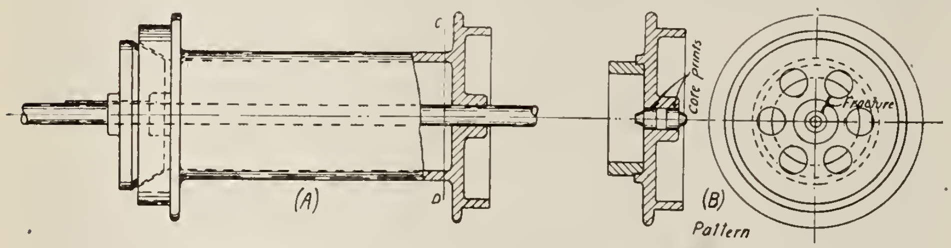
During the unloading of a hoisting engine at a railroad construction camp, it was found that one of the hubs of the drum had become somewhat seriously cracked. To shrink a band on the hub would have proved impracticable since the drum had to be free to revolve on the shaft, and such a procedure would have the tendency to bind it tight, so it was finally sent to the machine shop with orders to put it in first-class working condition in the shortest space of time possible.

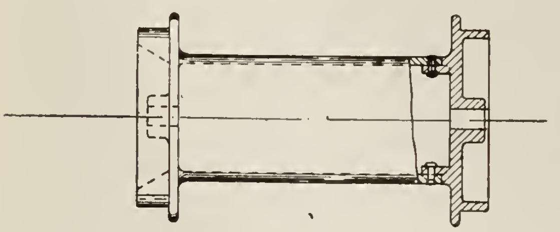
The job was first placed in a large lathe, being chucked by the sound hub, and supported by a large pipe centre in the tailstock. A cutting-off tool was then inserted and the entire end cut off close to the flange as shown by the line CD, upper sketch A. The end thus cut off was made into a pattern by providing it with a heaving ring and core prints as shown in sketch B.

When this was cast, the brake flange was machined to the correct size, and the ring turned down to make a snug fit for the end of the drum. The latter had been previously set up on the lathe carriage, and the end roughly bored, so as to insure a good fit for the end piece when driven on. A series of countersunk rivet holes was next drilled around the diameter of the drum, and the end piece riveted with $5/8$ in. boiler rivets, as shown by lower figure. These were hammered in hot, the head being held from the inside with a suitable holder on.

To complete the job, it was only necessary to bore the end piece to fit the shaft. This was accomplished by again setting the work up on the lathe carriage and boring by means of a long boring bar. In other words, the lathe was made to take the place of a horizontal boring machine. Considerable care was necessary, in lining up the work in order to ensure that both holes would be in direct line, as otherwise an unusual amount of trouble would be met with in placing the shaft in position.

Upon completion of this operation, the drum and shaft were assembled and sent back to the camp. The time required to complete the job was about a day and a half, and as for the job being satisfactory—well, the engine ran continuously for nearly eight months, and when laid up for winter, the drum was still in first-class condition.





HOISTING ENGINE DRUM REPAIR.

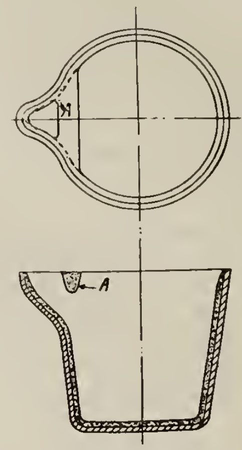
TRICKS OF THE TRADE

By "Gov"

A serviceable skimmer that may be applied to either a hand or larger sulky foundry ladle, and which, in both cases gives good results by pouring off several heats without requiring a renewal, is shown by the accompanying sketch.

The skimmer consists merely of a clay bridge, A, constructed across the top of the ladle. In constructing the bridge, a strong clay mixture should be used, reinforced with wire or a piece of wood, until the clay is set, after which the bridge becomes self-supporting. In forming the pouring spout, a gate pin or any round plug of the desired size, is requisitioned, and around this the clay is worked up till the bridge is of the required shape.

Since a skimmer of this description can be constructed while the ladles are



TRICKS OF THE TRADE—A LADLE SKIMMER.

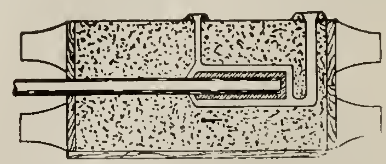
being "daubed up," the extra time and material required are of little or no consequence.

CASTING BRASS ON STEEL RODS

By B. R. S.

A foundry operation which is accomplished in many instances with no small amount of trouble is that of casting a brass covering or liner on steel rods, for use as pump plungers, etc. The difficulty lies chiefly in the fact that the castings are to a certain extent porous, resulting in a poor working surface when machined.

This difficulty can be overcome by casting two layers of metal on the rod, in which case the porosity of the first or inner layer will in no way effect the work. The rod should be cleaned bright, be absolutely free from rust, and by further washing with a solution of copper sulphate, thus covering it with a thin film of copper, better results will



CASTING BRASS ON STEEL RODS.

be obtained. The rod should also be heated to a comparatively high temperature in order to insure that the metal covering will not be chilled.

The method of pouring the second layer is shown in the accompanying sketch. In this case a wet sand mould is used, and it will be noticed that a suitable riser is employed, to draw off any dirt that may appear. A fairly high runner is used in order to maintain sufficient pressure to run the metal through in as short a time as possible.

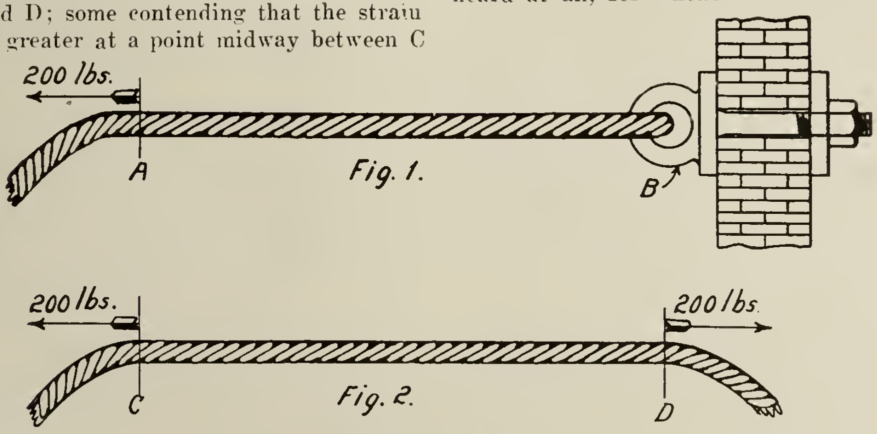
Where the casings are thin, dried moulds faced with plumbago can be more profitably employed, as in such the metal runs better than in the ordinary wet sand mould. In both cases, however, the inner casing should be thoroughly scratch-brushed and the metal fluxed with dry zinc chloride.

ROPE STRAIN PROBLEM

By J. R. H.

THE following question came up before a number of foundrymen a short time ago, and created considerable discussion. The difference of opinion was such that the writer felt that what would interest a few might also have a similar effect upon many of the readers of this journal. The question is, what is the difference in the strain upon the two ropes shown in Fig. 1 and Fig. 2? In Fig. 1 the rope is secured to an eye bolt in the wall, and a pull of 200 lbs. in the direction of the arrows is exerted at A. In Fig. 2 a pull of 200 lbs. is acting on each end of the rope in the direction of the arrows.

It was generally agreed that the strain on the top rope would be 200 lbs., but, in the opinion of those interested, the strain on the lower rope varied from 200 to 400 lbs. Another interesting point raised was whether the strain was equally divided between the points C and D; some contending that the strain is greater at a point midway between C and D. Any solutions from the readers of this apparently simple problem will be appreciated.



ROPE STRAIN PROBLEM.

CONCERNING EXPORT INFORMATION

By N. G. Near.

WHEN answering inquiries from distant countries, such as South America, it has been hammered into us that we should be as courteous as possible and give complete information. The latter should not stop, however, with f.o.b. Montreal or your factory. Give the cost delivered. Foreigners are lazy, just like the rest of us, and they will buy where things can be bought with least effort and greatest assurance. Therefore, your letter should be made to sound as though you will walk right up to the buyer and hand him the machine he wants personally.

A good way to make matters clear to the prospective buyer is to tear the page that will interest your man out of a catalogue and write complete information on that page. It makes things seem more personal. For instance, if your catalogue is printed for distribution in Canada and the United States, it is quite probable that the price will be wrong for exportation, the dimensions may not be given, the weight, etc. It is well to write all this information right on the catalogue sheet, and at the same time incorporate it in a letter so as to make it all the more forcible, as well as for record in your files.

At the same time, send a complete catalogue with such machines that might interest your buyer, fully detailed as above. The buyer will then know that his catalogue is "fresh" and he will value it. He may loan it to friends, and other sales may follow. Don't be stingy with information.

CONCERNING PREMONITIONS

By Woodworker

"I THOUGHT it would break, and it did." The above "wise saying" is heard much too often. It should not be heard at all, for whenever it is feared that something is going to snap, it should be thoroughly investigated, so that one's mind may again be at ease. If the design or construction is wrong, it should be made right. If your investigation proves that everything is O.K., very well, your premonition will vanish.

For some reason or other, an engineer friend of mine worried constantly about the belt that drove his exciter. He feared it would break any minute because it often slipped off the pulley on starting. He looked it over carefully every day. He kept the lacing in tip-top shape. He did everything, almost, except to investigate the matter. The belt was three times stronger than necessary and was amply safe. The exciter pulley was simply too small and the trouble was easily remedied. After the belt stopped slipping off, my friend had no more premonitions. However, had it broken before the investigation he doubtless would have said, "I thought it would break, and it did."

I can think of no case where a man who is entrusted to care for a plant could utter these words in a careless care-free manner, especially if the break is of a serious nature.

LABOR AND MACHINERY

THERE is nothing more pathetic in industrial history, says Engineering, than the conflict of labor with machinery. It has existed for a hundred years or more, during which time there has been a constant progress in comfort and well-being among the working classes. Yet even to-day the machine is looked upon with suspicion by the workman as something designed to filch his living from him. Curiously it is only the novel machine that is the subject of hostility.

If men were asked to do the old heavy work with chisel and file that obtained fifty years ago, they would indignantly refuse and ask why there were not planing machines and shapers to do the job. They do not object to a condition of affairs which has become established, and has lightened their toil, but an appliance that threatens even temporarily to produce a greater output fills them with apprehension.

All the efforts of the economists seem to have failed to spread clearer ideas on this subject; but until more accurate views prevail, it is difficult to see how the amelioration of the lives of the working classes is to be achieved. As a general proposition, a man gets about what he has earned in whatever class he is, and the way to get higher pay is to produce more.

Metallic zirconium and its alloys have recently been employed in metallurgy. The oxide is not reduced by the aluminum but ferro-zircon can be prepared by reducing the oxides of iron and zirconia together with powered aluminum, and have been used to a limited extent in place of ferro-titanium for the purification of steels. Zirconium is also claimed to be excellent as a deoxidizer of copper and its alloys, but this has not been proved.

NEW PROCESS DEVELOPMENTS

Inventive Genius and Research Operate to a Dual End — They Aim to Improve What We Now Possess and Bring to Our Service Commodities Before Unknown

STEEL MAKING IN THE ELECTRIC FURNACE*

By James H. Gray**

PROGRESS in chemistry and metallurgy has kept pace with the world's ever-increasing demand for steel, but the instrument with which to apply our knowledge has not always been at hand. At first it was possible to obtain steel-making materials in sufficient quantities and of such purity that steel of fine quality could be made by a simple process requiring little real technical knowledge. As the demand for steel grew, and with it the necessity of lowering the cost, the supply of pure material did not suffice to meet both these conditions. The acid Bessemer, acid open-hearth, basic Bessemer and basic open-hearth processes followed one after the other. Tremendous tonnages were made by these processes, but they did not displace the crucible when the highest grade was required.

Oxygen in Steel

All known means of applying heat carried with them oxidizing conditions from which we were not able to protect the material under treatment. We could eliminate objectionable metalloids, and add alloys giving various striking and beneficial qualities, but our only means of getting rid of oxygen, for which steel has such a greedy appetite, was by the introduction of materials which had a still greater affinity for oxygen, but which could never grasp the last traces and which left in the steel certain quantities of their own oxides.

Though the oxides in steel are often more deleterious than moderate quantities of the supposedly more objectionable elements, there has been more or less mystery about them because a ready and practical everyday method of measuring the quantities of these oxides has not been introduced. The reason however, why we did not succeed in making the highest grades of steel in large quantities was because of the lack of an instrument rather than lack of knowledge.

The discovery of the electric furnace gave us the instrument we require to make steel free from all the objectionable elements, including oxygen and sulphur. In this process we use a clean heat. Whether we employ the arc furnace or the induction furnace, the use of kilowatts instead of flame can in no way add oxygen to the metal. Certain elements, as carbon and phosphorus, must first be oxidized before their elimination, and it is necessary to introduce materials, such as iron ore, to give up their oxygen to the elements to be burned. When this is done we can proceed to purify the metal bath from all contaminating oxides, because an overlying slag is supplied which absorbs the oxides, which are in turn broken up, allowing the oxygen to unite with carbon and pass out of the furnace as a gas.

We have in the electric furnace not only a neutral or non-oxidizing condition, but a really reducing condition. We are able to throw sulphur into a basic slag, as in the blast furnace, where the process is one of reduction, but with the conditions existing in the electric furnace we can eliminate the traces of sulphur which cannot be removed in the blast furnace.

Now that the instrument as well as the knowledge has been secured the use of the electric furnace must become general unless some still more perfect method is devised, and provided that electric steel can compete with other processes in cost of production.

Growth of the Electric Furnace

The growth in the use of the electric furnace has been rapid, considering that the process is hardly more than ten years old. That upward of 150 furnaces have been installed in many different countries shows not only that the interest in the electric furnace is widespread, but that many men have invested their money to back their opinions, and are now getting handsome returns on their investment.

Up to this time installations consisting of units larger than 20 tons have not been made. When it was demonstrated that electric steel is equal in every way to crucible steel, installations were made with the object of displacing the high-grade but expensive crucible steel, and the furnaces used were of a size to conform to the requirements of crucible output.

The reduction in cost of the electric process over the crucible gave a good margin of profit. Experience showed that the better grades of steel, especially alloy steels, which, though being made in the open-hearth furnace, commanded higher prices than the commoner grades, could be made still better in the electric furnace, and with profit. The consumer wished crucible quality, but could not pay crucible price, although able and willing to pay more than for ordinary basic open-hearth. The automobile industry was largely responsible for this demand.

Savings in Adding Alloys

The possibility of adding alloys to the steel, such as vanadium, in the electric furnace without oxidation, and also of melting alloy scrap without any loss of the valuable alloy, often compensates for the cost of operating the electric furnace. The same fact is utilized at a number of bessemer and open-hearth steel works, where ferromanganese is melted in an electric furnace and added to the steel in the molten condition. The better deoxidation of the steel in the ladle by the use of molten ferromanganese greatly improves its quality. At the same time, the loss of ferromanganese which is experienced when it is placed in the bath in the open-hearth furnace or melted in a cupola is avoided.

Electric steel is now being extensively used for such products as tires, axles, seamless tubes and small castings. The fact that electric steel lends itself to heat treatment more readily than other kinds of steel, both as regards greater range of temperature and absence of cracking in the quenched piece, and that there is less loss due to defective material after machining in the machine shop, also gives this steel a preference even at higher prices.

Electric Steel for Rails

Many have doubted if electric steel can ever be made for such low-priced products as rails and structural material so as to compete with open-hearth steel. I believe that the solution of this problem depends upon the adoption of the proper combination process by which the roughing down work will be done by one or several of the older methods using cheap fuel, and the finishing or final refining done in the electric furnace. Both the acid and the basic Bessemer and the open hearth have been used to supply molten metal to the electric furnace. The finishing has been done in both basic and acid electric furnaces.

In the basic electric furnace both dephosphorization and desulphurization can be performed, and it can be supplied with a metal only partially refined, while the acid electric furnace should be supplied with a metal from which both phosphorus and sulphur have been removed, requiring greater preliminary refining—going back even to the blast fur-

*Contribution to a symposium on iron and steel at the International Engineering Congress, San Francisco.
**U. S. Steel Corporation staff.

nace. During the last two or three years rapid strides have been made with the duplex or Bessemer-open-hearth process, and costs are being obtained which compensate for the excessive metal loss in the Bessemer part of the process.

It may be that the duplex process in connection with either the basic or acid electric furnace will give us the solution. However, enough has been already done with the manufacture of the heavier or lower priced products to indicate that, provided it is turned out in producing units of equal size, the total cost of electric steel will be near enough to that of open-hearth steel, so that the manufacturer can afford to stand the difference in order to give the consumer quality, the requirements for which are constantly growing more rigid.

The possibility of bringing the cost of the two steels near together will appear more feasible if we consider such incidental savings as the use of cheap pig iron at the beginning of the process and the smaller discard of rolled product due to having an ingot free from segregation.

Electric Furnace in Germany and France

In Germany, Luxembourg and eastern France, the electric furnace is the best apparent solution of a condition which is a menace to the steel industry of those countries. While the high phosporus ores of Luxembourg and Lorraine, together with the basic Bessemer process, made possible the great steel development of Germany, the quality of basic Bessemer steel does not to-day give it a standing with open-hearth steel, while the demand for better quality is daily growing. On the other hand, basic Bessemer steel, after refining in the electric furnace, is superior to open-hearth steel. The manufacture of electric steel by this method was begun in Germany several years ago, and has in moderate quantities been made into all kinds of steel products. It seems probable that the American steel manufacturer will find it necessary to adopt electric steel to meet the competition which he will meet in the world's markets.

Fast Progress in America

It has been remarked that the process of electric steel manufacture in America has been slow as compared with that in Europe, but the indications are that this relation will soon be reversed. It was natural that the invention of the electric furnace should be made in countries where cheap hydroelectric power was already in extensive use for other electrochemical processes, but it was only a couple of years before the first electric furnace was installed in the United States. We must also remember that the first large furnace, namely, one of 15 tons capacity, requiring electrodes 2 ft. in diameter, a then unheard of size for steel furnace use, was built here; also that this furnace was the first to use 3-phase electric current, which adapted it to utilize the kind of current in general commercial use. There are now (September) either built or building over 40 electric furnaces in America, of which there are 27 of the Heroult type alone. The average size of these furnaces is also greater than the average size in Europe. These figures have however, been considerably exceeded in the last three months, says the Iron Age, to which we are indebted for this condensed statement of the Author's views.

If the electric furnace be used for the further refining of steel made in present installations of the older processes, as now seems probable, the amount of electric steel produced should then eventually be commensurate with that now being produced by those processes; and it follows that "electric steel production in the United States will exceed that of any other country."

ZINC SMELTING

By F. E. Pierce.*

GENERALLY speaking, zinc sulphide ores will carry from 45 to 60 per cent. zinc and 30 per cent. sulphur, and one ton of average ore 50 per cent. will yield about 850 pounds of spelter and one ton of what is known as 60-degree sulphuric acid.

To-day is the golden age of the zinc business. Spelter sold recently for 17 cents pound. A ton of 50 per cent. ore costs about $100. The working costs are about $15 per ton of ore. About 850 pounds of spelter and a ton of acid are recovered. The spelter is worth about $135 and the acid about $40. The total receipts are, therefore, $175 and the costs $115, leaving profits of $60 per ton of ore. A 200-ton plant would return $12,000 per day, or pay for itself in less than eight months. In normal times, it would be lucky to pay for itself in 10 years.

Characteristics

Zinc has an atomic weight of 65.1; it is bluish white in color and has a crystalline fracture. It tarnishes on exposure, has a specific gravity of about seven, weighs about 435 pounds per cubic foot and has a tensile strength depending on its structure and purity of from 3,000 pounds and 10,000 per square inch. It is quite brittle when cold, but malleable and easily rolled between temperatures of 250 degrees and 300 degrees Fahr.; it is brittle again at 400 degrees Fahr., melts at 790 degrees Fahr., and boils at 980 degrees Fahr. Spelter is the commercial name for metallic zinc. Ordinary slabs of spelter weigh from 45 pounds to 70 pounds and measure 7 inches to 9 inches wide, 16 inches to 18 inches long and 1 to 1¾ inches thick.

*From a paper read before the Engineers of Western Pennsylvania.

Roasting

Zink dust, or blue powder, is very finely divided metallic zinc superficially oxidized and is produced by the sudden cooling of zinc vapors. It is used where a strong reducing agent is required. In roasting zinc sulphide ore (ZnS) zinc oxide is produced and the loss in weight is approximately 15 per cent. In other words, 100 tons of green or raw ore will, when roasted, result in about 85 tons of roasted ore.

Every spelter man has his own pet formula for his retort and condenser mixes, but the proportions of grog and plastic clay are approximately half and half. To this is sometimes added graphite or coke dust in the proportion of 10 per cent. more or less. The spelter furnaces used in representative plants in this country include the Hegeler producer fired furnace; the natural gas furnace of the Hegeler type and the regenerative furnace of the Siemens or Neureuther type. Both the Hegeler and the natural gas furnaces have middle walls with ledges for supporting the butts of the muffles and front walls made of pillars and plates, held in place by buckstays. These furnaces have two arches, making really two furnaces in one block, back to back.

Classes of Ores

Zinc ores broadly are of two classes, oxidized and sulphides. The oxidized ores are easily reduced and play an important part in the smelting operation, but they are relatively of small tonnage and are used mainly for special purposes as a front charge, or for mixtures to obtain a more reducible or non-slagging charge. The sulphides are the basis of nearly all the spelter produced. They are obtained from the well known districts of Joplin, Missouri, Wisconsin, Montana, Utah, Colorado, Mexico, Australia—almost everywhere in fact. In addition to the zinc, they may contain 2 to 10 per cent. of lead, 2 to 15 per cent. of iron and varying percentages of silica, lime, etc., and they may carry in small percentages, silver, copper and gold. In almost all cases, the ores are concentrates from the run of mine of the district in which they occur.

Great attention has been given of late to the treatment of furnace residues, principally because of the silver values which they contain. A spelter furnace can be worked so that 60 to 70 per cent. of the silver in the ore will remain in the residues. This may amount to 10 ounces per ton of residue. About 50 per cent. of the lead in the ore will remain. This may amount to 50 to 100 pounds per ton of residues.

NEW AND IMPROVED EQUIPMENT

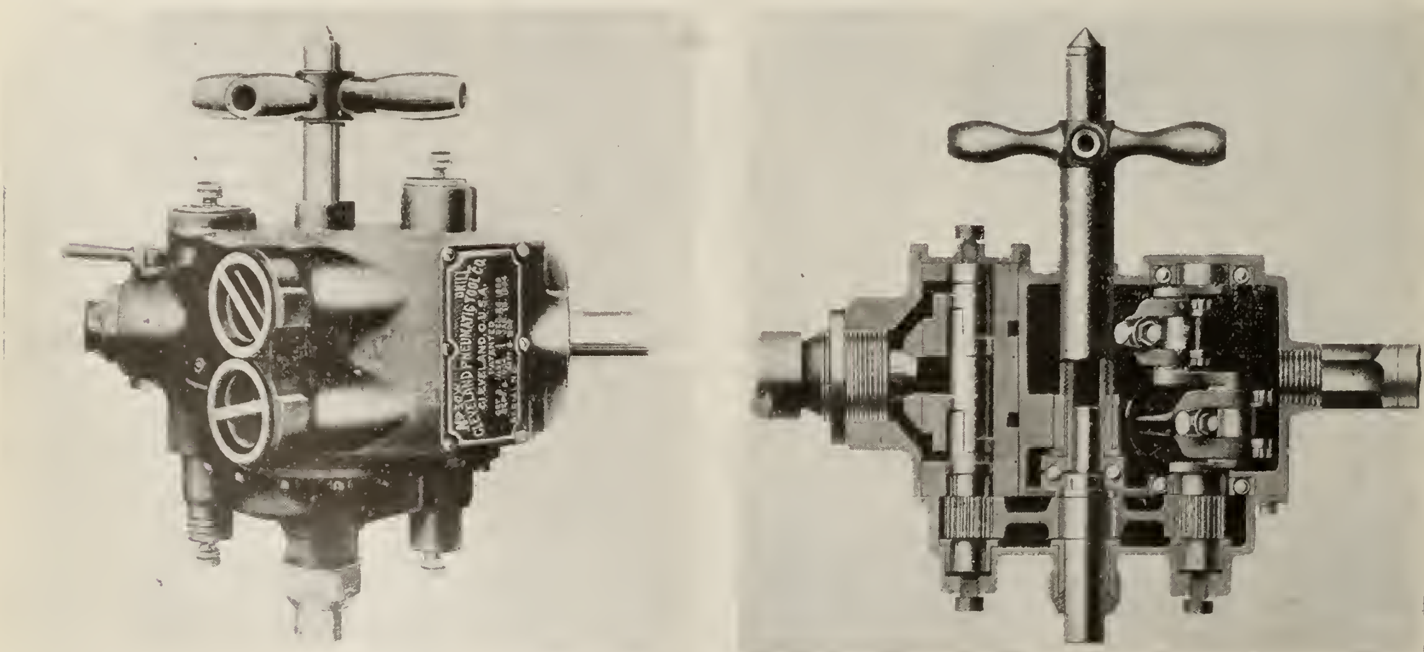
A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

PNEUMATIC FOUNDRY APPLIANCES

THE accompanying illustrations show two of the many air operated foundry appliances manufactured by the Cleveland Pneumatic Tool Co. of Canada, Ltd., Toronto, Ont. The sand rammer, Fig. 1, is adapted for floor work and has an extension handle which may be made any length to suit the height of operator. Blows at the rate of 650 per minute, according to the distance from the work are delivered, and various sizes of butts or peins can be fitted as required. Round or flat rods can be used the flat rod preventing the pein from turning in operation.

FIG. 1. SAND RAMMER FOR FLOOR WORK.

An exhaust deflector is fitted which deflects the exhaust air and moisture downward into the sand, preventing the cold air and water from affecting the operator. The packing chamber is separate from the piston chamber, and an attachment is provided to compress the packing as it wears. The resilient packing employed prevents the entrance of any dirt or grit which is so injurious to the working parts.



FIGS. 2 AND 3. CENTRE SPINDLE FOUR PISTON AIR DRILL.

These rammers are made in five sizes and styles adapted for all classes of work such as bench and core work, heavy loam, pein and flask ramming.

The centre spindle four piston Air Drill shown in Figs. 2 and 3, is one of 58 types made by this concern. The construction is alike in all types, varying only as to the size of the machine, and gear ratio for spindle speeds. The interior view shows the simplicity of construction, the fewest possible number of parts for satisfactory service being employed. The cylinder body, in which are assembled the component parts, is a one piece steel casting with hand hole openings for access to chank and connections.

The main valve, at the left of the casing is of the rotary type, and revolves in a renewable valve bushing. It is hollow and acts as an oil reservoir. A selected grade of steel is used for this part which is hardened and ground. On the lower end of the valve is a driving pinion which meshes with the main spindle gear which in turn is driven by the pinion on the crank shaft.

The driving crank is a high-grade drop forging, hardened, ground, and mounted in annular ball bearings located close up to the crank arms or webs, maintaining its rigidity under heavy loads. The connecting rods are drop forgings, secured to the pistons by a ball and socket joint which allows of universal motion. The complete enclosing of the crank chamber allows it to be filled with heavy lubricant which maintains all the working parts in a state of high efficiency.

Another appliance, not illustrated, is a corner drill for performing work in close quarters. The body casting of this machine is designed so that one side of it, in which the spindle is mounted, may project into corners. Two cylinders only are used in this design so that the general shape is narrowed down considerably. Two ratchet arms on the spindle are oscillated by the crank shaft, thus acting as a reducing gear and dispensing with a large diameter gear wheel. The rotary valve is replaced by an eccentrically operated piston valve located between the cylinders, the whole arrangement approximating to the straight line design.

All parts are interchangeable and renewable from stock, and working parts of steel are hardened and ground.

SAFETY GLASSES FOR METAL WORKERS

THE vital need for eye protection is being more widely recognized in all branches of the metal working trades, and the use of goggles is slowly but surely increasing where workmen are chipping, grinding, boring, turning, working with hot metals, etc. The rec-

FIG. 1. STYLE MI

ent enactment of various workmen's compensation acts, along with the strict requirements of liability companies, makes it a matter of economy as much as humanity for employers to provide adequate eye protection.

T. A. Willson & Co., Inc., Reading, Pa., have made an exhaustive study of actual working conditions, in consultation with many of the foremost safety engineers, and the accompanying illustrations show three of their many styles of goggles adapted for various conditions.

FIG. 2—STYLE SG2

In Fig. 1 is shown a light substantial goggle specially designed for grinders and men doing light work. It is made entirely of rust proof white metal, has an adjustable bridge, and fine wire screen sides with comfortable half cable temples. The provision of screw-joint end pieces makes the replacement of lenses easy.

Style SG2 (Fig. 2) is another grinder's style of lower price. This has well

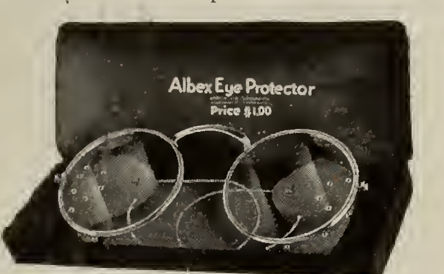


FIG. 3—STYLE A1

ventilated leather side guards, adjustable bridge and soft cable temples.

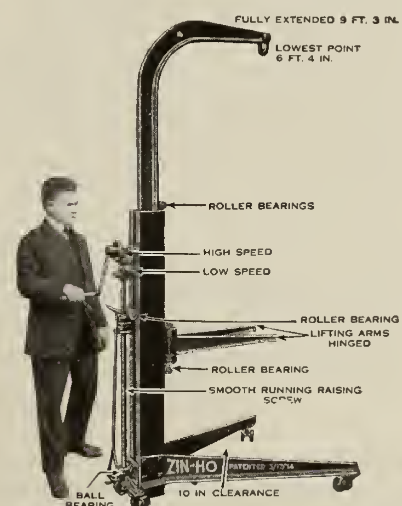
Chemists and similar workers who require protection from acids, gases, and fine dust have their requirements met in stype A1 (Fig. 3). This eye protector gives protection from all angles and can be easily adjusted to fit the curves of the face. Soft leather sides, and cable temples insure complete comfort. The provision of adequate side protection is a special feature of this firm's product as investigations of engineers who have studied actual grinding conditions prove that much grit and dust will whirl around the sides of unprotected glasses.

All of the styles are furnished in a strong steel case, and are designed to slip over ordinary spectacles or eye, glasses.

PORTABLE JACK AND CRANE

THE adaptability of the screw jack principle to the operation of portable cranes has been made use of in a portable jack and crane recently placed on the market. The device, as will be observed from the illustration consists of a boom or mast similar in appearance to a ship's davit, which can be moved vertically by means of a raising screw located at the back of the vertical guides. thus raising or lowering a nut fastened to the lower end of the boom. The upper end of the raising screw is provided with two sets of hand operated bevel gears which give high and low speeds.

The upper end of the boom is curved over to give a suitable length of reach, and the lower end is provided with a



PORTABLE JACK AND CRANE

couple of arms which swing horizontally out of the way when not required. These arms are very useful in garage work, and are of considerable assistance in assembling many types of machinery where accurate lifting and locating of parts is essential.

This crane is well adapted to handling large shells; its capacity is ample, and the load is self sustained in any position so that one man can adjust the work in his machine with the greatest of ease and accuracy.

Roller bearings support the contact points of the boom on the column, and steering gear of the type usually adopted for this class of device, is employed.

The lowest height of the boom eye is 6 ft. 4 in. from the ground, and the extended height is 9 ft. 3 in. A clearance of 10 in. is provided between the base and the floor.

The total weight of the crane is 300 lbs., and the guaranteed lifting capacity is 4,000 lbs. This device is the product of the Zin-Ho Mfg. Co., 1324 Michigan Avenue, Chicago.

WAR LOSSES IN METALS.

THE losses of all the metals have been multiplied many times by the great war, says the Engineering Magazine. The British high explosive or shrapnel shell goes to the field with a brass head which is unscrewed, thrown away, and the time or percussion fuse screwed in. This fuse is also usually of brass, and the shell has a copper ring to take the grooves of the rifling. The shell is fired, and the copper and brass are lost. If the shell is shrapnel, the lead-antimony bullets are lost also. The French shoot a rifle bullet which is pure copper, the other nations, one containing considerable lead and usually antimony, sometimes with a nickel-steel or supronickel jacket. Every detonating cap used results in the volatization of a little mercury. Early in the war it was estimated that 112,000 metric tons of copper were being consumed yearly by each side, much of which is unrecoverable. The figure is probably low. The trench-furrowed fields of Europe will probably make rich picking for a while for the old-metal man, but most of this spent wealth will almost inevitably be lost.

DOMINION CUSTOMS INCREASE

A TWENTY-FIVE million dollar increase in Customs receipts during the finance year, which ended on March 31, is shown by figures issued by the Customs Department. The total receipts for the twelve months ending on that date, were $102,609,621, as compared with $78,262,535, or an increase of $24,-347,085 for the year. The March statement itself shows an increase of $3,-307,109. The total receipts during the month were $10,663,234, as compared with $7,356,125 during the same month last year. Returns from the Finance Department confirm the statement made some days ago, that the total revenue receipts for the finance year will exceed Sir Thomas White's estimate by from three to four million dollars. The total revenue, including that from the war taxation, will be in the neighborhood of $175,000,000.

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GENERAL BUSINESS CONDITIONS

A GRATIFYING feature of the present industrial situation is the steady improvement in domestic business, due to the prosperous condition of the country. The outlook for an increase in exports, other than munitions and war supplies, has improved considerably and manufacturers are looking for more important developments. The spring weather has had a stimulating effect on many industries and the outlook generally is distinctly favorable. Navigation will be open on the Lakes and St. Lawrence very shortly, which will considerably relieve the congestion of freight at railroad terminals. The situation in this regard has been getting more and more acute and has caused considerable delay to shipments and inconvenience to merchants. The customs returns for Toronto for the fiscal year which ended on March 31, are almost two million dollars in excess of the greatest previous year in the history of the port. There has been a very marked gain in revenue since September, and March showed the largest increase for any month.

Manufacturers are concerned over the shortage of labor which is beginning to be felt, and which will become more serious as the number of battalions for overseas increases. The shortage of raw materials is also becoming a serious question for manufacturers to contend with, in addition prices are still rising, thus increasing the cost of production. The upward trend in prices of finished products continues, a number of advances having been made during recent weeks.

EXPORT TRADE DEVELOPMENT

AN interesting feature relative to the development of American export trade, and incidentally that of the home market is the appeal by the United States Bureau of Foreign and Domestic Commerce for young, high-grade men whose education and natural ability fit them for service abroad. It is realized that nothing will contribute so effectively to the efficiency of the Bureau in the matter of aiding manufacturers to establish new connections and make those already formed more progressively valuable, than through the above indicated medium. As showing the urgency with which the immediate situation is viewed, and the highly sanguine achievement expectations formed of the scheme, it is desired that young men in large numbers present themselves at the Civil Service Examinations on April 5, the purposes of which are the selection of clerks for service with Commercial Attaches in foreign countries, and for service in the Bureau of Foreign and Domestic Commerce at home. The knowledge of one or more foreign languages is made an essential, and the salaries for appointments abroad are stated as being $1,500 per annum.

Canada, as well as the United States, is interested in establishing and building up an export trade. Her Attaches abroad—Trade Commissioners, are for the most part, however, located in Great Britain or in Colonies of the Empire, but the time has arrived when she too must "lengthen her cords and strengthen her stakes" by taking action along lines very similar to those of our Southern neighbors. Something more than the administrative and business activities of our Department of Trade and Commerce are called for at this juncture, and either in co-operation therewith or on their own initiative should our Canadian manufacturers in a corporate capacity take the requisite step. The scheme launched by the United States Bureau of Foreign and Domestic Commerce is worth appropriating.

NATIONAL FAIRS AND NATIONAL BUSINESS

THE Second British Industries Fair was held from Feb. 21 to Mar. 3 in the Victoria and Albert Museum, London, Eng. In drawing the attention of Canadian firms to this event, emphasis is laid on the object of these Fairs which are to be of annual occurrence and destined to be of great assistance in furthering British trade interests.

The object is to bring manufacturers into contact with buyers for the home and overseas markets, and thus assist the former to capture the trade in certain products previously supplied by Germany. The first Fair which was held a year ago was organized by the British Board of Trade, and the results were so satisfactory that the exhibitors urged that body to assume control of future functions.

The importance of such an event will be understood when it is stated that admission was by invitation of the Board of Trade only, and was confined to bona fide buyers for home and overseas markets, this restriction of admission emphasizing the fact that the Fair was organized for business pure and simple.

While we do not wish to appear as advocating anything like an abandonment of amusement at the Canadian National Exhibition, we do wish to point out the desirability of every Canadian manufacturer exhibiting his product more extensively and intensively than ever before. The Exhibition authorities can be relied upon to give the usual publicity to the event, and the Department of Trade and Commerce through their Commissioners should see that foreign buyers are advised of the event in time to include it in their itinerary.

The Canadian Exhibition, however, is broader in its scope than the British Fair referred to, which was confined to toys and games; earthenware, porcelain and china; glass goods; fancy goods; and stationery, etc., and the wider field here only makes it more desirable that every line of industry be represented more strongly than before. The value of the efforts being made by the Department of Trade and Commerce on behalf of our manufacturers could be admirably demonstrated by the establishment of a Bureau at the Exhibition where samples and catalogues at present in Ottawa would be available to interested parties. The opportunity for examining these articles would be welcomed and accepted by numerous parties who otherwise might not be able to make a special journey to Ottawa, and the present awakening of Canadian interest in overseas trade would receive an impetus which will be invaluable during the world-wide competition of the near future.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

MODERN ACID-DIPPING, ELECTRO-PLATING AND JAPANNING PLANT—II.

By H. N. Trumbull.

IN our March issue particulars covering this plant were given relative to general construction, lighting, heating, and ventilation, followed by a description of the plating room equipment and processes detail. The present article features the painting and baking arrangements.

Painting and Baking

The third section of this building is devoted to painting and baking. The sanding necessary on filled castings, and the painting are done on the bench along the wall. Openings on this bench are connected by goose-neck pipes under the bench to exhaust fans which effectively remove all dust when sanding and paint motes when spraying.

Articles to be japanned are dipped in the tanks and then placed on adjustable shelves or hung from racks in the electrically heated revolving bake oven.

This oven consists of a square brick room open on part of one end and lined with nonpareil insulating brick which is sprayed on the exposed surface with silicate of soda. In the oven is a motor-driven turntable on which is built a steel cylinder ten feet in diameter and nine feet high, containing two opposite compartments with openings corresponding to the opening in the brick wall.

In the space between the brick wall and the steel cylinder there are placed a sufficient number of electric heaters, consisting of resistance grids, to bring the temperature of the oven to 500 degrees F. When the turntable is in such a position that one of the openings of the cylinder is in line with the opening of the brick wall, that compartment of the cylinder may be loaded with the material to be baked. After this is done, the turntable is revolved through 180 degrees. The loaded compartment is then in the baking position. The other compartment of the cylinder has now swung round to the position where it may be unloaded and reloaded. If the turntable is turned 90 degrees instead of 180 degrees, both compartments will be in the baking zone.

The wire mesh gate allows access for loading and unloading, and acts in addition as a safety device. It is necessary for the gate to be in the lowered position before the driving motor circuit can be completed, thereby preventing movement of the turntable when the gate is up, but allowing the table to be revolved at the proper time without danger of accident to the operator or others.

A means taken to conserve heat consists of two vertical doors or flaps along the edges of the oven opening, which press against the revolving cylinder and close to the outer air the zone between the oven and the cylinder. When the cylinder is revolving the flaps are drawn to one side automatically.

Clock dials, conveniently located, are used to show the time of placing a load in the oven. A dial thermostat located under the clock dials indicates the inside temperature of the oven. Behind the oven is located the switchboard which controls the heating of the oven. On the switchboard are mounted an ammeter, a circuit breaker, a relay, a lever switch for each bank of heating resistances and two single-pole contactors which are controlled either by a lever switch or an automatic time switch.

By use of the automatic time switch, which has a resetting device, the current may be automatically shut off from the heating resistances at a pre-determined time and turned on again when desired. Thus the work can be safely left baking when the attendant goes home at night, and when he arrives in the morning the oven will be at the required temperature and ready for the next load.

The oven and equipment are unique in design, and very efficient in operation. The objects accomplished by this revolving oven are: (a) Continuous baking may be obtained without having to bring the temperature from that of the room to the baking temperature at each loading; (b) There is no fire risk as with gas-heated ovens, and (c) The turntable feature allows the work to be handled close to the oven so that floor space is economized and the distance necessary to carry the parts reduced to a minimum.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

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PLACE AND DATES OF MEETING.

The Occident Hall, corner of Queen and Bathurst Streets. Fourth Thursday of each month, at 8 p.m.

NEW PRIMARY BATTERY

A WELL KNOWN deficiency of electric cells consists in the tendency of the solution to form a salt of the metal composing the soluble electrode. This is the case in the ordinary copper-zinc cell; the sulphuric acid combines with the zinc to form a zinc sulphate and the tendency of the current then is to decompose the sulphate and deposit zinc on the copper. This zinc on the copper constitutes a galvanic couple which tends to dissolve the zinc again and to restore the copper to its original state. Thus two contrary actions take place, one tending to deposit zinc on copper, the other tending to dissolve this deposit.

Preventing Zinc Deposition

To eliminate the difficulty it is necessary to prevent the zinc deposition. In two-liquid cells, like the Daniel and Brunsen, this is effected by retaining the zinc salt around the zinc electrode. H. Bellini in a recent article in the Bulletin de la Societê Internationale des Electriciens states that he has obtained a similar result with a single-liquid cell, which has the advantage of offering lower internal resistance than do the two-liquid cells, inasmuch as the electrodes can be placed close to one another and intermingled just as in storage batteries, where a number of pairs of plates are alternated.

The evident means of accomplishing this consists in employing electrodes which form insoluble salts, and lead, of course, is first thought of for this purpose. A difficulty, however lies in the fact that both the sulphate and the chloride of lead stick to the lead surface and increase internal resistance beyond permissible limits. A partial solution of this difficulty consists in adding nitric acid to the sulphuric or hydrochloric, but the complete solution was found in the employment of an amalgam of lead instead of the lead alone. Using this, the insoluble salt which is formed falls automatically to the bottom of the jar.

Although the solution used may vary within certain limits, sulphuric acid is found preferable to hydrochloric, and a good formula consists of 1000 parts of water, 80 parts of sulphuric acid of 66 deg. Beaume, and 120 parts of nitric acid of 36 deg. Beaume. An increase in the proportion of sulphuric acid increases the voltage developed but also increases the internal resistance, making it sometimes difficult to start the cell. An increase in the nitric acid decreases both the voltage and the internal resistance; while an excessive quantity of nitric polarizes the cell by forming a deposit of zinc.

The optimum for the lead amalgam is 9 parts of lead to one part of mercury. To avoid volatilizing the latter, the lead is first melted and the mercury is added just before pouring into the molds. The other electrode should consist of some material insoluble in acid preferably carbon.

The voltage developed will vary from 1.10 to 1.15. The internal resistance, as in the case of all cells, varies with the current furnished. In this case it was found that an increase in resistance chiefly depends on the thickness of the lead sulphate coating which adheres to the plate before falling.

In a certain cell tested the internal resistance showed a maximum of about 0.13 ohms. In this case the lead-amalgam plate had 31 sq. in. of surface exposed and was placed between two plates of carbon at an average distance of about ¾ in. from each, the total surface of the carbon plates being 35½ sq. in. The lead-amalgam plate was in the form of a wedge with the small end down. A shower of heavy white powder fell from it and was found to consist of lead sulphate, metallic mercury, and a little sulphate of mercury.

The carbon electrode developed a certain amount of nitrogen. So little of this was collected however, as to make the nature of the reaction involved uncertain, but it was found to consist of about 92 per cent. nitrogen, with some nitrogen oxides, carbonic acid, oxygen, hydrogen etc.

Consumption of Lead Amalgam

With the circuit open, the consumption of lead amalgam is very small. The electromotive force of the cell increases slightly during the first moments of operation and then decreases uniformly at the same rate that the electrolyte is used up; the curve of discharge resembles that from a storage battery. Experiments with the cells with prolonged discharge, periods of rest, and renewed discharge, show that by adding new electrolyte and cleaning out the deposit of salt, action can be maintained as long as the lead amalgam holds out. The consumption of lead amalgam is about five grams per ampere-hour. The figures obtained by the author were confirmed pretty closely by the Societe pour Le Travail Electriques des Metaux.

The cell is held by the author to possess advantages over other sources of current in certain cases, such as used in wireless-telegraphy field stations, in small electroplating installations, and in laboratory work—Engineering Magazine Abstract.

ZINC SOURCES WITHIN BRITISH EMPIRE

THE large amount of zinc required for war purposes, and the resulting enormously increased demand for the metal known commercially as spelter, lend special interest to an article in the current number of the "Bulletin of the Imperial Institute" on "The Occurrence and Utilization of Zinc Ores." The chief zinc minerals are described, and a brief account given of the more important occurrences in the United Kingdom, the colonies and India.

Zinc ores have been mined in many parts of the United Kingdom, notably in Cumberland, Northumberland, Durham, Derbyshire, Shropshire and the Isle of Man, but a large proportion of the production has for several years past been shipped to the Continent for smelting. By far the most important zinc deposits in the British Empire are those of Broken Hill Mines, New South Wales, the output of which alone is sufficient to supply the entire demands of the United Kingdom for metallic zinc. The Broken Hill ore before the war went mainly to Germany for smelting, but the Australian Government has adopted measures which will prevent this in the future. Zinc is also found in South Australia, Queensland, Tasmania, New Zealand and Newfoundland. Canada contains a number of workable zinc deposits, particularly in British Columbia, and there is every prospect of Burma becoming an important producer. In Africa there are zinc deposits in Egypt, Nigeria, Rhodesia and the Transvaal, as to which more information is needed.

ALUMINUM AS EXPLOSIVE

THE USE of aluminum in aeroplanes is now widely known, but its use when filed to a powder is less understood. Yet in this condition it forms part of two of the most destructive agents used by the Central European Powers, says the London Standard.

The first is the high explosive used to charge the Austrian shells. This is known as "ammonal," a mixture of five or eight parts ammonium nitrate with one part of finely powdered aluminum. The exact proportions and the means for keeping the mixture dry are, of course, secrets which the Austrians keep to themselves, but even as made in English laboratories its explosive violence is tremendous.

It is one of the few explosives that has never been used as a propellant. No gun known to warfare could resist its suddenness. The explosion chambers would be smashed to pieces before the projectile had begun to move. So it is put inside the projectile itself, and allowed to explode amongst the enemy a few miles away from the gun. So far as we know it is only the Austrian howitzer shell that contains this horrible mixture.

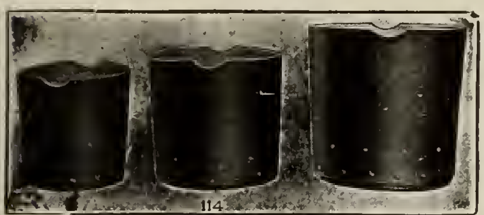
EFFECTS OF LEAD UPON GUN METAL

A PAPER read before the Institute of Metals furnishes some interesting information concerning the effects of lead upon gun bronze tested at different temperatures. It was found that straight gun bronze (88-10-2) dropped from a tensile strength of about 32,500 lbs. at 550° F., above which it rapidly decreased. By substituting one-half per cent. of lead for an equal amount of copper (giving 87½, 10, 2, ½) it was found that the strength of bronze remained at about 32,000 lb. up to a temperature of 550° F., above which it rapidly decreased to 22,500 lb. at 600° F. The variation in elongation was found to be even more pronounced; at 550° F. the alloy containing one-half per cent. lead gave an elongation of 18 per cent. and the straight gun bronze at the same temperature gave an elongation of a trifle less than two per cent. In gun bronze to which had been added 10 per cent. of lead at the expense of the copper was found a strength of 28,500 lb. and an elongation of 10 per cent., and when the amount of lead was increased to 16 per cent. the alloy still had a strength of 25,000 lb. and elongation of five per cent. This test was made with the metal heated at 500° F. In considering these results it should be borne in mind that lead softens the brasses, and therefore a casting which is to be subject to great erosive action should contain but very little lead.—Engineering.

PLUGGING BLOWHOLES IN CASTINGS TO BE PLATED

CASTINGS which have to be electroplated are very often marred by blowholes which do not affect other than by their appearance. A method of plugging these holes is as follows:—Drill into the hole with a bit less in diameter than the blowhole, and drive into it a piece of copper wire, leaving the end long enough, and then rivet it down so as to fit the cavity. It is unnecessary to drill a hole that will cut out the entire blowhole. This method of plugging blowholes does not take long, and the surplus copper can easily be filed off even with the casting. After this has been done, it can be nickel-plated, and the blowhole be quite disguised.

The Chadwick Brass Co. of Hamilton, Ont., has changed the name of the concern to that of the Wentworth Brass Co., Ltd.

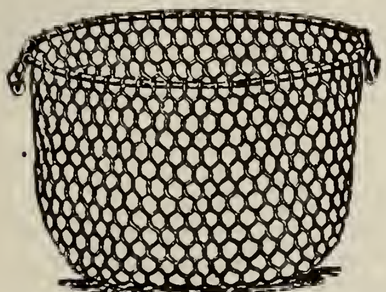


Foundry Ladles—Flat bottom riveted steel bowls provided with forged lips and vent holes.

FOUNDRY SUPPLY SERVICE

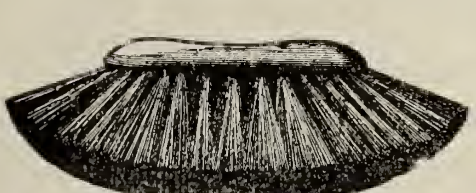
that's reliable, prompt and efficient

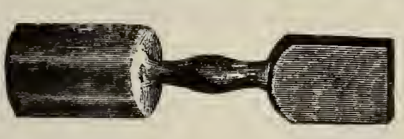
When you are in need of high-grade Plumbago, Stoveplate Facings, Core Wash, Charcoal, Partine, Core Compound, either Powder or Liquid, Riddles, Bellows, Brushes, Fire Brick or Fire Clay or other requisites for the Foundry



Coke or Charcoal Basket—Made of galvanized steel wire.

We Can Supply You Quickly from Stock and at a Very Moderate Price





Bench Rammers—Made from Maple Hardwood well oiled.

When you buy from us (a Canadian Company), there is no holding up by customs or delay for lack in shipping facilities, no duty and no extra price on account of high tariff. When you buy from us you get the benefit of our twenty-five years' experience in meeting the demands of the foundry trade.

Send a trial order.

MADE IN CANADA

The Hamilton Facing Mill Company, Limited

HAMILTON, CANADA

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey Forge, Pittsburg	$18 45
Lake Superior, charcoal, Chicago	19 25
Michigan charcoal iron	28 00
Ferro Nickel pig iron (Soo)	25 00

	Montreal.	Toronto.
Middleboro, No. 3	$24 00	.....
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Glenarnock	28 00	.....
Summerlee, No. 1	33 00	.....
Summerlee, No. 3	32 00	.....
Victoria, No. 1	27 00	24 00
Victoria, No. 2X	27 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

METALS.

Aluminum	$ .68
Antimony	.48
Cobalt 97% pure	1.50
Copper, lake	30.00
Copper, electrolytic	30.00
Copper, casting	29.50
Lead	.10
Mercury	100.00
Nickel	50.00
Silver	.48
Tin	.54
Zink	.23

Prices Per Lb.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$18 00	$17 75
Copper, crucible	21 00	21 00
Copper, heavy	20 75	21 00
Copper wire,	20 75	20 75
No. 1 machine, compos'n	10 50	16 25
No. 1 compos'n turnings	14 75	14 25
No. 1 wrought iron	11 75	11 75
Heavy melting steel	9 00	9 30
No. 1 machin'y cast iron	14 75	14 75
New brass clippings	16 00	14 00
New brass turnings	11 75	11 25
Heavy lead	7 25	7 25
Tea lead	6 25	6 25
Scrap zinc	15 50	15 75
Aluminum	36 00	36 00

COKE AND COAL.

Solvay foundry coke, on application	
Connellsville foundry coke	$7.02
Yough steam lump coal	....
Pittsburgh steam lump coal	4.30
Best slack	3.87

net ton f.o.b. Toronto.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	66 00
Wire rods, Pittsburgh	57 00

PROOF COIL CHAIN.

1/4 inch	$9.00
5-16 inch	5.90
3/8 inch	4.95
7-16 inch	4.55
1/2 inch	4.30
9-16 inch	4.20
5/8 inch	4.10
3/4 inch	3.95
7/8 inch	3.80
1 inch	3.70

Above quotations are per 100 lbs.

MISCELLANEOUS.

Solder, guaranteed	0.31½
Babbitt metals	.11 to .60
Putty, 100-lb. drums	2.85
Red dry lead, 100-lb. kegs, p.cwt.	13.87
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls	0.80
Linseed oil, raw, single bbls.	0.98
Linseed oil, boiled, single bbls.	1.01
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7 00
Lead wool, per lb.	0.13
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23
Lard oil, per gal.	1.35

SHEETS.

	Montreal.	Toronto.
Sheets, black, No. 28	$3 90	$3 80
Sheets black No. 10	4 35	4 35
Canada plates, dull, 52 sheets	4 00	4 25
Canada plates, all bright	6 30	6 00
Apollo brand, 10¾ oz. galvanized)	7 00	7 00
Queen's Head, 28, B.W.G.	7 50	7 50
Fleur-de-Lis, 28 B.W.G.	7 25	7 25
Gorbal's best, No. 28	7 50	7 50
Colborne Crown, No. 28	6 75	6 75
Premier, No. 28, U.S.	6 90	6 90
Premier, 10¾ oz.	7 50	6 95

ELECTRIC WELD COIL CHAIN B.B.

3-16 in.	$11.70
1/4 in.	8.40
5-16 in.	7.40
3/8 in.	6.35
7-16.	6.35
1/2 in.	6.35
5/8 in.	6.35
3/4 in.	6.35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, 5 per cent., B and C, 25 per cent., cast iron 50; standard bushings, 60; headers, 60; flanged unions, 60; malleable bushings, 60; nipples 72½; malleable, lipped union, 60.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.07
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper carbonate, anhy.	.35
Copper sulphate	.25
Cobalt Sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide substitute	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 129-130 per cent.	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	4.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.25
Zinc sulphate	.08

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.35 to .37
Tin	.58 to .60
Silver	.55 to .60
Zinc	.27 to 29

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt	1.75 to 2.00
Polishing wheels, bullneck	.90
Emery, in kegs, American	.06
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .07
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Toronto, Ont., April 4, 1916.—The steel market continues strong and prices are still moving upward. The opinion is held in some circles that the high point for prices has probably been reached or nearly so, but at the same time a recession in quotations is not expected for a long time to come. The fact that the steel mills have all the business they can take care of this year will have a tendency to steady the market and prevent any marked decline. Steel companies are making strenuous efforts to develop their export business and considerable success in this direction in anticipated. The mills continue to be actively engaged in the production of steel for shells, the demand still being very insistent. Export business is developing and there has recently been a noticeable improvement in the domestic demand.

An advance in steel shafting has been announced, the new price being list plus 20 per cent. at warehouse, and list plus 10 per cent. at mill. The market for boiler tubes is very firm and an advance in prices is looked for. Tube mills are sold up for four or five months, consequently deliveries are very backward. Prices on boiler plates are firm and a further advance is expected owing to the sold-up condition of the plate mills. Prices of wrought iron and galvanized pipe have advanced in the States and a similiar movement may take place here. Steel bars are firm and unchanged at $3, and iron bars at $2.75 per 100 lbs.

The galvanized sheet situation is unchanged and the market continues very firm. The uncertainties of the spelter market and high prices are not attractive to the galvanizers who are also confronted with increasing prices on black sheets. The demand for black sheets in the primary market is on the increase and many mills are well sold ahead. In some cases orders now on the books run well into the fourth quarter. Quotations locally on black sheets are firm and unchanged.

The steel market in the United States is very strong and prices still have an upward tendency. It is believed in some quarters however that the top of the market has probably nearly been reached and that prices will remain at the high level for some considerable time. The larger steel companies are booked up for the rest of the year and some inquiries have been received for 1917 delivery. Steel bars are unchanged at 2.75c, plates 3.50c, and shapes 2.50c f.o.b. Pittsburgh. Prices of semi-finished steel products are very firm and will probably advance. Billets are now in great demand but prices are unchanged. No wire rods for the open market can be had from Pttsburgh mills, and quotations are very firm at $57 per ton.

Pig Iron

The market is very firm and the general situation is unchanged. Indications point to very heavy consumption this year of steel making grades of pig iron. The Nova Scotia Steel & Coal Co., propose building a new blast furnace at their plant at Sydney Mines, C. B.

Old Metals

There is no change in the situation and quotations are practically the same as last week. All copper scrap is in good demand and prices firm. There is a good demand for heavy melting steel and the market is strong. Old lead is strong in sympathy with the pig lead market, but prices are unchanged.

Machine Tools

The market is fairly active, the bulk of the business in machine tools being for munition plants. Canadian machine tool makers continue busy turning out lathes and also special tools for machining shells. Deliveries from U.S. makers have not improved and are still very backward especially on standard tools.

General Supplies

A good demand is reported for machine shop supplies, buying being generally of the hand-to-mouth type. Prices continue to advance, the most important change this week being the new discounts on carbon drills and reamers which have advanced about 10 per cent. New discounts are also given this week on cap and set screws, nuts, etc. Turpentine has advenced 1c and is now quoted at 80c per gallon. Prices of wool packing waste and washed wipers have been withdrawn and are only on application. This step has been taken on account of the great scarcity of wool yarns and cotton rags. The market is very strong and an advance in white and colored waste is expected in the near future owing to the scarcity and increase in cost of cotton threads.

Scrap Metals

The most interesting feature to note in the metal markets this week is another advance in lead, otherwise prices are at about the same level as last week. Stocks of all metals are low in Toronto and prices on the local market are very sensitive. Business is very good having improved considerably during the past few weeks. The copper market is stronger due to a large buying movement which may result in higher prices. Tin is also strong and may possibly advance. The lead market is strong and higher after a period of comparative dulness. The antimony and aluminum markets are strong with nominal quotations. Solders are unchanged but very firm and higher prices are very probable.

Copper.—An active demand for copper has developed into a strong buying movement and there is every possibility of higher prices. The consumption of copper in Europe is said to be far in advance of the present shipping facilities and an urgent need exists for this metal. There is also an abnormal demand for spot copper in the States but very little is available. The local market is strong with quotations unchanged and nominal at 30½c per pound.

Tin.—The market is easier in London but firm and unchanged at New York. The outstanding features in the tin situation continue to be heavy consumption and difficulty of getting supplies. The New York market is still affected by the delays attending the granting of licenses permitting exports of metal from England. The situation is rather tight and higher prices may be looked for. Quotations are unchanged and nominal at 53c per pound.

Spelter.—The market is more active and firmer. It is possible that the buying movement which has already started in copper may extend to spelter as both metals are used together at the brass mills. Production has been greatly increased and it is doubtful if prices can go much higher unless some extraordinary demand develops. The market is firm at 22c per pound.

Lead. — The "Trust" has again advanced prices of lead and is quoting at 7.50c New York. The outside market is higher still, the price ranging from 7.87c to 8.12c. The market is very strong and the demand continues heavy with a scarcity of spot metal. Lead has advanced ½c and is now quoted at 11c per pound.

Antimony.—The market is strong and the demand is heavy but supplies are scarce. Quotations are nominal and unchanged at 48c per pound.

Aluminum.—The situation is unchanged and the market is strong at 68c per pound.

Solders.—Prices are very firm and an advance is not unlikely owing to the continued strength in the tin and lead market. Guaranteed is quoted at 31½c and strictly at 29c per pound.

If any advertisement interests you, tear it out now and place with letters to be answered.

Foundry and Plating Supplies

The general situation continues to improve, there being a better demand for foundry supplies. The activity in the agricultural implement industry and among machine tool makers has had a distinctly beneficial effect on foundry supplies. Prices on some lines, particularly those involving metals of any kind, have advanced, and the market generally is very firm. Platers report fair business and high prices for all materials which they use.

There is no improvement in the situation as regards supply of chemicals, and quotations continue practically nom, inal. There is no relief in sight and no sign of any recession in prices. Sulphuric and carbolic acid are very high and the consumption is very heavy. Copper sulphate or blue stone is another material affected by the war, the demand for it being also heavy. Prices are abnormally high, due, of course, to its great scarcity. Inquiries from all over the world are going to the United States, and it looks as if American producers would be called upon to supply the bulk of the world's requirements. This, naturally, affects the Canadian market as the major portion of the copper sulphate used here now comes from the States. There is little doubt but that high prices for blue stone will prevail until the termination of the war.

Higher prices for many lines of polishing wheels are looked for owing to the increase in cost of leather and cotton rags, the latter being very scarce. American emery has advanced 2 cents and is now quoted at 6c per pound. Turkish emery is practically off the market, stocks having become depleted and nothing of course is being imported owing to the war.

WAR EXPENDITURES STIMULATING CANADIAN INDUSTRIES

THE expenditure for war purposes in Canada during the current calendar year will aggregate $600,000,000 according to the Canadian Bank of Commerce. In its monthly commercial letter for March, the bank says:

"At the close of 1915, the total orders placed by the British Government in Canada for ammunition was $303,000,000, on which up to the end of the year $80,000,000 had been paid out. Orders on a large scale for other requirements of the Allies are in course of execution. To this volume of business will be added that arising from the equipment of the forces in process of enlistment in all parts of the Dominion, to provide for which Parliament has voted a credit of $250,000,000.

"On our own account and that of the Allies, if the war continues, the expenditure for war purposes in Canada will aggregate $600,000,000 within the present calendar year. The output of ammunition, which at the commencement of the present year was valued at $30,000,000 per month, is steadily increasing as a result of greater efficiency. That still heavier demands will be made upon our industries is foreshadowed by the announcement that at the request of the Government the banks are preparing to provide a further credit of from fifty to seventy-five millions for Imperial purposes. It is hoped that this will result in bringing new orders of at least $150,000,000 to this country.

"Expenditure on an unprecedented scale cannot fail to sustain the prevailing business activity while it continues. The profits of our fields and industries will in the meantime constitute a material set-off against our indebtedness, but we shall still have to provide for our increased annual obligations, and the as yet unforeseen and indeterminable conditions which will prevail when the war comes to an end."

STEEL CO. OF CANADA MEETING

THE directors of the Steel Company of Canada, at a meeting held at Toronto last week, wiped the slate clean of dividend arrears on the cumulative preferred stock by declaring a 3½ per cent. dividend on back dividend account, in addition to the regular 1¾ per cent. dividend for the quarter. When the two dividends, totalling 5¼ per cent. and calling for a disbursement of $341,555, are paid on May 1 next, full amends will have been made to shareholders for the temporary loss sustained through the deferring of payments from the fall of 1914 to the fall of 1915.

Domestic Business Developing

Following the meeting, C. S. Wilcox, the president, issued a brief statement to the effect that the most encouraging feature of the company's business at the present time was the extremely healthy growth of domestic orders. The future of the company, he said, did not depend, to the extent generally believed, upon its war orders.

CONTRASTS IN STEEL OUTPUTS

THE production figures for 1915, given in Col. Cantley's report at the Nova Scotia Steel & Coal annual last week furnished some interesting comparisons with 1914. Pig iron output showed an increase of 200 per cent.; the production of steel ingots at Sydney Mines rose about 80 per cent., and the increase in steel billets rolled at New Glasgow was about 50 per cent. Shipments of finished steel, forgings, etc., were approximately 70 per cent. higher than in 1914. Coal and iron ore alone showed smaller outputs, both being affected by scarcity of labor as well as of ocean tonnage. Production figures, in tons, for the past two years follow:

	1915.	1914.
Coal mined	618,103	752,153
Ore mined	125,069	334,066
Coke made	90,277	37,795
Limestone, etc.	79,211	33,435
Pig iron	73,110	24,678
Steel ingots	97,072	53,334
Steel billets rolled	76,052	43,969
Steel shipments	60,283	36,718

Trade Gossip

St. George, Que.—G. P. Gonthier will build a foundry here, at an approximate cost of $4,000.

Hamilton, Ont.—The Canada Wire & Iron Goods Co. will build an addition to their plant.

Berlin, Ont.— Fire damaged the premises of the Forwell Foundry Co., and caused a loss of $5,000.

Hamilton, Ont. — The Steel Co., of Canada, will build an addition to its plant, estimated to cost $24,000.

Brockville, Ont.—The Canada Foundries & Forgings Co., will make an extension to their plant here to take care of increasing business.

George P. Breckon, head of the firm of G. P. Breckon & Co., sheet metal workers, Toronto, Ont., died suddenly at his plant on March 30.

Guelph, Ont. — A company propose building a stove factory here at an approximate cost of $7,000. W. A. Mahoney of this city is the architect.

New Toronto.—The Brown Copper & Brass Rolling Mills, Ltd., are having a brass rod and shape mill erected here which will cost about $125,000.

Rail Mills Busy.—The rail makers in Canada are reported to have opened their books covering deliveries for the first six months of 1917. Several thousand tons have been booked.

Three Rivers, Que.—The general contract for the erection of an addition to the plant of the Canada Iron Corporation has been awarded to Loomis Dakin & Co., Sherbrooke, Que.

The Hudson Bay Zinc, Ltd., has been incorporated at Victoria, B.C., with a capitalization of $5,000,000, divided into 1,000,000 shares. The company is empowered to carry on a mining and smelting business and to purchase from Maurice W. Bacon and William E. Cullen, Jr., 14 mining claims situated in the Kootenay mining division. The Hudson's Bay Company has its headquarters at Salmo. Maurice W. Bacon and William E. Cullen, Jr., are at present associated with others in the operation of the Hudson Bay mine at Salmo, which it is believed will be the principal property to be controlled by the new company.

Halifax, N.S.—At a meeting of the Board of Directors, of the Nova Scotia & Coal Co., it was decided to proceed at once with the erection of another blast furnace at Sydney Mines, to cost from $200,000 to $300,000.

Copper Bounty Proposed.—The Hon. Lorne Campbell, Minister of Mines for B. C. Legislature announced in the House that the Dominion Government was considering the proposal of a copper bounty for British Columbia, which would place the province in control of the copper and zinc output of Canada.

The Iron Works, has been incorporated at Ottawa, with a capital of $96,000 to carry on a general foundry, boiler and machine shop business at Owen Sound, Ont. Incorporators: Frances Howard Kilbourn, John McEwen and Samuel A. McDougall, all of Owen Sound.

N. Bruce McKelvie, of the firm of Hayden & Stone, Boston and New York, has been appointed a director of the Nova Scotia Steel & Coal Co., Halifax, N.S. Mr. McKelvie is a native of Prince Edward Island and was at one time on the Bank of Nova Scotia staff. This appointment completes the board of directors.

A. E. Wright, of the Dominion Steel Foundries, Hamilton, Ont., has been promoted to the position of secretary-treasurer, and **Fred W. Sherman** will assume the duties of purchasing agent. **Mr. Hammon**, who was formerly secretary treasurer has severed his connection with the company, and has taken up his residence in California.

The International Molybdenum Co. has been incorporated at Ottawa, with a capital of $5,000,000 to develop, refine and otherwise treat ores, metals and minerals substances of all kinds, at Renfrew, Ont. Incorporators: Reginald Holland Parminter, Arthur John Thomson and William Symon Morloch, all of Toronto, Ont.

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Webster & Sons, Ltd., Montreal.
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Webster & Sons, Ltd., Montreal.
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Wire, Wire Rods and Nails.
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Osborn Mfg. Co., Cleveland, O.

CANADIAN FOUNDRYMAN

AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields.

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EDITORIAL CONTENTS

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ADVERTISING INDEX

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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VOL. VII. PUBLICATION OFFICE, TORONTO, MAY, 1916 No. 5

Elliptic ANODES

MADE IN CANADA

We are in a position to give you

Nickel Anodes of Established Purity

made from Canadian Grain Nickel and cast in Canada under conditions that ensure a plate of the proper structure as regards hardness and crystaline formation of the molecules of metal.

H. & V. W. Patented Elliptical Anodes save loss of metal and electrical energy, and they give uniform, smooth and quicker deposits with best possible distribution of metal and circulation of solution. They are not porous or spongy.

A great advantage in the use of these Patent Elliptic Anodes is the uniformity of deposit as disintegration takes place from all sides of the anode, consequently the molecules are distributed uniformly throughout the solution, and not only hasten the deposit, but give a heavier deposit in a given time. Another important feature in these anodes is the fact that they wear down evenly to a small narrow strip, and when worn down to such a point that it seems desirable to put in more nickel, the old ones, which take up practically no room in the tank, can remain until entirely consumed, and as a result there is practically no scrap nickel to dispose of at half price. The waste averages but 5% of the original weight, while a flat plate shows a loss of from 14% to 27%.

All other shapes of anodes are used down to a certain point, taken out and disposed of as scrap, and in this way an average of 14-27% of the original weight is sold at a heavy loss, while our Patent Elliptic Anodes can be used until almost entirely consumed.

Curved Elliptic ANODES

for Plating Barrel Solutions

We show herewith a curved Elliptic Anode which we use with our patent mechanical plating apparatus. These anodes are curved to fit the periphery of the revolving barrel, and when the anodes are hung at each side of the tank, the barrel holding the work is equidistant at all times from the anodes, hence a regular and even deposit is obtained.

Canadian Hanson & Van Winkle Co., Limited

TORONTO, CANADA

The Publisher's Page

By B.G.N.

I WAS talking a day or two ago to one of Canada's most prominent advertisers in the engineering field. The subject was advertising.

"We are sold up now for several months and I cannot see how we can very well increase our capacity or our facilities for turning out our product," said this successful manufacturer.

"In spite of this, however, we are going to continue our advertising week in and week out and year after year, and we are going to do more advertising if anything—certainly not less. We are not going to quit.

"I started in this business thirty years ago," he continued, "and at one time I personally knew every firm from whom we purchased material and supplies. As promotion came I lost touch with our transactions with these firms and in a comparatively few years I was signing checks payable to concerns which I had never heard of when I was purchasing agent.

"New firms are constantly being established, new factories being built, new men being placed in charge of them. It is to reach these men long before they acquire purchasing power that we are advertising so aggressively to-day.

"I want to reach the apprentices, the ambitious mechanics, the young fellows in the offices who some day, perhaps in the near future, may acquire authority and possibly own businesses of their own."

The advertiser in question said many other things regarding pertinacity of purpose in promoting prosperity through publicity. He preached as fine a sermon on advertising as one could wish—clear, convincing and bristling with incidents from his own experience as a successful advertiser. I would like to tell the whole story but there's sufficient meat in the part I have related to keep a thinking man busy and a busy man thinking. The moral of it is worth real money. I wish I felt at liberty to give you the advertiser's name—it would, perhaps, add strength to the story.

Metal Coating Processes: Their Application and Apparatus

Staff Article

Metal coating is a mechanical process as distinguished from electro-plating and dipping in molten metals which processes exert more or less of an alloying influence between the work and the coating. The processes described cause the metal to impinge so violently as to intermesh with the surface particles of the substance being coated at a temperature and under conditions which allow of its application to non-metallic, perishable and delicate materials.

THE protection of metals from oxidation has long occupied the attention of chemists and metallurgists. Many methods and processes have been developed and utilized, with varying degrees of success, but in every instance their usefulness has been confined within certain limits; both to the metals or objects coated, and also to the coating materials.

With the exception of the higher classes of electro-plating the only two notable examples which have been extensively used in the industrial field are those of galvanized zinc and tin covered sheets; and even with the limitations imposed by lack of scientific knowledge up to this time, millions of dollars have been invested and made with these two metals acting upon sheets of iron brought to the coating medium, and individually handled. However, even these processes with all their other limitations could not be successfully carried out with some metals, and no coating could be made on fabric, wood, glass, etc.

Recent Developments

Probably the most recent method, and also the most promising for commercial and industrial purposes, is that of the Schoop process. For many years Dr. Max Ulrich Schoop, of France, carried on research and experimental work along these lines. There has recently been developed by the present holders of the process patents to such a degree that the uses to which this process can be adapted are almost innumerable.

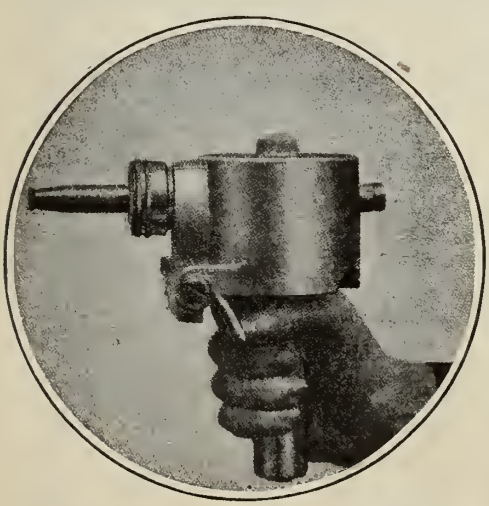


FIG. 1. METAL COATING PISTOL WITH AUTOMATIC WIRE FEED AND BLOW PIPE COMBINED.

With this latest method—in contradistinction to all other methods— it is not necessary to bring the object to be coated, to the coating medium; the process can be successfully applied under any condition. No surface of any nature whatever will be too small, nor too large, to receive a coating of almost any metal, varying in thickness from 1-1,000 of an inch to as thick as may be desired. In other words, the applications of this discovery are revolutionary in character and have evoked the wonder and admiration of the scientific and industrial world, in the possibilities opened up for their use and application.

Light and Serviceable Equipment

The necessary equipment for this process of metal coating, is a supply of oxygen and hydrogen, and a specially constructed "pistol," shown in Fig. 1. The operation of this "pistol" will be more clearly understood by referring to Fig. 2, which illustrates the internal details of nozzle and operating mechanism. This interesting portion of the "pistol" consists of a minuiature air motor, with straightening and centering device, also a set of rolls for feeding the wire through the "pistol." These feed rolls can be operated at two different speeds, according to the nature of coating metal being used and the grade of coating desired. When the oxygen supply enters the "pistol" it divides into two channels, one leading to the nozzle, and the other into the operating motor. The sectional cuts shown in Fig. 2 are views of the most recently developed type of "pistol," used for disintegrating a wire of any metal and projecting the molten particles thereof on to a surface so that they are in intimate contact therewith.

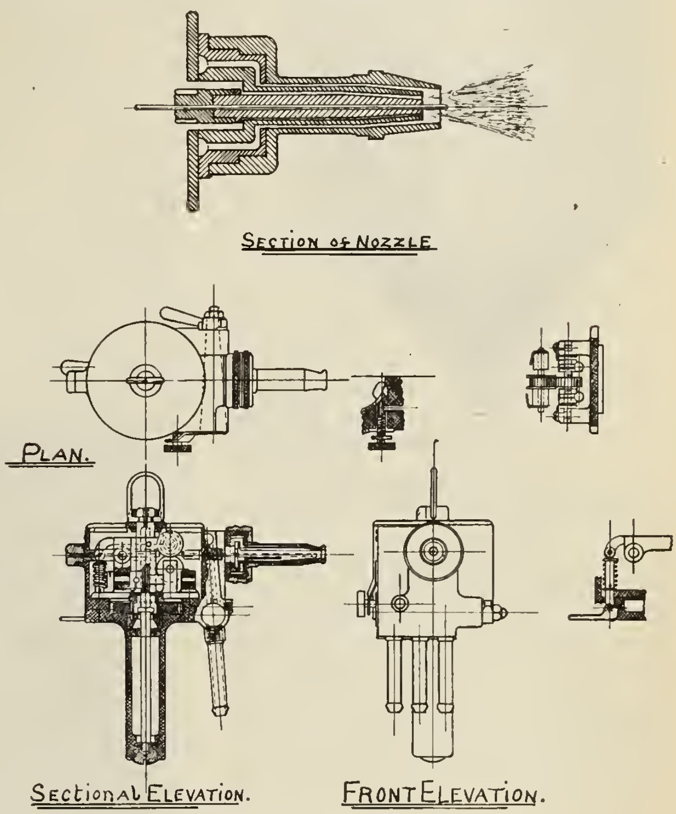


FIG. 2. DETAILS OF PISTOL CONSTRUCTION.

The theory of the Schoop process, as given by the inventor is, that the gaseous medium used is much larger in volume at any moment than the drop of metal it has atomized and is carrying, and the gas is expanding so rapidly that its temperature is far lower than that of the spray. A rapid exchange of heat therefore, takes place between them which consolidates the molten particles and gives them a temperature far below the melting point. If the particles arrived in a liquid state at the base with the observed velocity of 3,000 feet per second, they would simply splash on the surface and largely rebound. As a matter of fact, they impact and inter-penetrate freely, and later bombarding particles unite with the earlier ones to form a homogeneous compact body.

"Gravitas" Method of Application

The latest development along these lines is that shown in Fig. 3 which is the "Gravitas" (trade mark) type of machine, in which the metal to be used for coating is finely pulverized before being applied. In this apparatus, the inner tank contains the metal dust, and the outer portion, the air; the supply of metal dust is regulated by the valve shown in the centre of the tank which communicates with the outlet at the base. The mixture of air, dust and gas is then ignited and applied similarly to that described above.

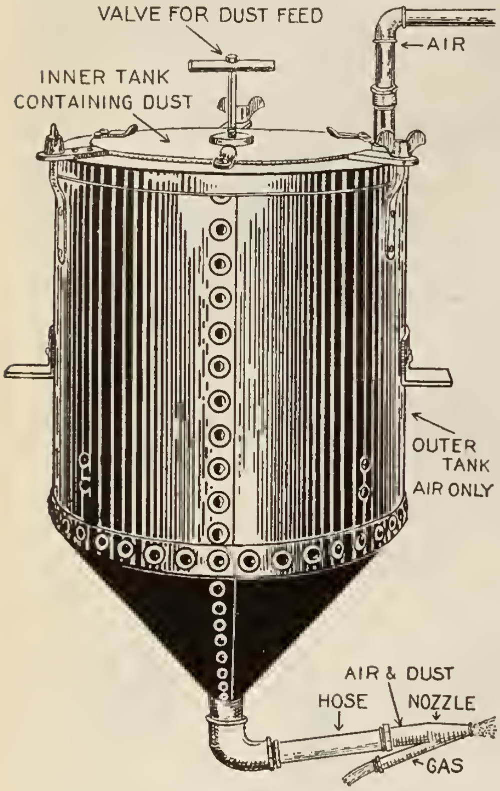


FIG. 3. DOUBLE TANK APPARATUS FOR USE WITH METALLIC DUST PROCESS.

In all cases of metal coating it is advisable to have surfaces thoroughly cleaned before applying the spray; in fact, to insure satisfactory work it is essential that the surface be entirely free from any dirt, grease or other impurities. It may be found necessary, therefore, under certain conditions, that surfaces will require to be sand-blasted or otherwise cleaned to remove any objectionable feature that would prevent the satisfactory application of the coating material.

An interesting feature in connection with the use of this method of metal coating is noted. This is the use of the Schoop system of metalisation for imparting a metallic polish to the surface of enemy airships. The nose end of the envelope is coated for about one fifth of the ship's length, and considerable increase in speed is obtained due to the decreased skin friction between the surface and the atmosphere.

Tables 1, 2 and 3 set forth the relative cost of various coatings under different conditions. These costs, however, are based on the price of metals under normal conditions before the opening of European hostilities.

Unlimited Field

The uses of the processes are so wide that to enumerate them all would be to index all the arts and sciences. The general application for electrical purposes is unlimited, and for construction and industrial purposes this method of applying non-corroding metal will be indispensable, taking the place of the now expensive and easily destructive paints and varnishes. In fact the process can be adapted to such universal advantage that it is almost impossible to conceive

TABLE 2—COST TO COVER ONE SQUARE FOOT BY SPRAYING.

Metal	Diam., inches	Speed of wire in ft. per min.	Time to cover one sq. ft. Min.	Sec.	Thickness inches	Cost of spraying	Cost of wire	Total cost
Copper	.032	12	1	10	.001	$.021	$.0076	$.0286
Brass	.032	12	1	10	.001	.020	.0071	.0271
Bronze	.032	12	1	10	.001	.024	.0101	.0341
German silver	.032	12	1	10	.0089	.024	.0105	.0345
Aluminum	....	16	..	40	.001	.0128	.0042	.0170
Zinc	....	18	..	30	.0015	.0081	.0115	.0196
Lead	.076	25	..	25	.002	.0064	.021	.0274
Tin	.062	25	..	30	.002	.0088	.0875	.0963

TABLE 3—COST OF SPRAYING ONE POUND.

Metal	Feet per pound	Speed of wire in feet per min.	Time to spray one lb. Min.	Cost of spraying	Cost of wire	Total cost
Copper	340	12	28	$ .50	$.1725	$ .6725
Brass	350	12	28	.47	.1625	.6325
Bronze	244	12	28	.53	.2225	.7525
German silver	330	12	28	.51	.25	..76
Aluminum	761	16	48	1.075	.37	1.445
Zinc	283	18	14	.227	.33	.557
Lead	50	25	2	.032	.10	.132
Tin	105	25	4	.07	.70	.77

FIG. 4. VIEW IN EXPERIMENTAL LABORATORY SHOWING A VARIETY OF THE APPLICATIONS.

TABLE I—DETAIL COST OF USING PISTOL ONE HOUR.

Metal	Diameter inches	Speed of wire in feet per min.	Pounds per Hr.	Oxygen Gauge pressure	Oxygen Cubic feet	Cost at $.02 cu. ft.	Blau Gas Gauge pressure	Blau Gas Cubic feet	Cost at $.008 cu. ft.	Labor per Hr.	Cost of air per Hr.	Cost of spraying	Wire cost per Hr.	Total cost per Hr.	Total cost per Min.
Copper	.032	12	2.15	27	24	$.48	25	13	$.104	.30	$.20	$1.08	$ .366	$1.446	$.0241
Brass	.032	12	2.15	28	21	.42	26	14	.11	.30	.20	1.03	.335	1.365	.0228
Bronze	.032	12	2.15	27	24	.48	25	14.4	.116	.30	.20	1.09	.432	1.522	.0253
German silver	.032	12	2.15	28	23	.46	26	14	.11	.30	.20	1.08	.545	1.625	.0271
Aluminum	.0375	16	.12	19	36	.72	16	13	.104	.30	.20	1.32	.44	1.76	.0127
Zinc	.0375	18	4.3	15	20	.40	13.5	10	.08	.30	.20	.98	1.23	2.21	.0368
Lead	.076	25	.30	14	20	.40	12	8	.064	.30	.20	.964	2.00	3.964	.0661
Tin	.061	25	.15	13	24	.48	14	10	.08	.30	.20	1.65	10.50	11.56	.1933

the entire range; even the long sought "putting on tool," of the careless mechanic is now available.

Experimental Laboratory

Fig. 4 shows a view of the temporary laboratory in Montreal; a large variety of articles are here shown which have been coated with various metals. The operator on the left is seen spraying a 4.5 shell with a coating of zinc, while the operator on the right is coating a smaller shell, by the "Gravitas" process.

We are indebted to the Metals Coating Co., of Canada, Montreal, for the illustrations accompanying this article.

FOUNDRYMEN'S CONVENTION AT CLEVELAND

TO permit the foundrymen who will attend the annual meetings of the American Foundrymen's Association and the American Institute of Metals, which will be held in Cleveland during the week of September 11, to indulge in plant visitations to a greater extent than was possible at previous conventions, where two or three sessions were held daily, it has been decided by the program committee of this organization to have only one technical session per day, which will continue from 9.30 a.m. until the papers and discussions for that session have been disposed of, the hour of adjournment having been tentatively fixed at 1 p.m. This arrangement, it is believed, will meet with the hearty approval of all of the members of these societies, and it will enable them also to devote more time to the inspection of the exhibits of foundry supplies and equipment and machine tools, which will be held concurrently at the Cleveland Coliseum. The conventions of these two societies will open one day earlier than formerly, the final session to be held on Friday. The annual meeting of the American Foundrymen's Association, therefore, will continue for a period of five days, from Monday, Sept. 11 to Friday, Sept. 15, inclusive. The meetings of both the American Foundrymen's Association and the American Institute of Metals will be held at the Hotel Statler, which also will be the headquarters of these two societies, but headquarters for the exhibitors will be at the Hollenden Hotel.

The meetings of the American Foundrymen's Association and the American Institute of Metals will be opened on Monday morning with a joint session of both societies, and the program will include the address of welcome and response; the annual addresses of the presidents of the American Foundrymen's Association and the American Institute of Metals and the reports of the secretaries of these two organizations. In addition, the representatives of the American Foundrymen's Association on the "Joint Conference Board on the Training of Apprentices" will present a report and the report of the committee on "Safety and Sanitation" also will be heard.

A joint technical session also will be held on Tuesday, the program being limited to three papers, which will constitute symposiums on the following subjects: "Waste Foundry Sand; Its Reclamation and Disposal," which will be discussed in various papers that will treat the topic from different viewpoints: "Results of the Closer Co-operation of the Engineer With the Foundry," as relating to the manufacture of aluminum and brass castings, cast iron, malleable cast iron and cast steel, and "Proper Gating of Molds," for the manufacture of aluminum and brass castings, cast iron, malleable iron and steel castings.

The annual business meeting of the American Foundrymen's Association will be held on Wednesday morning, Sept. 13, when officers will be elected and reports of the executive committee and the auditors will be heard. Also a report will be made by the special committee of five on the conferences which it held during the year that led up to the conduct of the exhibit under the auspices of the American Foundrymen's Association and the American Institute of Metals.

Three simultaneous sessions will be held on Thursday morning for the discussion, respectively, of gray iron, cast steel and malleable iron, while on Friday morning malleable iron and steel sessions will conclude the business of the convention. The program, as outlined, promises to be the best in the history of the American Foundrymen's Association, since the topics to be discussed are practical and relate to problems daily confronting the foundryman.

C. E. Hoyt, Lewis Institute, Chicago, exhibition manager, already has received a large number of applications for space and the indications are that the Cleveland Coliseum, which affords a floor area of 60,000 square feet will be crowded to capacity. No assignments of space have yet been made, nor has a floor plan been prepared, although this will be done within the next few weeks, when requirements of the various exhibitors approximately will be known.

A meeting of Cleveland foundrymen will be held for the purpose of appointing committees for the entertainment of the visitors, to serve as guides in plant visitation and for the reception and entertainment of the ladies who will attend. It is probable that the annual banquet will be held at the Statler hotel on Thursday evening, Sept. 14. Negotiations now are being conducted to secure several speakers of national reputation to deliver addresses at the banquet.

PRESERVATION OF IRON PATTERNS

A METHOD of preserving iron patterns from rust and corrosion is first to subject them to an air blast to remove dirt and dust, and then to immerse them in a pickle composed of 5 gallons of water and 1 pint of sulphuric acid. This is used hot, and the patterns are allowed to remain in it for 5 min. The patterns are then rinsed in water and dipped into a hot potash solution made by dissolving 1 lb. of potash in 1 gallon of water, thus neutralizing the acid left in the pores of the iron. The patterns are allowed to remain in the solution for about 5 min., and are then scoured with a stiff brush to remove the rust and again dipped into the sulphuric acid for a minute or so. They are then rinsed in cold water and not allowed to dry, afterwards being immersed in a weak cyanide of potassium solution made by dissolving 2 oz. of the cyanide in 1 gallon of water. Copper plating takes place in the regular cyanide copper-plating solution used by all electroplaters. The solution is used hot, and the deposit need not be thick, the time necessary being usually from 5 to 10 mins.

The next step is to rinse and dry the patterns, after which they are warmed and paraffin wax rubbed over the surface as a thin coating. When cool, the surface is brushed with a bristle brush in order to smooth down and even up the paraffin coating. They are then ready for use. The paraffin protects the copper from corrosion and allows the pattern to leave the sand easily.

Arc Welding.—Arc welding has been experimentally used for depositing new metal on worn flanges of steel car wheels. The electrode employed was of ¼ in. diameter cold-rolled steel. The total cost of removing, welding, finishing and replacing a wheel amounted to $3.50, which is approximately the same as that of turning down, while the value of the metal that would be wasted in turning is saved. Moreover, if turned, at least ⅝ in. of metal would have to be removed from the tread, reducing the life of the wheel by one-third. Wheels with welded flanges have run on an average 40,000 miles, which might be increased by using carbon electrodes and chilling the metal. The process has also been employed for restoring flat spots on wheels by depositing new metal and grinding to a true contour.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

THE FOUNDRY AND THE WAR

By R.C.G.

DURING this busy season when all those employed in the mechanical arts and industrials are engaged in turning out shells, cartridges or something for the Imperial Government, very little is being said about the part foundries are playing in this great work which is being rushed to the limit. A large concern, employing at the present moment, however, only 16 molders was called upon to make and deliver two 300 ton hydraulic shell forging presses for drawing 18 pounder shrapnel shells. The total weight assembled was a little over 30 tons and there was to be no delay in shipment.

Nature of Equipment

The foundry was equipped with overhead travelling crane, 72 in. and 54 in. diameter cupolas and every modern convenience for general work but quite unsuited for heavy hydraulic castings. On account of a deficiency in the required equipment for flanks and molders it was only possible to make one at a time of the 17,000 lb. castings of which there were 2 required which left a total of 54,800 lbs. of iron to be melted for the other special castings of which there were 2 of 10,500 lbs. top tables 2 of 6,400 lbs. rams 26 in. diam,; 2 of 1100 lbs. rams 10½ in. diam.; 2 of 900 lbs. rams 8½ in. diam., but an addition there was the regular work which amounted to some 15 tons. This tonnage would take too long to melt in the small cupola, consequently the large one had to be used.

The 8½ ton table required three hours to feed and the 72 in. cupola melted 18-20 tons per hour which would make it necessary to have the molders put up enough work to total at least 125,000 lbs. which was done in 2½ days of 10 hours each. Not in itself such a bad performance when it is remembered that only 16 men were used.

Drying a Large Mold

The core ovens were 60 inches wide while the platen to be made was 92 inches in diameter, without the flask, consequently a dry sand mould could not be made. Fortunately we had a turntable flask the drag of which was about 12 inches deep and the cope 11 inches. A wooden ring was built up out of 3 in. pine segments and nailed together forming a drag 12 in. deep into which the turntable drag was set the two parts being rammed up as one. Two molders with air rammers and one helper rammed and then swept up the job finishing it and setting cores by means of a spider. The cope was rammed upon a board, nailed up and dried with the drag the following day by supporting it on trestles and building a fire underneath. Care was taken to see that the flames were kept low and the heat distributed as uniformly as possible.

While it was realised that such a weighty chunk as this should be made in a dry sand mold, our core ovens being so small necessitated skin drying, which was done by employing a mixture of 9-1 flour and sand wetted with clay wash. This was placed for a depth of 1½ inches on the outside of the mold and after blacking had been sprayed over and brushed with glutine which is a core binder composed of resinous compounds which are the by-product of the wood pulp industry, and a proportion of sour beer. The other cores and in particular the small tee ones were made of a mixture containing one part of oil to thirty parts sand. It was found that all other core mixtures were unsuited for this class of work as they were incapable of withstanding the heat without casting the cores to bake or fuse. With this mixture 45 minutes sufficed to clear the burned cores, rods, nails etc., from the slot. In setting the cores they were placed when just hard enough to handle as the subsequent skin drying which was done with steel plates and coke in about four hours gave off enough heat to dry the cores.

The pouring gates dropped iron straight down to plates nailed on the bottom of mold, so it was necessary to cut small gates in the webs of the cores to let iron in on both sides of the cores, which prevented the possibility of iron breaking core, due to the head of metal. Great care was exercised in making this skin dried mold to guard against the deep walls, cope, etc., from giving trouble due to lack of nails and gaggers which were used freely. In drying a slow uniform heat was used and a moderate temperature to prevent the flour burning out and causing the walls to crumble.

The 5 ton castings were straight dry sand work as were the 10½ in. and 8½ in. rams straight green sand, while the 26 in. rams were made with a ring pattern about 24 in. long; the mould being checked up and the pattern drawn as the work progressed. All cores were made with sweeps which effected a great saving in time, labor, and expense. The iron mixture used contained 30 per cent. of steel, and from the following figures it will be seen that the results were quite satisfactory.

	Sample No. 1	Sample No. 2
Silicon, per cent.	1.38	1.48
Manganese, per cent.	.55	.59
Sulphur, per cent.	.127	.142
Phosphorous, per cent.	.454	.415
Combined carbon, per cent.	.76	.70
Graphitic carbon, per cent.	2.19	2.85
Total carbon, per cent.	2.95	3.55
Chill depth, inches	¼	⅜
Tensile strength, pounds per square inch	32,850	32,700

Mixture of Iron

A 4 in. square test piece showed very uniform metal throughout, and a 1½ in. square piece showed that the iron could be easily machined, and showed no signs of excessive hardness.

Transverse test 1¼ in. dia. on 12 in. centres.

Maximum load, pounds, 4,000 defection, inches .18.

The heavier of the smaller castings required twenty-four hours to cool before cleaning, and the 8½ ton piece required 36 hours.

An Improvised Job

Recently an order for a hydraulic accumulator 23 feet long and 13 inches diameter was received. The thickness of casting was 5 in. and a 4 in. diam. core ran down the centre for almost the whole length. There was no pit, no flanks and no core ovens for drying which would fit the work; so it was necessary to improvise as much as possible.

A red pine flask was made out of 3 in. stock leaving approximately 14 in. sand around the pattern. Some iron bars were found which would fit and four were placed in the cope and four in the drag. The cope and drag were both 24 inches deep, which would make the approximate weight of cope some 9 or 10 tons which is quite a weight for a wooden flask and the figure given does not include the weight of the timber but sand only. Iron hooks for lifting with the crane were made from 3½ in. x 1 in. steel plates forged to shape at one end.

The pouring gates were 1½ in. and the runners to castings were 2 in. x 3 in. high (they being made high so that iron would not be carried out against and cut the core) on each side 15 in. from each end of casting. The risers were 4 in. x 3 in. and $6\frac{1}{2}$ in. diam. and as there were four they were evenly spaced from the highest point at the big end where the largest was placed.

The mold was rammed by three molders, two with air rammers, assisted by two helpers the pattern was drawn, the whole job nailed and blackened in 10 hours. This was a dry sand job the mixture being 1 barrow old molding sand; 2 barrow new moulding sand; 1 barrow old river moulding sand; 1 barrow new river moulding sand; 2 pails saw dust; $\frac{1}{4}$ bag sea coal. Wet with thick clay wash. Plates, set on bricks on the parting line of drag, supported wood and coke which dried the mold in six hours.

Construction of Core

The core was anchored with 4 $1\frac{1}{2}$ in. diameter chaplets and 4 $\frac{3}{4}$ in. chaplets put down through the cope and barred. The heads of all chaplets were shaped to the diameter of core to prevent or minimize chances of slipping. The diameter of the $1\frac{1}{2}$ in. chaplets while unnecessary to hold core, was increased to minimize chances of burning. These chaplets were set one yard apart or very nearly so, as this was deemed advisable on account of the very small diameter of the core, the core's great length which necessitated a fairly large vent hole thus weakening and allowing it to spring in spite of 6 $\frac{3}{4}$ in. diameter and four $\frac{1}{2}$ in. core rods; also the thickness of the metal.

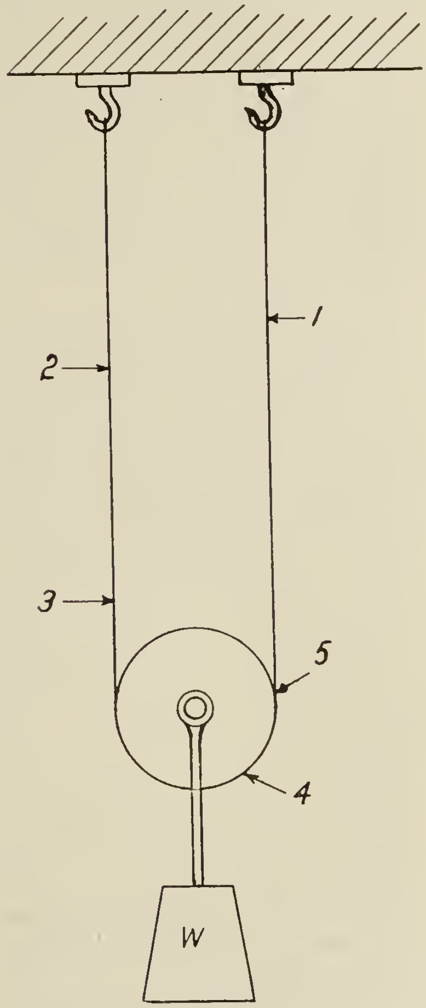
As the mold was poured in a horizontal position from each end and had to be run cold so as not to strain the mold or burn the core (which was protected by being inserted in a pipe) a small ridge was made along the top of casting to receive any or all dirt which might accumulate. This ridge was afterwards planed off before turning. The core was made in two sections and jointed with a pipe in the vent hole. Oil sand was used in the mixture, as in cases similar to the above, it had proved its capability of withstanding the extreme heat and pressure.

It might be said that in 10 days from the time the order was placed the castings were delivered. In addition to the heavy presses which are being made there are all kinds of dies, tool holders, gauges, chilled dies and machine repairs so that I believe the foundryman as usual deserves some little credit.

ROPE STRAIN PROBLEM

By N. G. Near.

WITH reference to the query of J. R. H. under the above title in a recent issue, we all have doubtless known for a great many years that there is no difference in tension between Figs. 1 and 2, appearing there. This is true because of the old law of physics—"Action and reaction are equal and opposite in direction." Yet, that isn't a good answer. Just because a law says a certain thing it doesn't necessarily prove that the thing is right, for even laws may sometimes be wrong. It is stated, for example, that the well-known laws of gravitation aren't "absolutely accurate," but are very close—close enough for all practical purposes. Perhaps, as far as I know, they are "absolutely accurate." I am merely quoting others who have studied laws of gravitation more than I have and should therefore know more about them. In consequence, we will assume for the present that the old "action and reaction law is wrong," and go after the "proof" which J. R. H. desires.



ROPE STRAIN PROBLEM. DIAGRAMMATIC PROOF OF SOLUTION.

I rigged up a little device as shown in the sketch and instead of a rope used a string around the pulley. I applied load enough with my hands to break the string. I used five different lengths of string, all from the same ball, and noted the places where the string broke each time. In no test did the string break at the "middle" of the contact with the pulley. It broke in the places I have indicated by number, the numbers designating the number of the tests made.

Since a string is fairly uniform in strength from end to end, and since my results are fairly uniform, I consider this pretty good "proof" that the tension is equal all over the rope or string, as the case may be, and that therefore no difference in tensions exist in the two figures accompanying the original query. The old "Action and Reaction Law" is also vindicated.

GRINDING WHEEL FLANGES

By C. W. Blakeslee*

THE flange plays a very important part in the protection and support of the grinding wheel. Opinions differ somewhat as to the diameter of flanges relative to the diameter of the wheel. However, my opinion is that the minimum diameter of flanges should not be less than one-half the diameter of the wheel and as much larger as possible consistent with grinding conditions. If possible use more than one set of flanges so that changes can be made as the wheel wears down.

Objections are somtimes made against large-diameter flanges on account of interfering with the grinding on the side of the wheel. If it becomes necessary to do much of this class of grinding, it is advisable to equip the floor machine with a cylinder to carry ring wheels, which are made especially for side grinding, or the cup wheel with a protection hood. However, if the straight wheel is used for this purpose, do not forget that an unusual strain is put on the wheel and the greatest of judgment should be used in this operation. Side grinding on a straight wheel should be discouraged wherever possible and cylinder wheels recommended.

Grinding on the top of the wheel is a very dangerous operation. Many serious accidents have resulted in this method of grinding. If the work is allowed to ride over the wheel to the front it is likely to catch on the wheel and be carried rapidly to the hand-rest. The crash usually results in a broken wheel. While this class of grinding is extremely dangerous and should be discouraged, yet if such method becomes absolutely necessary, the operator should by all means place himself back of the machine so that the wheel will revolve from him rather than toward him as is the case when standing in front of the machine. This would prevent the wheel from at least catching the work and snapping it down to the hand-rest.

*Manager, Abrasive Material Co., Chicago.

Mineral Production of Canada for Calendar Year 1915--II.

By John McLeish, B-A. *

The accompanying statistics have become available through the issuance of a preliminary report by the Department of Mines, Ottawa. Although subject to slight additions or modifications of detail pending final compilation at a later date, we believe a more than ordinary interest will be taken in the data presented, particularly on account of the war-created activity which has marked almost every section of Canada's mineral resources development.

IRON ore shipments in 1915 amounted to 398,112 short tons valued at $774,427, compared with 1914 shipments of 244,854 short tons valued at $542,041. The 1915 shipments included hematite 205,989 tons, roasted siderite 132,906 tons, and cobbed magnetite and concentrates 59,217 tons. The 1914 shipments included hematite 89,454 tons, roasted siderite 109,838 tons, and cobbed magnetite and concentrates 45,562 tons. In the Great Lakes area the same ore prices prevailed as in 1914 and 1910 which were the lowest recorded in many years. Mine operators report 93,444 tons of ore exported to the United States and 304,668 tons shipped to Canadian furnaces.

According to the records of the Customs Department exports of iron ore amounted to 79,770 tons valued at $206,823 and imports of iron ore to 1,490,722 tons valued at $2,320,066. Shipments of iron ore from Wabana Mines, Newfoundland, in 1915, by the two Canadian companies operating there were 686,451 short tons of which 620,128 tons were shipped to Cape Breton and 66,323 tons to England. In 1914 the shipments were 639,430 short tons, of which 422,920 tons went to Cape Breton and 216,510 to the United States and Europe.

Pig Iron

The total production of pig iron in Canadian blast furnaces in 1915 was 913,719 short tons, valued at approximately $11,592,819 as compared with a production of 783,164 short tons in 1914 valued at approximately $10,002,856. A large proportion of this production is used directly in the manufacture of steel and the values are in part estimated. The 1915 output shows an increase of 130,555 tons or 16.67 per cent. over that of 1914, and compares favorably with the average of recent years. Of the total production in 1915, 13,692 tons were made with charcoal and 900,027 tons with coke. Included in the ore charged to blast furnaces, there was 293,305 short tons from Canadian mines and 1,463,681 tons of imported ore. Of the imported ore approximately 840,587 tons came from Newfoundland.

The blast furnace plants, operated for varying periods of time, included those of the Dominion Iron & Steel Co., at Sydney, N.C., the Nova Scotia Steel & Coal Co., at North Sydney, N.S., the Standard Iron Co., at Deseronto, Ont., the Steel Co., of Canada at Hamilton, Ont., the Canadian Furnace Co. at Port Colborne, Ont., and the Algoma Steel Co. at Sault Ste. Marie, Ont.

There was also in 1915 a production in electric furnaces of 10,794 tons of ferro-alloys (chiefly ferro-silicon with a very small tonnage of ferro-phosphorus), valued at $753,486 as compared with a production in 1914 of 7,524 tons valued at $478,355. About two-thirds of the ferro-silicon production in 1915 was of 50 per cent. grade, and the balance was of 75 and 85 per cent. grade.

Pig Iron Exports and Imports

The exports during 1915 of pig iron were 17,307 short tons valued at $231,551 or an average per ton of $13.38, and of ferro-silicon and ferro-compounds 9,238 tons valued at $537,081, an average of $50.81 per ton, or a total of 26,545 tons valued at $768,632 as compared with a total in 1914 of 19,063 tons valued at $486,366. The imports were 47,482 tons of pig iron valued at $624,200, or an average of $13.15 per ton, and 13,758 tons of speigeleisen, ferro-manganese and ferro-silicon valued at $807,312, or a total of 61,240 tons valued at $1,431,512.

Electro Metals, Ltd., producing ferro-silicon, have considerably enlarged the capacity of their plant at Welland, Ont., to meet the increased demand for their product occasioned by the war. In addition to sales for Canadian consumption a large and important tonnage has been furnished to Great Britain, Russia and the United States.

Steel Ingots and Castings

The production of steel ingots and castings in 1915 including 5,626 tons from electric furnaces, was 1,020,335 short tons, as compared with a production in 1914 of 828,641 tons. The 1914 production included open-hearth ingots 608,383 tons; Bessemer ingots 203,184 tons; direct open-hearth castings 15,315 tons; and other steel castings 1,759 tons, these figures being a revision of those previously published.

Asbestos

The asbestos production in 1915 was obtained from the same field in Quebec as heretofore. The output was less than in 1914, but sales showed an increase of about 17 per cent. Stocks on hand at the end of the year showed a noticeable decrease. The total output in 1915 was 106,558 tons, as against 107,668 tons in 1914, showing a decrease of 1,110 tons or 1.03 per cent. The sales and shipments during 1915 were 113,115 tons valued at $3,491,450, or an average of $30.87 per ton, as against sales in 1914 of 96,542 tons valued at $2,892,266 or an average of $29.92 per ton. The 1915 sales were larger in quantity than those of 1914 by about 17 per cent. and in value by about 20 per cent. Stocks on hand at December 31st, 1915, were 22,052 tons, as compared with stocks on hand of 31,171 at the end of the previous year. The number of men employed in the mines or quarries and mills were 2,393 and the amount paid in wages was $1,089,976 as against 2,992 men employed in 1914 to whom was paid in wages $1,283,977. The total quantity of asbestos rock milled during the year is reported as 1,795,472 tons, which with a mill production of 102,571 tons shows an average estimated content of about 5.71 per cent. of asbestos fibre in the rock. The estimated content of fibre in rock milled in 1914 was 6.03 per cent.

Asbestos Sales and Exports

The total sales of crude asbestos in 1915 were 5,366.7 tons valued at $1,071,860, or an average of $199.72 per ton as against sales in 1914 of 4,147.9 tons valued at $773,193 or an average of $186.42 per ton. The total sales of mill stock in 1915 were 107,748 tons valued at $2,419,590 or an average of $22.46 per ton, as against sales in 1914 of 92,394 tons valued at $2,119,073, or an average of $21.64 per ton. There was also a production of asbestic of 25,700 tons valued at $21,819.

Exports of asbestos during the calendar year 1915 were 84,584 tons valued at $2,734,695, or an average of $32.45 per ton, as against exports of 81,081 tons in 1914 valued at $2,298,646 or an average of $28.35 per ton. There was also an export of asbestos sand amounting to 25,103 tons valued at $157,410, or an average of $6.27 per ton and of manufactures of asbestos valued at $125,003. Imports of asbestos manufactures for the year amounted to $168,894.

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Coal and Coke

Coal.—The total production of marketable coal for the year 1915 (comprising sales and shipments, colliery consumption, and coal used in making coke, or used otherwise by colliery operators), was 13,209,371 short tons valued at $31,-957,757, as against 13,637,529 tons valued at $33,471,801 in 1914 showing a decrease of 428,158 tons, or 3.14 per cent. in quantity, and of $1,514,044 or 4.52 per cent. in total value. In estimating the values of the coals, arbitrary values are assumed for the Nova Scotia and British Columbia production viz.: $2.50 per long ton for the former and $3.50 per long ton for the latter. The values used for coal production in the other provinces are those furnished by the operators.

The Nova Scotia production was 7,-429,888 tons, an increase of 58,964 tons, or 0.8 per cent. over that of 1914; the Alberta production 3,320,431 tons, a decrease of 362,584 tons, or 9.8 per cent.; the British Columbia production 2,089,966 tons, a decrease of 149,833 tons, or 6.7 per cent.; the Saskatchewan production 236,940 tons, an increase of 4,641 tons, or about 2 per cent.; the New Brunswick production 122,422 tons, an increase of 24,373 tons, or 24.85 per cent.; and Yukon Territory, a production of 9,724 tons, a decrease of 3,719, or 28 per cent.

Coal Exports and Imports

The exports of coal in 1915 were 1,-766,543 tons valued at $5,406,058, as compared with exports of 1,423,126 tons in 1914 valued at $3,880,175, an increase of 343,417 tons or 2.41 per cent.

The imports of coal in 1915 were made up as follows: Bituminous round and run of mine; 6,106,794 tons, valued at $7,564,369, or an average of $1.24 per ton; bituminous slack 2,286,916 tons valued at $2,027,256, or an average of $0.89 per ton; and anthracite 4,072,192 tons valued at $18,753,980, or an average of $4.61 per ton, making a total of 12,-465,902 tons valued at $28,345,605.

Imports during 1914 included bituminous, round and run-of-mine 7,776,415 tons valued at $14,954,321 or an average of $1.92 per ton; bituminous slack 2,-509,632 tons valued at $3,605,235, or an average of $1.43 per ton; and anthracite 4,435,010 tons valued at $21,241,924 or an average of $4.79 per ton, making total imports of 14,721,057 tons valued at $39,801,498.

The above figures show that in 1915 there was a decrease from imports of the previous year in quantity of 2,255,-155 tons, of 15.3 per cent., and in value of $11,455,893, or 28.78 per cent. The larger decrease in value is due to the average value of bituminous, round, and run of mine dropping from $1.92 per ton in 1914 to $1.24 per ton in 1915, and that of bituminous slack from $1 44 to $0.89. The details of the decreases in imports are as follows:—In bituminous, round and run-of-mine 1,669,621 tons or 21.5 per cent.: in bituminous slack of 222,-716 tons, or 8.9 per cent.; and in anthracite of 362,818 tons or 8.2 per cent. The apparent consumption of coal during 1915 was therefore 23,849,040 tons, as against a consumption the previous year of 26,852,323 tons. Canadian mines contributed 48 per cent. of the domestic consumption, and the balance was imported. The total Canadian production was equivalent to about 53.4 per cent. of the consumption.

Coke.—The total output of oven coke during 1915 was 1,200,766 short tons made from 1,856,393 tons of coal of which 1,425,172 tons were of domestic origin and 431,221 tons were imported The total quantity of coke sold or used by the producers during the year was 1,168,921 tons valued at $4,253,536 or an average of $3.64 per ton. In 1914 the total output was 1,015,253 tons, and the quantity sold or used by the producers was 1,023,860 tons valued at $3,658,514 or an average of $3.57 per ton. Returns for 1915 show a production of 0.647 tons of coke per ton of coal charged, as compared with 0.658 tons of coke per ton of coal charged in 1914.

Provincial Coke Output

The output of coke by provinces in 1915 was as follows: Nova Scotia 584,-993 tons, an increase of 239,113 tons over 1914 production; Ontario 316,211 tons, a decrease of 61,303 tons; Alberta 24,187 tons, a decrease of 4,354 tons; and British Columbia 275,375 tons, an increase of 12,057 tons. The Ontario production was entirely from imported coal. By-products from coke ovens which included 10,448 tons of ammonium sulphate, 7,365,931 gallons of tar, and 4,-089,602 thousand cubic feet of gas, made in 1915 were in excess of the production in 1914; there was also for the first time a production of benzol and associated compounds. The production of trinitrotoluene near the close of the year was reported by Col. Carnegie of the Shell Committee, as 100,000 pounds per week

The ovens operated during the year were those at Sydney, Sydney Mines and Westville, N.S., Sault Ste. Marie, Ont., Coleman, Albert, and Fernie, Michel, and Union Bay (Comox), British Columbia. At the close of the year there were about 1,742 ovens in operation, as contrasted with only 797 in operation, at the end of 1914. Over 800 ovens at Stellarton and Londonderry in Nova Scotia; Port Arthur, Ont.; Lille and Passburg, Alberta; Carbonado and Hosmer, British Columbia, were idle throughout the year. Imports of coke during 1915 amounted to 637,857 tons valued at $1,608 464, and exports were 35,869 tons valued at $160,053.

TAPPING BLAST FURNACES

AT the Edgar Thompson works of the United States Steel Corporation, blast furnaces are tapped by a method devised by the engineering department of the Westinghouse Electric & Mfg. Co. An electric arc is drawn between an electrode and the chilled metal in the tap hole; the heat of the arc burns through the chilled metal until the fluid contents of the furnace are reached. If during the opening operation non-conducting material be encountered, it is necessary to stop the arc and drive a steel bar through this mass. The process of melting is then continued, the arc following this bar of metal. A 250-volt circuit is used, the pressure being reduced by means of a water rheostat. A current of from 800 amperes to 1,000 amperes is ample for the operation.

The apparatus required consists of a special electrode holder, electrodes, cable, a resistance, and a head shield or protector for the operator. The electrode holder consists of an iron pipe 4 ft. or 5 ft. long, in one end of which the electrode material is placed and clamped by means of a ring; the end of the pipe is split in order to give a clamping effect when the ring is forced down towards the end of the pipe. In the other end of the pipe a wooden pole is placed, the cable connection being made to the iron pipe. The entire length of the electrode and its holder is about 12 ft.

ELECTRIC STEEL

SOME statistics which have been recently issued show that the electric furnace is making steady headway. It is stated that the total number of furnaces now employed for steel making and in service has increased to over 300, and it is a significant fact, that recent progress in England has proceeded by greater strides than in any other country. Even in Sheffield, where a few years ago it was imagined that local conditions would preclude anything like an extensive employment of electric furnaces, a considerable number have now been installed.

It is the increasing demand for special steels which has led to this increasing use of the electric furnace by Sheffield steel makers. For motor car construction and for aeroplane parts the need for special varieties of steel has increased very rapidly since the outbreak of war, and it has been found by experience that these steels can be best produced in the electric furnace. No fewer than fifteen furnaces have been put in operation in Sheffield during the past twelve months.

Furnace Types

The type of furnace most commonly employed is the arc type, mainly of the Heroult form, and those now in service vary in capacity from 3 to 10 tons. It is reported that Hadfields have already five such furnaces at work, while Vickers, John Brown & Co., and Thomas Firth & Sons have each two in operation, and Arthur Balfour & Co., Samuel Osborne & Co., and the metallurgical department of the University one each. The demand for special steels for motor car manufacture has induced some of the leading motor manufacturers—including the Daimler Co.—to instal an electric furnace in their own works, and this is a tendency which is likely to increase. Whereas in England, as already indicated, the electric furnace has been mainly employed for the production of special steels, in the United States electric melting has been largely employed for the production of ordinary steels, although, of course, alloy steels are included in the output.

World Statistics

Turning to world statistics, it appears that the number of furnaces working in the United States, which was 30 at the end of 1914, has now increased to a total of over 70, so that America has displaced Germany, which has about 50 in service, from first place in the list. It should be pointed out also that many of the Germany furnaces are now being employed for the production of ferro-manganese. The Heroult furnace is that most favored by steel-makers — more than one-third of the total being of this type, the number of induction furnaces being less than 40.

TURNING OUT CHEAP CASTINGS

IN foundry work, says the Foundry Journal, two classes of castings have generally to be turned out—those which have to be made of the best quality and to stand high tests irrespective of cost, and those which have to be produced at a moderate cost, and which have to undergo no tests, but which merely have to be sound. Possibly both classes may have to be made in the same foundry, but more generally this is not the case where castings are made by engineering works running their own foundries, as such places always specialize more or less.

Class of Castings Feature

When laying out a place where cheap output has to be dealt with, the class of castings produced will need consideration and this because there are means of reducing costs very considerably. Thus the use of moulding machines, false backs in band moulding, and other things of this character cheapen labor in the making of moulds, while a coremaking machine reduces the cost where large numbers of cores of stock sizes are required. Besides such appliances as these there are also different things in regard to the sifting, mixing, and grinding of sand, carefully made flasks, and other items, tending to save time, so that having in view the class of work which is to be produced, by a suitable selection of the tools used in working, large savings can be made in the cost of the mould production.

As wages are a very important item in all classes of foundry work, it is equally important that everything should be done to make patterns and other details favor the moulder, because in many places more time is spent in mending and patching broken moulds than in their actual production, and this simply because the make of the patterns prevents a clean lift or draw being secured. The making of one or two extra flasks per day means a large reduction in cost of production, particularly where light castings are being dealt with.

Pattern Upkeep

Another point is to keep all patterns in good condition and well varnished, so that they do not suck the sand, for it will be found that, in all but exceptional cases, moulders appreciate good patterns. Apart from labor charges, fuel has to be considered, and a good foundry coke free from an excess of sulphur is cheaper than gas coke in crucible melting, because there is less weight per part of metal used on the one hand; again, crucibles burn out less on the other, sulphur being bad for plumbago crucibles.

Scrap Metals

Generally speaking, scrap metals would be used for cheap castings, and by careful sorting almost any class of castings can be produced. Take iron, for instance:—If galvanized stuff is kept out, rough scrap bought from itinerant collectors will take in everything from old machinery to soft iron, and from hard and burnt stuff to old saucepans and the like, some of the older material being good as new pig.

Brass and gunmetal, taken unsorted from the dealers, may be bought on an average far below what new metals would cost, and by careful sorting almost any class of castings can be produced. Even such stuff as small turnings, at a price, comes in well, but, of course, it is desirable that it should be passed through a magnetizing machine to remove iron. A good sorter will make a variety of qualities from a heap of mixed stuff, and will enable one to turn out almost any kind of cheap casting needed, even the poorest qualities having use. It generally happens with cast brass scrap that a fair proportion little better than brazing spelter is present; it may, therefore, usually be assumed that zinc is in excess. For this reason it is necessary to run down large crucibles where this is sorted out separately, and to use the metal for the lowest-priced castings. For the better work the rolled scrap will come in well.

Old-fashioned house bells should always be saved, as owing to their richness in tin, they work in well with gunmetal, provided they are not too freely added. As a matter of policy it is always well to use some good make of deoxidant flux with all scrap metals, because there is the ever-present risk of having paint or other objectionable foreign matter present with some part of the charge, and this may very well cause porosity. New metal should cast clean enough, but scrap is often awkward to deal with unless outside assistance is provided.

Trade Gossip

Amherst, N.S.—The Ledcote Co., of Canada, Ltd., has taken over a property here and is installing plant for covering sheets, etc., with lead as a substitute for galvanizing. William Knight is president of the concern.

The Burlington Metals Co. Ltd., has been incorporated at Toronto, Ont. with a capital of $40,000 to manufacture articles consisting of copper, brass, bronze, iron and steel or other metals. Head office, Hamilton, Ont. Incorporators, Reginald H. Parmenter, Arthur J. Thomson and William Symon Morlock all of Toronto.

The International Nickel Co. has informed the Dominion Government of its intention to begin the erection of the Canadian plant immediately. The company is understood to have under consideration a site on the Atlantic coast somewhere in the vicinity of Halifax, although the exact details in regard to this have not been given.

Britain Prohibits Export of Pig Iron.—The British Government on April 14, proclaimed an absolute prohibition of the export to any destination of all kinds of steel. The prohibition on steel applies especially to the variety used by railroads and shipbuilders, including rails, sleepers, springs, wheels, axles, tubes, girders, ingots, bars, angles and rods, and of plates more than an eighth of an inch in thickness.

To Provide Bounty on Canadian Zinc.—Sir Thomas White on April 11 gave notice of a resolution providing for the payment of a bounty of two cents per pound on zinc or spelter produced in Canada from zinc ores mined in Canada. The bounty is to be the difference between the standard price in London and a maximum of £36 19s. 3d. per ton. No bounty is to be paid when the price of zinc or spelter is eight cents per pound, none is to be paid during the war, and in no event is there to be a bounty on zinc produced after July 31, 1917. The total amount payable under the resolution is limited to $400,000.

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GENERAL BUSINESS AND SHIPBUILDING

INDUSTRIAL conditions continue to show steady improvement, the immediate and future outlook being, generally speaking, such as to engender and foster optimism. Canadian business enterprise is perhaps on a more stable basis than at any time in its history, and is marked by a caution that augurs well for its permanent maintenance in that respect. While the possibilities of developing an export trade have been fully realized for many months now, we have only recently taken active measures to get into touch with it, a circumstance, however, that is in no sense indicative of tardiness, but rather expressive of the already-mentioned caution and desire to fit and adapt ourselves to one or more of the trade opportunities that the war has made available.

In this connection it may be stated that not a few of our steel mills and allied enterprises are already taxed to the limit of their capacity on export business, the latter embracing practically every country in the world with the exception, of course, of enemy countries. The effect in these instances has been to create a commodity scarcity as regards domestic requirements, and have the natural consequence of causing increased prices in the latter sphere. However, if the export campaign as it develops intensity, works out as successfully as anticipated, it will not only lead to the maintenance of a favorable trade balance after the war is over, but will offset any tendency to a reactionary period which might be expected to set in immediately peace is declared.

The steel market, which after all is the real barometer and foundation of the industrial activity of this or any country, continues to maintain strength, the demand for steel being as insistent as ever. Our own mills as well as those of the United States have all the business they can handle for this and a large slice of next year, and, in saying that much, we are far from straining the situation. A shortage of labor is the meantime bugbear, and the immediate outlook is that manifestation of the latter may become more aggressive. The upward price tendency of practically all manner of commodities continues, and indications are that we are yet some distance from the peak.

The revival of wood shipbuilding on our Atlantic seaboard warrants passing notice, and, taken in conjunction with the activities in and demand for this class of vessel, it may not be amiss to infer that our Maritime Provinces of New Brunswick and Nova Scotia will achieve again at least a fair measure of the glory of accomplishment that the building of "wind jammers" brought them ere steel shipbuilding took pride of place.

The propagation and development of steel shipbuilding and marine engineering is not, however, being neglected, as the address delivered recently before the Canadian Manufacturers' Association in Montreal, by Col. Cantley, president of the Nova Scotia Steel & Coal Co., New Glasgow, N.S., amply proves. Both the need for an up-to-date Canadian merchant marine and for its being in large part, if not wholly, a Canadian product, were given ample vindication, and the parallel drawn and the results achieved through Government recognition and support of railroad and steel manufacturing enterprises were distinctly illuminating, well-timed and forceful as an argument.

The reference by Col. Cantley to Government support of our steel industries in years past is one that is easy of appreciation in times like the present, bringing vividly to our mind's eye the practically certain conditions that would have prevailed in Canada during these months of war—absence of munition and war supplies orders, had steel-making lacked the national recognition that has enabled it to place our Dominion on a production plane of world competitive degree. It is but natural to expect that what has been accomplished through Government support of railroad transportation and steel-making, will be procurable on an equal scale in the realm of shipbuilding.

ECONOMY IN USING METALS

THE present state of the metal market, while gladdening the hearts and fattening the purses of metal producers, ought ultimately to have a beneficial effect on the manner of consumption by large users in particular and individuals in general. In too many cases we have been apt to use whatever was most easily available and gave no thought to other materials which would have served the purpose equally as well. Much of this practice had become more habit than anything else, and only the hard fact of actual scarcity has been able to persuade people that something cheaper would do as well.

The successive changes from brass to cast iron, and cast iron to wood in the matter of shell shipping plugs is an outstanding instance of such necessity. The results are quite as satisfactory, and any manufacturer who in his private business could effect such a saving would not be likely to return to the use of the more expensive metal, even when prices are normal.

Most people never know what they can do without till they are forced to, and not the least of the ultimate benefits of the war will be in the general economy of material, which will be practised as a result of the many more or less compulsory experiments which are now being carried on.

INDUSTRIAL RESEARCH AND THE OPEN MIND

THE question of scientific and industrial research is engaging the attention of many manufacturers in this country, who, until the matter was forcibly impressed upon them by the commercial upheaval since hostilities started, did not appraise at its full value the wonderful development of enemy technical education.

It is more than desirable, indeed—it is imperative that our manufacturers strengthen their impending entry into world-wide markets by availing themselves of all possible sources of information, means of research, and methods of organization. The sources of information available to us will more than likely be available to our competitors, but no matter how much exclusive information any of our manufacturers might be able to obtain, it would be but of negative value if not vigorously applied to active production and progressive advancement.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

PRODUCTION OF VERDE FINISHES

THE production of the proper shades to match a sample is a difficult proposition for even a man with long years of experience behind him. The composition of the metal to be finished, the structure of the grain, and whether rolled or cast, are factors which play an important part in the production of the desired finish.

The writer has had samples of green finishes brought to him which were obtained on rolled brass and he was required to reproduce the finish on cast brass containing a higher content of copper. This is one of the demands which turn the hair gray. Again, a sample may be brought which had been sand-blasted and the same results were expected when there was not a sand-blast apparatus within a hundred miles. However, by acid dips, a casting brush run at the proper speed, and a good heating plant, the obstacles may be overcome.

Keen Observation Required

To obtain the beautiful mottled green and slate color seen upon jardinieres and articles of like nature which puzzle the amateur plater so much, it is necessary for one to have a keen observation. We can lay down general rules to follow which may be depended upon for uniform results provided the operator is able to see when he has gone just far enough with each operation.

The method for providing the effect mentioned is to begin by electroplating the article in a low brass solution (or light bronze) to which about one grain of arsenious acid to each gallon has been added. The content of free cyanide must be negligible. In fact it is better to have the solution clouded a little with undissolved copper salt. The voltage from the dynamo must be low (about two and one-half volts) so that a smut will be formed in depositing and the deposit show a yellow color blending into orange; as this takes only a few minutes the piece must be watched closely. Any granulation in the deposit is sure to cause trouble in finishing.

After plating to the desired color and smut, the piece is raised and lowered several times in a large volume of fresh water and then hung suspended in the water for a few minutes so that all trace of cyanides from the solution shall be removed. It is then immersed in the following solution:

Water	1 gal.
Sulphate of copper	5 oz.
Chloride of sodium	2 2/3 oz.
Cider vinegar	2 oz.
Acetic acid	1/4 oz.

The piece is left in the solution for ten minutes or more, when it will turn a dull slate color. It is then removed from the solution and placed in a moist atmosphere until it is nearly dry. Now a good, stiff stippling brush is used to bring out the mottled effect, the green not showing until the article is almost dry. If it be desired to leave the article with light and dark spots, giving an ancient look due to action of the elements, no further manipulation is required. If desirable however, that the piece should show a uniform mottled green and slate appearance then the moistening of the stippling brush with the verde solution is necessary, and the piece re-stippled after it has become dry.

If a gray and green and slate effect is desired it will be necessary to double the quantity of acetic acid in the verde solution. It should be lacquered with a spraying device, using a flat lacquer if a dull finish be desired, although a very beautiful effect is given with a brilliant lacquer.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers:

President—John A. Magill, 591 St. Clarens Ave., Toronto.

Vice-President—William Salmon, 48 Oak Street, Toronto.

Secretary—Ernest Coles, P.O. Box 5, Coleman, Ont.

Treasurer — Walter S. Barrows, 628 Dovercourt Road, Toronto.

PLACE AND DATES OF MEETING.

The Occident Hall, corner of Queen and Bathurst Streets. Fourth Thursday of each month, at 8 p.m.

Verde Antique

Verde antique or antique brass is produced as follows:—Cleanse the unpolished rolled or spun brass in a strong alkali and pickle in the sulphuric acid and water pickle until the scale has all been removed, then rinse thoroughly in water and again immerse in the potash. Right here is where the skill in handling comes in. If it be desired that the piece show an aged, streaked appearance with here and there reddish-brown streaks intermingled with green, it will be necessary to have some heavy iron wire coiled about the piece, and the handling of the work from the potash dip to the old and worn out bright dip which is the next step in the operation, must be rapid.

A quick immersion in the old bright dip will give a brighter color to the brass, which will naturally show lighter shades of verde and brass. A longer immersion in the bright dip will precipitate streaks of copper upon the piece near the spots where the iron wire touches it and these will show reddish-brown in the finish. After the bright dip the piece is immersed in the solution named above and allowed to remain until a dull color appears, when it is suspended in a moist atmosphere until dry, which requires from two to three hours. The effects may be varied by repeated immersions or by stippling, the more the operations are repeated the brighter will be the green destroying the antique effect.

Miscellaneous Effects

Another very pleasing effect in green and brass is obtained by buffing the brass to a high luster and then burying in sawdust saturated with a solution composed of:

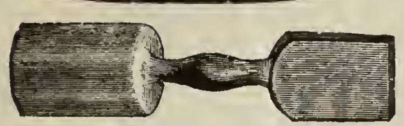
Vinegar	1 qt.
Neutral acetate of copper	3 oz.
Ammonium chloride	2 oz.

and leaving in a moist atmosphere until nearly dry. Then remove and brush the sawdust from the piece with a soft brush.

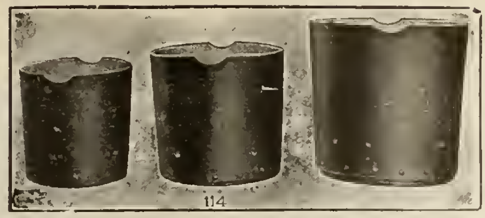
Some beautiful effects may be obtained by this method by varying the quantity of acetate of copper or by leaving it out entirely; also by increasing or decreasing the quantity of ammonium chloride.

The pale, soft greens upon builders' hardware are usually obtained by immersing in a hot solution of sulphate of copper and sal ammonia—one composed of water, 1 qt.; sulphate of copper, 1½ oz.; sal ammoniac, ¼ oz. This solution is used hot and the work immersed until the green tinge appears, when it is taken out and allowed to dry. It is afterward relieved as desired. The variation of the quantity of sal ammoniac and the temperature will give different effects.

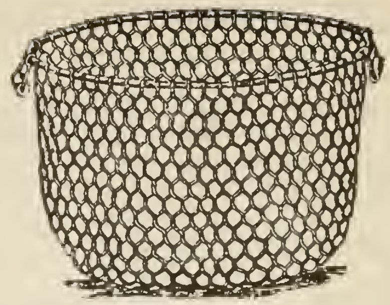
Another solution for obtaining greens on bronze, copper and brass is composed of water, 1 gal.; sulphate of copper, 2½ oz.; chlorate of potash, 2½ oz.; to be used while actually boiling; the variation of chlorate of potash or the substitution of common salt giving different effects. In this solution a dark



Bench Rammers—Made from Maple Hardwood well oiled.



Foundry Ladles—Flat bottom riveted steel bowls provided with forged lips and vent holes.



Coke or Charcoal Basket—Made of galvanized steel wire.

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You get the benefit of over twenty-five years' experience in meeting the demands of the foundry trade when you buy from us.

Our **Foundry Supply Service**

gives you the very best in supplies promptly, and our prices are very reasonable.

Try it out and you'll be convinced.

The Hamilton Facing Mill Company, Limited

HAMILTON, CANADA

green with a cinnamon brown background may be obtained on jewelers' bronze metal.

On copper the color is lighter green with a darker background, while on yellow brass the green is shown blended with lemon brass.

With the above formulae almost any shade of verde may be obtained by proper manipulation and close observation. If a color is to be matched and the sample is on rolled brass and the plater has cast brass, then he must plate the article to the proper shade of brass and treat it accordingly. It may need several attempts to produce the finish, but pluck and perseverance will get there.—Brass World.

SEPARATING SILVER FROM PLATINUM WASTE

THE entire waste is cut into small pieces and heated to redness to destroy grease and organic substances) and then dissolved in aqua regia (3 parts hydrochloric acid, 1 part nitric acid). The platinum and all metals combined with it are thus dissolved, but the silver, as chloride, in the form of a gray, spongy powder is deposited. The solution is then drawn off, tested for the possible presence of gold, which by means of oxalic acid is precipitated as a fine, yellowish powder. The other metals remain unaffected. The platinum still present in the solution is recovered by gradual addition of salammoniac, as a yellowish gray powder. These different precipitates are washed out with warm water, dried, and with the aid of suitable fluxes transformed into the metallic condition.

Platinum precipitates must, however, first be purified, and for this purpose must be first heated to redness. Then any steel or iron fragments present are extracted by means of a reagent, the remainder immersed in concentrated sulphuric acid and heated with it as long as any action of the sulphuric acid is noticeable. The remaining powder is then pure platinum.

Hot sulphuric acid dissolves silver without affecting the platinum. The fluid employed for the separation of the platinum is then diluted with an equal quanitity of water and the silver precipitated therefrom by means of saturated solution of common salt, the salt solution being slowly added until no more separation is apparent. The fluid is then carefully drawn off (filtered off), the residue washed out in warm water, dried and with some soda to act as a flux, is melted down into pure silver.

PROCESS OF COLD ENAMELING

THERE are many small objects whose beauty is much enhanced by the application of a coat of enamel, but which are not capable of being fired. A process of enameling these in the cold, so simple as to be quite practicable, is described in La Nature as follows: To a solution of sodium silicate, boiled in a closed vessel, there is added about 5 per cent. of sulphate of lime. This causes a precipitation to take place, the ulterior effect of which is to prevent efflorescences which would injure the looks of the enamel. The solution, after being once decanted, assumes the consistency of a paste which is heated to about 75 deg. C. to apply to the objects to be enameled. A second decantation takes place in the vitreous layer, and this then takes on an unalterable translucence. It may be tinted any desired shade, either in the mass or superficially, the colors being fixed by tannates of gelatine and alum.

DOMINION SHEET METAL CO. EXTENSIONS

TWO additions 20 ft. x 100 ft. and 40 ft. x 80 ft. are being made to the plant of the Dominion Sheet Metal Company, Hamilton, Ont., manufacturers of Galvanized Sheets. It is interesting to note that while many sheet galvanizing plants in the United States have been operating of late, only on a 30 per cent. basis, this new plant in Canada has to it credit a considerably better record.

Immense difficulties have . tered, embracing freight embargoes both inbound and outbound, shortage in fuel supply, extreme scarcity and high cost of labor, excessive prices of raw materials, all of which might have been sufficient to discourage even an older established concern. Undaunted however, by such obstacles this new organization has kept the plant in operation and have built up in the meantime a reputation for service as well as quality. This has necessitated unceasing effort, so much so that an employee has been continually engaged tracing raw material shipments, especially spelter, from Missouri and Oklahoma points. We understand that not a pound of Canadian Prime Western Spelter is available for purchase, press reports recently given out in connection with proposed spelter bounty arrangements, notwithstanding. It is hoped however, that eventually the British Columbia product will be available.

IT is reported from Sheffield that thefts of high-speed steel alloys have become so serious that the Government intends taking strenuous steps to put a stop to it. It is no longer a question of odd pieces being taken; the trouble has developed into thieving on a wholesale scale. According to present regulations action will be taken to combat the evil.

MISCELLANEOUS

Copper Plating Plaster Moulds.—To copper plate plaster moulds the moulds should be first thoroughly dried for a few days in a drying oven, then while warm immersed in molten wax. After removing from the wax they should be wiped quickly with a rag to remove any excess of wax, and graphite powder brushed on with fine brushes, the hooks and wires from the rear of the articles connected and the article placed in the regular electro-plating tank.

Coating with Aluminium.—According to an American patent (No. 1,154,651) a method of coating receptacles with aluminium for the storage and transport of liquids, foodstuffs, etc., involves first heating the surface of the vessel and then giving it a soaking of paraffin, which fills the pores. Aluminium is then sprayed on the surface to a thickness of about 1/10 mm., and penetrates into the finest pores of the articles, eliminating all traces of air and moisture. Wood tanks thus treated are found cheaper than those lined with pitch.

Steel articles that have been tempered or blued and show a light color, either straw or blue, cannot be tinned without first removing the thin film of oxide which gives color to the hardened and tempered steel. A bath of dilute hydrochloric acid is necessary to remove this thin film of oxide. It will require only a few seconds' immersion to do so, after which the object should be dipped into the lead and tin bath while wet. Place it immediately afterwards in the melted bath, and the lead and tin alloy will immediately coat the surface and form an excellent foundation for further soldering.

Coppering Iron and Steel.—The coppering of iron and steel is best done electrolytically, but Metal Industry recently suggested an immersion process for coppering iron articles, warning those interested, however, that the method requires considerable experience to obtain satisfactory results. The goods should be immersed in a solution consisting of one gallon of water at 160 deg. Fah., sulphate of copper 7 oz., and sufficient ammonia water (26 per cent.) to neutralize the free acid and give a clear blue tint to the solution. An alternative plan is to tumble the articles in hard wood sawdust moistened with the solution. The articles must be perfectly clean, or the copper will not cover well. It would be advisable to tumble the articles first in water, to which is added about 4 oz. of carbonate of soda per gallon for fifteen minutes; then wash in clean water and immerse them in the solution or tumble them afterwards as indicated. After coppering, the articles must be carefully dried.

If any advertisement interests you, tear it out now and place with letters to be answered.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey Forge, Pittsburg	$18 45	
Lake Superior, charcoal, Chicago	19 25	
Michigan charcoal iron	28 00	
Ferro Nickel pig iron (Soo)	25 00	

	Montreal.	Toronto.
Middleboro, No. 3	$24 00	.....
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Glenarnock	28 00	.....
Summerlee, No. 1	33 00	.....
Summerlee, No. 3	32 00	.....
Victoria, No. 1	27 00	24 00
Victoria, No. 2X	27 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

METALS.

Antimony	.47
Aluminum	.68
Cobalt 97% pure	1.50
Copper, lake	32.00
Copper, electrolytic	32.00
Copper, casting	31.50
Lead	.10
Mercury	100.00
Nickel	50.00
Silver, per oz.	.65
Tin	.54
Spelter	.22

Prices Per Lb.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$18 25	$18 25
Copper, crucible	21 75	21 50
Copper, heavy	22 00	22 00
Copper wire	22 00	22 00
No. 1 machine, compos'n	17 00	17 00
No. 1 compos'n turnings	15 00	15 00
No. 1 wrought iron	11 75	11 75
Heavy melting steel	9 00	10 00
No. 1 machin'y cast iron	14 75	14 50
New brass clippings	16 25	15 00
New brass turnings	12 00	12 00
Heavy lead	7 25	7 25
Tea lead	6 25	6 25
Scrap zinc	15 25	15 75
Aluminum	36 00	36 00

COKE AND COAL.

Solvay foundry coke, on application	.....
Connellsville foundry coke	$7.02
Yough steam lump coal	....
Pittsburgh steam lump coal	4.30
Best slack	3.87

net ton f.o.b. Toronto.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	68 50
Wire rods, Pittsburgh	60 00

PROOF COIL CHAIN.

1/4 inch	$9.00
5-16 inch	5.90
3/8 inch	4.95
7-16 inch	4.55
1/2 inch	4.30
9-16 inch	4.20
5/8 inch	4.10
3/4 inch	3.95
7/8 inch	3.80
1 inch	3.70

Above quotations are per 100 lbs.

MISCELLANEOUS.

Solder, guaranteed	0.31½
Babbitt metals	.11 to .60
Putty, 100-lb. drums	2.85
Red dry lead, 100-lb. kegs, p.cwt.	13.87
Glue, French medal, per lb.	0.16
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls	0.75
Linseed oil, raw, single bbls.	0.96
Linseed oil, boiled, single bbls.	0.99
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7 00
Lead wool, per lb.	0.13
Pure Manila rope	0.21
Transmission rope, Manila	0.25
Drilling cables, Manila	0.23
Lard oil, per gal.	1.35

SHEETS.

	Montreal.	Toronto.
Sheets, black, No. 28	$4 10	$4 00
Sheets black No. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 25	4 25
Canada plates, all bright	6 30	6 00
Apollo brand, 10¾ oz. galvanized)	7 00	7 00
Queen's Head, 28, B.W.G.	7 50	7 50
Fleur-de-Lis, 28 B.W.G.	7 25	7 25
Gorbal's best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 00	6 75
Premier, No. 28, U.S.	6 90	6 90
Premier, 10¾ oz.	7 50	6 95

ELECTRIC WELD COIL CHAIN B.B.

3-16 in.	$11.70
1/4 in.	8.40
5-16 in.	7.40
3/8 in.	6.35
7-16.	6.35
1/2 in.	6.35
5/8 in.	6.35
3/4 in.	6.35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, 5 per cent., B and C, 25 per cent., cast iron 50; standard bushings, 60; headers, 60; flanged unions, 60; malleable bushings, 60; nipples 72½; malleable, lipped union, 60.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy.	.35
Copper sulphate,	.30
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130 per cent.	.42
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.37 to .39
Tin	.58 to .60
Silver	.60 to 65
Zinc	26 to 28

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck	.90
Emery, in kegs, American	.05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.06 to .08
Emery composition	.08 to .09
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

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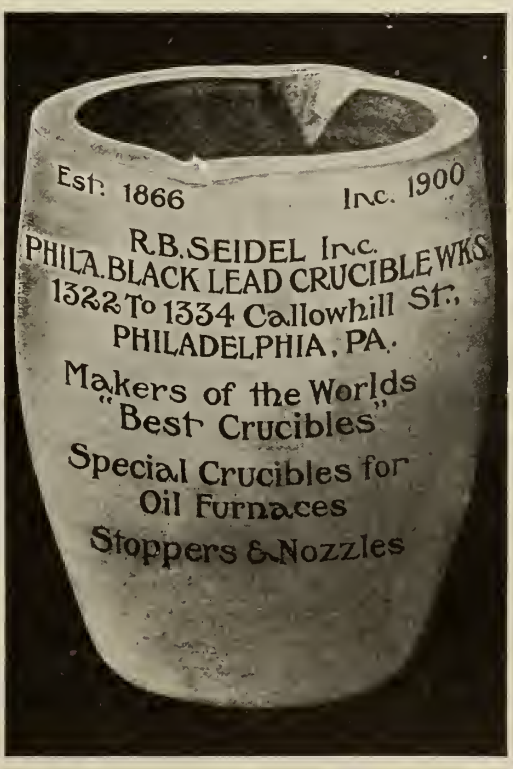

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The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Toronto, Ont., May 2. — Customs revenues continue to make an exceptionally good showing and the returns for April are a fair indication of what may be looked for during the year. The revenue for April was $10,346,000, being $4,070,000 more than the corresponding month of last year. The increase is largely accounted for by importations of materials being used in the manufacture of goods destined for shipment abroad. Although the export trade is steadily increasing it is being seriously handicapped by the shortage of ocean tonnage. The situation in this regard is acute and there appears to be little prospect of any improvement this year.

The congestion of freight on the railways has been relieved to some extent, but the embargo on shipments to Eastern points is causing considerable inconvenience to manufacturers. The scarcity of labor in conjunction with a shortage of raw materials will result in a scarcity of many finished iron and steel products. Prices continue to advance and there is no indication that the top has been reached. The more important lines meantime affected include wrought iron pipe, cut nails, wrenches, some makes of taps and dies, etc., some sizes of boiler tubes and cotton waste.

Steel Market

The extraordinary activity in the steel trade is unabated and the mills continue operating at full capacity. Plants are being extended to take care of the increasing demand but a shortage of labour is a problem which is becoming more and more serious. The output of steel is increasing in tonnage but at the same time deliveries are getting more backward. Prices of steel products continue to advance due to the shortage of raw materials and general activity in the trade.

The market for sheets continues strong and quotations very firm with an upward tendency. The new demand for blue annealed sheets is still heavy, some mills being sold up for the entire year. The production of steel sheets is nearly up to rolling capacity but there is still some trouble in getting sheet bars. The situation in the galvanized sheet trade is unsettled owing to the high price of black sheets and spelter. Some galvanizers are not operating their plants while others have considerably reduced their production.

The steel market in the United States is steadier and few price movements are noted at the moment. The situation is unchanged, the demand on the mills for deliveries being as insistent as ever. Steel bars are unchanged at 3c, plates 3.75c, and shapes 2.60c, f.o.b. Pittsburgh. Forging billets have advanced and are now being quoted at $68.50 per ton. Pittsburgh. Wire rods are still being quoted at $60 per ton Pittsburgh for shipment at mill convenience.

Old Metals

The market for old materials is generally easier and business dull. Prices of copper and brass scrap are firm but the market is quiet. Heavy melting steel is stronger and has advanced, being now quoted at $10. Stove plate and No. 1 cast iron are also higher, being quoted at $10.50 and $14.50 per ton.

Supplies

The general tendency of prices continues upward and a number of lines have advanced recently.

Prices of white and colored cotton wiping waste have been advanced ¾c per lb., owing to the high cost and scarcity of raw materials. Prices on wool packing waste and washed cotton wipers are still withdrawn and are only on application. The linseed oil market is weaker and prices have declined 1c per gallon. Oil is now quoted at 96c for raw and 99c for boiled. Turpentine has declined 2c and is now quoted at 75c per Imperial gallon. Gasoline and benzine are unchanged but an advance is expected in the near future.

Foundry and Plating Supplies

Business has improved considerably during the past few weeks particularly in foundry supplies and brass goods. Indications point to continued activity and steady demand for some months. The high cost of raw materials however is affecting the situation and there is a decided upward tendency in prices of all foundry equipment and supplies.

Prices of a number of chemicals have advanced and the situation shows no improvement. The scarcity of some chemicals is as acute as ever and there is no indication of any relief. Higher prices are now being quoted on the following. Hydrofluoric acid, ammonium hydrosulphuret, copper sulphate, cobalt sulphate, nickel carbonate, sodium carbonate crystals, sodium cyanide, sodium hyposulphite, tin chloride, zinc chloride and zinc sulphate.

Silver anodes have advanced and are now quoted at 60c to 65c per oz. Zinc anodes have declined and 26c to 28c per lb. is now about the market price. Owing to the steady advance in copper, anodes made of this metal are higher at 37c to 39c per lb. Although Turkish emery is practically off the market and the quotations are nominal, American emery can be obtained for about 5 c per pound. Crocus composition is a little higher, the range being now 6c to 8c per pound.

Metal Markets

The feature of the market is the continued strength of copper the price having gone higher recently. The demand is still heavy but considerably less than it has been of late. Tin is unchanged but is firm and the market has an upward tendency. Spelter is also firmer and buyers are showing more interest in the market. Lead is dull and the outside market is weaker being now at the same level as the "Trust" figure. Antimony is weaker on all positions and quotations have declined slightly. The aluminum market is featureless and unchanged. Solders are quoted at about the same level.

Copper.—The market is very strong and a continued good demand is reported. The producers are in full control of the market and they are now sold so far ahead that they are not in a position to supply any large buying demand except for delivery during the fourth quarter. Copper has advanced ½c locally and is now quoted at 32c per pound, nominal.

Tin.—The market is firmer with an upward tendency. The tin situation is stronger and there is a good demand for this metal. Local quotations are unchanged and nominal at 56c per pound.

Spelter. — The New York market is steady and firm but London advanced £2 per spot and £1 on futures. The French Government is buying big tonnages of spelter in the United States market. Local are unchanged at 22c per pound.

Lead.—The market is dull and weaker. The "Trust" is holding lead at 7.50c New York, but the outside market has declined and is now at the same level as the "Trust" figures. Lead has declined ½c locally and is now quoted at 10c per pound.

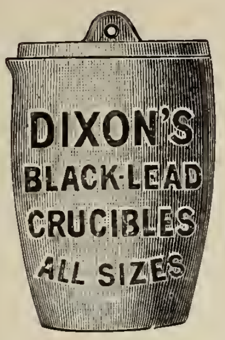
Antimony.—The market is weaker in all positions and no improvement is noted in the demand. Antimony has declined 1c locally and quotations are nominal at 47c per pound.

Aluminum.—The market is featureless and unchanged at 68c per pound.

ZINC AND SPELTER IMPORTS

PRIOR to the war about 50 per cent. of the blocks, pigs and bars, etc., of zinc came from Belgium, 20 per cent. from Germany, 15 per cent. from Great Britain and 15 per cent. from the United

For melting—from laboratory to furnace.



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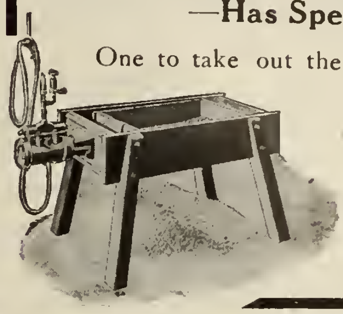

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Battle Creek Sand Sifter Co.
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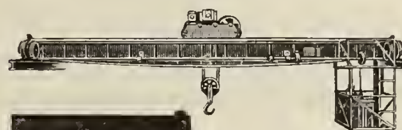
Bronze
Copper
Nickel
Tin & Zinc

CRANES



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Each and every one guaranteed.

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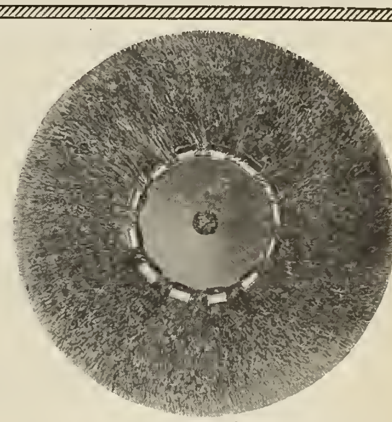
The Manufacturers Brush Co., Cleveland, Ohio
19 Warren St., New York



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The Most Convenient and Most Efficient Molding Machine on the Market.

Built on the principle that **the Centre of Gravity is the Centre of Rotation**—it is perfectly balanced and the largest flask can be easily and smoothly turned by one man.

Requires less than half the number of steps necessary with rockover machines, and consequently saves much time.

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CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

TO OUR READERS—Use this Directory when seeking to buy any foundry or pattern-shop equipment. You will often get information that will save you money.
TO OUR ADVERTISERS—Send in your name for insertion under the headings of the lines you make or sell.
TO NON-ADVERTISERS—A nominal rate of $5.00 per line a year is charged to non-advertisers.

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Air Compressors.
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Osborn Mfg. Co., Cleveland, O.
Smart-Turner Machine Co., Hamilton, Ont.
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Alloys.
Webster & Sons, Ltd., Montreal.

Anodes, Brass, Copper, Nickel, Zinc.
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W. W. Wells, Toronto.

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Northern Crane Works, Ltd., Walkerville, Ont.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Webster & Sons, Limited, Montreal.

Blowers.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
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Whiting Foundry Equipment Co., Harvey, Ill.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
H. S. Carter & Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

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Can. Hart Wheels, Ltd., Hamilton, Ont.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
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Whiting Foundry Equipment Co., Harvey, Ill.

Bricks, Graphite.
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Osborn Mfg. Co., Cleveland, O.
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Buffing and Polishing Compositions.
W. W. Wells, Toronto.

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Osborn Mfg. Co., Cleveland, O.

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Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

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Tallman Brass & Metal Co., Hamilton, Ont.

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W. W. Wells, Toronto.

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Whiting Foundry Equipment Co., Harvey, Ill.

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Webster & Sons, Ltd., Montreal.

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Webster & Sons, Ltd., Montreal.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.

Core Compounds.
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J. W. Paxson Co., Philadelphia, Pa.
Robeson Process Co., New York City.
Webster & Sons, Ltd., Montreal.

Core Machines, Hammer.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.

Core-making Machines.
Berkshire Mfg. Co., Cleveland, O.
Mumford Molding Machine Co., Chicago, Ill.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Tabor Mfg. Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

Core Oils.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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Webster & Sons, Ltd., Montreal.

Core Ovens.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Wash.
Joseph Dixon Crucible Co., Jersey City, N.J.

Core Wax.
United Compound Co., Buffalo, N.Y.

Cranes
Northern Crane Works, Ltd., Walkerville, Ont.

Cranes, Travelling and Jib.
Northern Crane Works, Ltd., Walkerville, Ont.
Smart-Turner Machine Co., Hamilton, Ont.

Cranes, Electric and Hand Power.
Dominion Bridge Co., Montreal.
Webster & Sons, Ltd., Montreal.
Northern Crane Works, Ltd., Walkerville, Ont.
Smart-Turner Machine Co., Hamilton, Ont.

Cranes, Hydraulic.
Webster & Sons, Ltd., Montreal.

Crucibles, Reservoir, Tilting Furnace, Bottom Pour, Etc.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Seidel, R. B., Philadelphia.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Webster & Sons, Ltd., Montreal.

Cupolas.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Northern Crane Works, Ltd., Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola Blast Gauges.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola Blocks.
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Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.

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Can Sirocco Co., Ltd., Windsor, Ont.
Webster & Sons, Ltd., Montreal.
Monarch Eng. & Mfg. Co., Baltimore.
Sheldons, Limited, Galt, Ont.
Stevens, F. B., Detroit, Mich.

Cupola Linings.
Can. Hanson & Van Winkle Co., Toronto, Ont.
H. S. Carter & Co., Toronto.
Webster & Sons, Ltd., Montreal.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.

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Webster & Sons, Ltd., Montreal.
J. W. Paxson Co., Philadelphia, Pa.
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Webster & Sons, Ltd., Montreal.

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W. W. Wells, Toronto.

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Joseph Dixon Crucible Co., Jersey City, N.J.

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Osborn Mfg. Co., Cleveland, O.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co. Harvey, Ill.

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W. W. Wells, Toronto.

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Pangborn Corporation, Hagerstown, Md.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Emery Stands.
Ford-Smith Machine Co., Hamilton.

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Webster & Sons, Ltd., Montreal.
Stevens, F. B., Detroit, Mich.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Sheldons, Limited, Galt, Ont.

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Webster & Sons, Ltd., Montreal.
Shelton Metallic Filler Co., Derby Conn.

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Whitehead Bros. Co., Buffalo, N.Y.

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Webster & Sons, Ltd., Montreal.
Whitehead Bros Co., Buffalo, N.Y.

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Tabor Mfg. Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

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Webster & Sons, Ltd., Montreal.

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Webster & Sons, Ltd., Montreal.
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Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
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Whitehead Bros. Co., Buffalo, N.Y.

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Hawley Down Draft Furnace Co., Easton, Pa.
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J. W. Paxson Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

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McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Webster & Sons, Ltd., Montreal.

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Independent Pneumatic Tool Co., Chicago, Ill.

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Cleveland Pneumatic Tool Co., Cleveland, O.
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Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

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Webster & Sons, Ltd., Montreal.
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Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

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Webster & Sons, Ltd., Montreal.

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McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Webster & Sons, Ltd., Montreal.

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Toronto Testing Laboratories, Toronto.

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Webster & Sons, Ltd., Montreal.

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Tabor Mfg. Co., Philadelphia.

Molding Sand.
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J. W. Paxson Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.

Molding Sifters.
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Webster & Sons, Ltd., Montreal.
Whitehead Bros. Co., Buffalo, N.Y.

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Monarch Engineering & Mfg. Co., Baltimore, Md.
Whiting Foundry Equipment Co., Harvey, Ill.
Webster & Sons, Ltd., Montreal.

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Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.
Webster & Sons, Ltd., Montreal.

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Limited, Toronto.
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F. W. Quinn, Hamilton, Ont.
Wells Pattern & Machine Works,

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Hamilton Pattern Works, Hamilton.
Hamilton Facing Mill Co., Ltd. Hamilton, Ont.
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F. W. Quinn, Hamilton, Ont.
Webster & Sons, Ltd., Montreal.

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Dom. Iron & Steel Co., Sydney, N.S.
Steel Co of Canada, Hamilton, Ont.

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McCulloch-Dalzell Crucible Company Pittsburg, Pa.
Whitehead Bros. Co., Buffalo, N.Y.

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W. W. Wells, Toronto.

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Joseph Dixon Crucible Co., Jersey City, N.J.

Polishing Wheels.
Osborn Mfg. Co., Cleveland, O.
W. W. Wells, Toronto.

Ramming Plates and Machines.
Oshorn Mfg. Co., Cleveland, O.

Rammers, Pneumatic
Cleveland Pneumatic Tool Co., Cleveland, O.
Independent Pneumatic Tool Co., Chicago, Ill.

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Joseph Dixon Crucible Co., Jersey City, N.J.
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Riddles.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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J. W. Paxson Co., Philadelphia, Pa.

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Webster & Sons, Ltd., Montreal.

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W. W. Wells, Toronto.

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Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.
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New Haven Sand Blast Co., New Haven, Conn.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.

Sand Blast Devices.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.

Sand Blast Sand
Whitehead Bros. Co., Buffalo, N.Y.

Sand Conveying Machinery
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Standard Sand & Mach. Co., Cleveland, O.
Vulcan Engineering Sales Co., Chicago, Ill.

Sand Molding.
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J. W. Paxson Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.

Sand Sifters.
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Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Standard Sand & Mach. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

Sieves.
Oshorn Mfg. Co., Cleveland, O.

Silica Rock, Ground and Pulverized.
Wm. Penn Silica Works, Wm. Penn P.O., Pa.

Skimmers, Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.

Small Angles.
Dom. Iron & Steel Co., Sydney, N.S.

Soapstone.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.

Spelter Bowls.
Joseph Dixon Crucible Co., Jersey City, N.J.

Special Machinery.
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Wells Pattern & Machine Works, Limited, Toronto.

Sprue Cutters.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Oshorn Mfg. Co., Cleveland, O.

J. W. Paxson Co., Philadelphia, Pa.
Vulcan Engineering Sales Co., Chicago, Ill.
Webster & Sons, Ltd., Montreal.

Squeezer Molding Machines
Mumford Molding Machine Co., Chicago, Ill.
Tabor Mfg. Co., Philadelphia, Pa.

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Davenport Machine & Foundry Co., Iowa.
Hamilton Facing Mill Co., Ltd. Hamilton, Ont.
Mumford, E. H. Co., Elizabeth, N.J.
Oshorn Mfg. Co., Cleveland, O.
Tabor Mfg. Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

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Wm. McGregor, Scottish Steel Grit Works, Airdire, Scotland.

Steel Rails.
Dom. Iron & Steel Co., Sydney, N.S.

Steel Bars, all kinds.
Dom. Iron & Steel Co., Sydney, N.S.
Northern Crane Works, Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Stirrers, Graphite.
Joseph Dixon Crucible Co., Jersey City, N.J.

Stones, Rubbing and Oil
Can. Hart Wheels, Ltd., Hamilton, Ont.

Talc.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
E. J. Woodison Co., Toronto.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.

Teeming Crucibles and Funnels.
McCulloch-Dalzell Crucible Company Pittsburg, Pa.

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Northern Crane Works, Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co. Harvey, Ill.

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W. W. Wells, Toronto.

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Northern Crane Works, Ltd., Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Trucks, Dryer and Factory.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Tumblers.
Webster & Sons, Ltd., Montreal.

Turntables.
Northern Crane Works, Walkerville.
J. W. Paxson Co., Philadelphia, Pa.
Webster & Sons, Ltd., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Vent Wax.
United Compound Co., Buffalo, N.Y.
Webster & Sons, Ltd., Montreal.

Vibrators.
Berkshire Mfg. Co., Cleveland, O.
Mumford, E. H. Co., Elizabeth, N.J.
Oshorn Mfg. Co., Cleveland, O.
Tabor Mfg. Co., Philadelphia, Pa.

Wall Channels.
Dom. Iron & Steel Co., Sydney, N.S.

Wheels, Grinding
Can. Hart Wheels, Ltd., Hamilton, Ont.

Wheels, Polishing, Abrasive.
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Osborn Mfg. Co., Cleveland, O.
United Compound Co., Buffalo, N.Y
Webster & Sons, Ltd., Montreal.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Webster & Sons, Ltd., Montreal.
W. W. Wells, Toronto.

Wire, Wire Rods and Nails.
Dom. Iron & Steel Co., Sydney, N.S
Oshorn Mfg. Co., Cleveland, O.

CANADIAN FOUNDRYMAN

AND METAL INDUSTRY NEWS

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EDITORIAL CONTENTS

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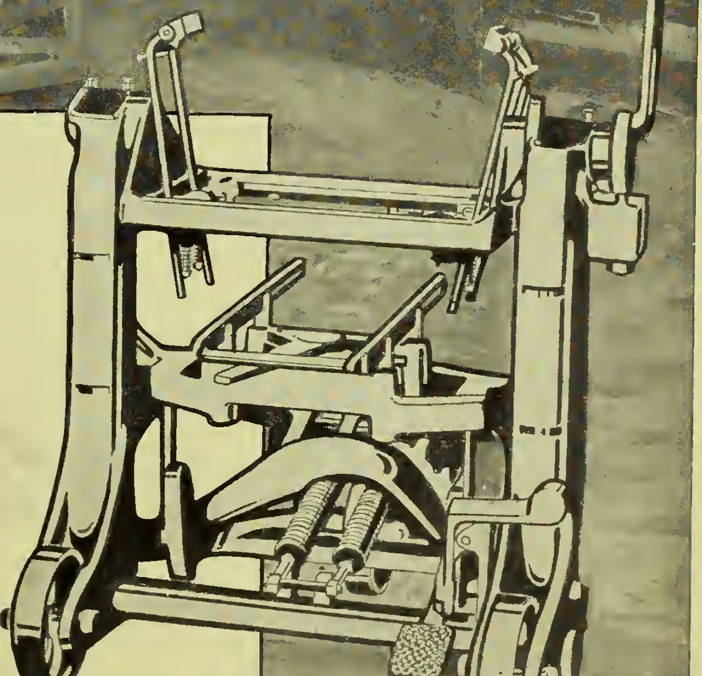

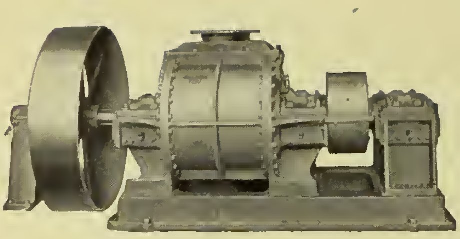

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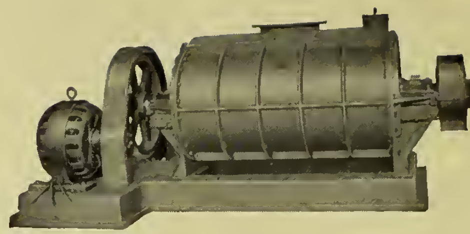
Any Capacity, Two to Ten Pounds.



Roots Motor-Driven Foundry Blower.

ROOTS

Positive Pressure BLOWERS

ENSURE A DEFINITE AND UNIFORM QUANTITY OF AIR PER MINUTE.

Too little air means CO and sluggish iron, low efficiency of cupola.

Too much air means free O and oxydization, consequently a higher melting temperature; therefore, dull iron and blow-holes.

THE RELIABILITY, EFFICIENCY AND CAPACITY OF ROOTS POSITIVE PRESSURE BLOWERS WILL BE OF WONDERFUL VALUE TO YOUR PLANT.

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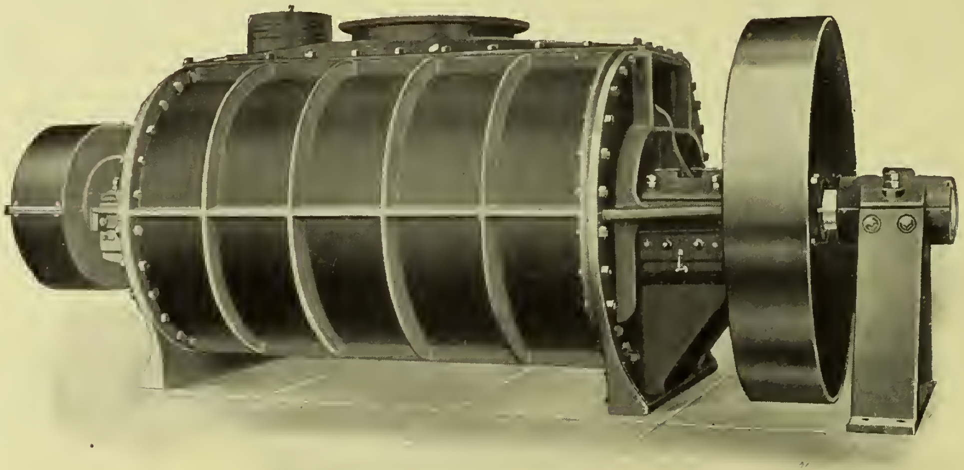

Belt-Driven Blower—Cupolas and Oil Furnaces

P. H. & F. M. ROOTS COMPANY

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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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The Publisher's Page

IN the city of Toronto there are five large wholesale and retail seed houses. They are all located in a short block on the same side of King Street East.

Why are these places of business so closely gathered together? To one who has purchased seeds, flowers, shrubs and plants in the city of Toronto the reason is perfectly obvious. One idea is, of course, to be near the market where thousands of people gather every week. Such a location naturally has its advantages. But if that were the only reason for close proximity, one seed house might as well be on the left of the market entrance, another on the right, one on the east and another on the west.

There is another reason, however, which prompts these seed houses to cluster together, side by side. It is to catch the public when it is in a buying mood, to invite comparison while the mood is on, to avoid being overlooked and to make buying *convenient*.

This explains in a measure why the modern business man advertises in his trade and technical papers. It is to make comparison, selection and buying convenient *for the buyer*.

Take Canadian Foundryman for instance. Grouped in our advertising pages you will find represented the firms who are making a specialty of catering to Canadian foundrymen. Turn to our Buyers' Directory if you do not find what you want advertised in this issue, and then write for further information.

The technical journal, in addition to disseminating information of inestimable value is the livest kind of a business directory. It is in a sense the wholesale district where you will find grouped the manufacturers serving a particular field or industry.

The grouping of seed houses in King Street, Toronto, makes buying convenient for the people of that city. The grouping of manufacturers and dealers in Canadian Foundryman makes buying convenient for foundrymen all over Canada.

CANADIAN FOUNDRYMAN

143-153 University Avenue, Toronto, Canada

Producing 4.5 inch Billets in the Electric Furnace

Staff Article

In the production of munitions an impetus has been given the establishment of the electric furnace in metal-working industries that under normal conditions would probably have taken some years to realize. The installation described refers to one only of a number of Canadian plants similarly equipped, and serves to indicate a development in steel-making that is to-day making rapid strides in Great Britain, Europe and the United States.

TO augment the production of steel billets for the larger shell forgings, electric furnaces are now being extensively employed, and, where properly operated, the results compare very favorably with those obtained by the open-hearth process. The successful manufacture of steel ingots or castings by the electric furnace method is now assured, the quantity output being governed entirely by the capacity of the furnaces installed and their power consumption, and the quality of product by the skill and experience of the operators. To convey to the reader some conception of the various details entering into the production of 4.5 in. shell billets is the purpose of the accompanying article.

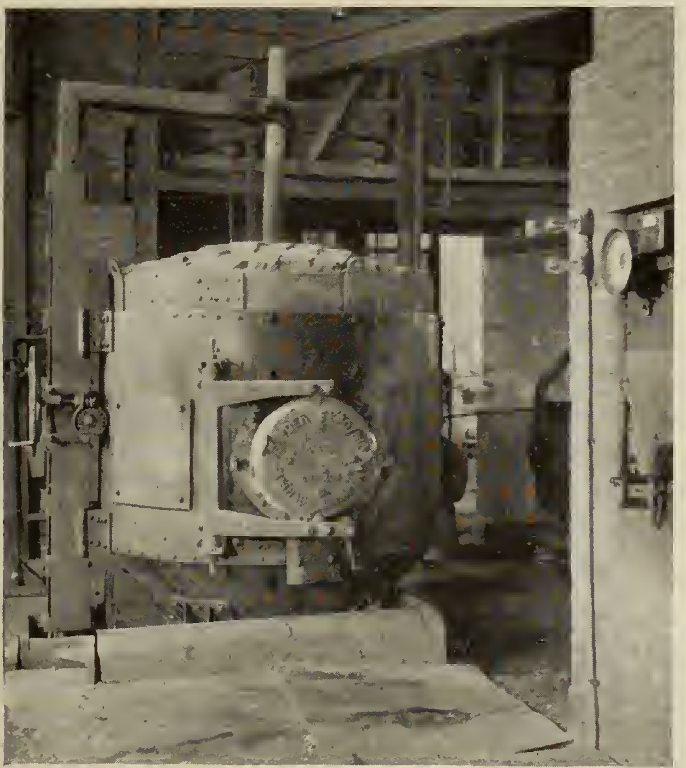


FIG. 1. SNYDER ELECTRIC FURNACE INSTALLATION.

Charging the Furnace

As soon as the melted charge, has been poured into the ladle, the furnace is tilted back to its vertical position, and the operation of recharging is immediately proceeded with so as to avoid any unnecessary loss of heat.

The first detail is to insert a new contact piece in the bottom of the furnace. This is done by means of a long pair of tongs, the workman's head being encased in a special hood fitted with a thick colored glass, to protect his face and eyes from the intense heat and dazzling light of the fire chamber. When this lower contact is in place the upper electrode is lowered to test the arc. The furnace is now ready for recharging, and the proportions of material adopted in the particular plant here described, in order to obtain the grade of steel necessary to meet the shell specification, are as follows:—60 per cent. shell ends; 10 per cent. wrought iron and steel turnings; 10 per cent. baling wire scrap; and 20 per cent. sheet steel scrap in bundles.

The shell ends and turnings are first thrown in and reduced to a molten state; during which process it is necessary for an operator to be continually at the electrode adjusting wheel, shown at extreme left of Fig. 1. The brilliancy of the two lights on the wall, to the right, indicate to the operator the action of the arc within the furnace, and the wattmeter on the wall records the power being consumed. When the shell ends and turnings have been reduced to a molten mass, the wire scrap and baled sheet scrap are added.

The time required to melt a charge of approximately 2,800 lbs. (the capacity of the ladle), is from $2\frac{1}{2}$ to 3 hours, but in the case of a first charge, where the furnace has been allowed to cool down, 4 hours may elapse before the metal is ready to pour.

When the metal is about ready to be poured, the melter makes a test of the charge by drawing off a few pounds by means of a long handled ladle, inserted through the charging door. This is poured into a small cast iron mould about 5 inches long and $1\frac{1}{4}$ inches square. After it has set, it is cooled off and broken apart for examination as to fracture and carbon content. If the carbon be found to be below the requirement, sufficient material, rich in carbon, is added, following which, in due course another test is made. It, however, sel-

FIG. 2. TAPPING THE FURNACE INTO LADLE.

dom requires more than two tests to bring the mixture to within the limits of the specifications. When the experienced eye of the melter indicates that the charge is ready to pour, no time is lost in doing so.

Pouring and Filling the Moulds

When tapping the furnace the ladle is placed under the pouring spout, and by means of underground mechanism, the furnace is tilted upwards as shown in Fig. 2. This movement is so arranged that the pouring spout remains practically stationary, it being the approximate centre on which the furnace pivots, while being tilted.

As already stated, the charge averages about 2,800 lbs., this being the capacity of the large ladle. When the ladle has been filled, the surface is lightly covered with floor sand, to minimize heat loss through radiation, and also protect the workmen. As shown in Figs. 1 and 3, a monorail is located in front and above the furnace, by which the ladle is taken to a position above the revolving table, which carries the ingot moulds. To prevent any possibility of injury to the operators through splashing of metal, the various levers which control the ladle mechanism are fitted with long extensions. Once the pouring nozzle is brought into position it is seldom necessary to shift the ladle further, as the forty-ingot moulds are so arranged as that the revolving platform on which they are mounted brings them under the ladle in regular rotation. The table is easily revolved by one man, using a length of pipe placed on levers situated at eight points around the platform. The design of the table is shown in the line sketch Fig. 4.

Imbedded in the concrete foundation A, is the shaft B, which extends up to

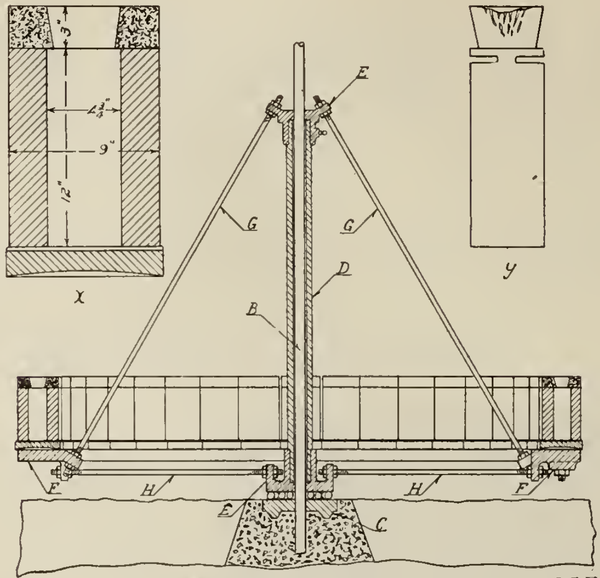


FIG. 4. INGOT MOLD, BILLET AND REVOLVING TABLE ARRANGEMENT.

the ceiling and is secured to one of the joists. About this shaft and resting on the foundation is the heavy thrust plate C, upon which the entire apparatus with the moulds, revolves. The framework consists of the centre column D, upon which is secured the two flanges E, the eight-piece platform F, being supported by means of the eight oblique stays G and the horizontal stays H; the whole revolving on the balls shown. An enlarged sketch of the mold and billet is shown at (x) and (y). It is usually found that the last billet poured, or possibly the last two, will not pass inspection, owing to "pipes" being formed by slag or chilled metal, etc.

FIG. 3. CASTING 4.5 SHELL BILLETS IN INGOT MOLDS.

Refitting the Ladle

When the last of the metal has been run out of the ladle, the latter is placed on the floor in a horizontal position and the stopper rod dismantled. It is allowed to cool, after which a new nozzle is placed in the bottom and a new graphite stopper on the rod. If necessary, new graphite sleeves are also inserted, but as these are not subjected to the running action of the molten metal they are generally good for a number of heats.

For about an hour before each cast, the interior of the ladle is kept hot by the flame of a strong fuel oil burner. This, of course, is usual practice, and is necessary, to avoid chilling the molten metal, when drawn from the furnace.

Preparing the Moulds

After the billets have solidified, which generally takes about ten minutes, the moulds are taken from the table and the billets removed. The metal shrinkage is usually sufficient to allow the billet to drop out freely, but in any case a light blow with a "sledge" ejects it. The ingot moulds are of grey iron bored and faced to the dimensions shown at x, Fig. 4; and have a life of from 80 to 100 casts, although often beyond this. The base plate is of grey iron, faced on the upper surface, and, to insure a good joint, a disc of felt paper ¼ inch thick is placed between the mould and the base plate. Before the next charge is ready to be tapped, the moulds are again assembled in position on the platform of the revolving table.

Inspecting and Cutting to Length

The billets from each heat are marked with a serial number, and are taken to a Hall cutting-off machine where the top is cut off, leaving a length of 10¼ inches. The specifications call for a section approximately 20 per cent. of the cross sectional area of the billet being left at the centre for fracture and carbon inspection. Some drillings are also taken from each heat for laboratory analysis.

WINTER LIGHTING ATTENTION IN SUMMER

AS a rule manufacturers are more interested in lighting during the winter months than during the summer, principally due to the fact that the lighting conditions in their plants are then forcibly brought to their notice.

The manufacturers of lighting equipment have, however, been endeavoring for some time to impress upon superintendents and managers of plants that the time to make changes, revisions or repairs in the lighting equipment is during the summer months, and that this work should be started early. Just after the winter season the superintendent or plant manager has clearly in mind his experience with the lighting system during the short and dark days, and it is, therefore advisable for him to make plans for the revision of the system, which can be carried out during the months when artificial light is seldom needed.

We find as the years go by, that the lighting season, so-called, is not as clearly defined a period as it was a few years ago, and that there is considerable activity during the summer months for industrial lighting.

METALLIC MAGNESIUM

MAGNESIUM is one of the several metals which the present war has proved to be of great value. As with numerous other products, before the war, France, Great Britain and the United States were dependent on Germany for their supplies of this material. The price was steady at about $1.45 per lb., but rose from $2.50 shortly after the beginning of the war to as high as $7.50 per lb. The price now is about $5.50 per lb.

The chief uses of magnesium are:—Scavenging alloys for making denser, cleaner, stronger and more homogeneous alloys; illumination, as in military uses for shrapnel trailers, star bombs, flare lights, etc., and in photography for flash lights.

In aluminum castings 2 per cent. of magnesium cleans up the aluminum, almost doubling its tensile strength, quadrupling its resistance to shock or jar and reducing the cost of machining by more than 50 per cent. This is of great importance in connection with the construction of aeroplanes and dirigible motors, high-speed engines of every type, and in all machinery or structures where strength, with a minimum of weight, is required.

Metallic Magnesium Recovery

Metallic magnesium is usually recovered by the reduction of the chloride, but it can also be obtained from the reduction of the oxide or carbonate. The common magnesium carbonate rock is known as magnesite. Deposits of this material occur in a limited area in the township of Grenville, Quebec. The production in 1915 (including some calcined), amounted to 14,779 tons, valued at $126,535, in striking contrast with a yearly average production from 1908 to 1914 inclusive, of 621½ tons. While the known deposits are limited in area, there is every possibility that the district contains other workable deposits. Float magnesite has been found over a wide area. Magnesite is also found in Yukon and in the Cariboo district, British Columbia.

The highly refractory quality of magnesite and its ability to form a hard vitreous body when combined with magnesium chloride has led to its adoption for a number of purposes. The largest consumption is in the manufacture of magnesite firebrick, crucibles and in bedding steel furnaces. It is mixed with sand, sawdust, ground quartz, talc and other substances in the manufacture of tile, flooring, roofing, artificial marble, wainscoting, etc. Magnesium bisulphide is used in digesting and whitening wood pulp in paper mills.

PATTERNS FOR THE SMITHY

WHERE there is a fair amount of repetition work done in the smiths' shop, the practice of having patterns is altogether a desirable one, as with these errors of working can be avoided. Generally speaking, such patterns should be of the exact size and shape of the forging as it leaves the hands of the smith, and not that of the finished article after machining and fitting. The former gives what might be called a limit size to the workman, and will diminish the weight of the stock used. Indeed, provided a good smith is in charge of the shop, and there are proper facilities for storing and displaying the reserve of stock at the command of the workmen, the use of patterns will make possible the utilization of short ends without wasting time, because the eye can better gauge what is wanted from a pattern or model than from a rough drawing and a few figures, which show the principal dimensions only. To provide him with such patterns does not cast any reflections on the workman's skill any more than it does in the case of a moulder's pattern. As a matter of fact, very many moulders could make moulds in sand without patterns, but that would not be a profitable way of working, unless in a few well-defined cases.—Practical Engineer.

CONCERNING ANTIMONY

A BRITISH Consular report contains an interesting reference to the effect of the war upon the supplies of antimony:

The war, says the report, had not been long in progress before it became evident to all concerned in the manufacture of explosives that the Province of Hunan in China actually controlled the total visible supplies of antimony then existent, and in order to obtain this much-needed metal, Hunan prices would have to be paid for it. Before the war the value of antimony regulus on the London market was about $125 per ton. It had long been assessed by the Chinese Customs for the purpose of export duty at about $50 per ton. The price has now risen to over $500 per ton, but the Customs rate remains the same.

Previous to the outbreak of the war the whole output of the pure metal, as refined by the Hua Chang Co. of Changsha, which enjoyed a monopoly of the manufacture of regulus in Hunan province, was controlled and marketed in London by a British concern, under a time contract. In times of peace and normal prices, this arrangement offered many advantages to the Chinese manufacturers, but after the outbreak of the war their interests lay in quite another direction. Temporary banking difficulties having arisen with the war, the Chinese refiners of the metal seized the opportunity to denounce the contract.

Soon afterwards market quotations for standard metals were stopped in the United Kingdom, and the export of antimony prohibited. Owing to the use made of it for the manufacture of munitions of war, it was declared to be contraband, and its transport by land or sea closely watched and restricted. The area within which it was produced in France was invaded by the Germans, and thus cut off from the world at large, as was also the output from Austria-Hungary. The Bolivian and Mexican mines having closed down, only two or three minor sources of direct production remained as possible competitors to the one important producing area left, that is to say, the Chinese Province of Hunan. From both foreign and Chinese sources of information, the real state of affairs soon became known to all the Chinese interested in the trade, and when an urgent demand arose in Japan, Russia, America and the United Kingdom, the Chinese seized their opportunity, held up supplies and cornered the market.

STEELWORKS PROMOTION IN JAPAN

IT has been stated that a steelworks company with a capital of £2,000,000 is in course of promotion in Japan. The plant is to be installed in the Island of Kinshiu. Plans for a further extension of the Government ironworks at Edamitsu is also reported. The scheme, it is expected, will cost £3,600,000, and will increase the capacity for steel production by 300,000 tons a year. Another scheme under consideration is the establishment of ironworks at Kuchian, Hokkaido, where iron deposits are being opened up. The company will have a capital of £250,000. A company has been floated for the manufacture of aluminum at Kachigawa, near Nagoya, with a capital of £250,000.

NEW PROCESS DEVELOPMENTS

Inventive Genius and Research Operate to a Dual End — They Aim to Improve What We Now Possess and Bring to Our Service Commodities Before Unknown

FAULTS OF THE SMALL ELECTRIC ARC FURNACE

by W. M. McKnight

THE small electric arc furnace is rapidly coming into favor for the production of small highly-refined steel castings, and its advent is welcomed by both the manufacturers of steel castings and the electric power companies. Without going into the merits of the electric furnace as a competitor of the crucible and open-hearth furnace as to the quality of the product or regarding it as a welcome load builder for power companies, I wish to point out some of the handicaps to its universal adoption and successful operation.

The furnaces that are now in operation in several sections of this continent, while differing in some respects in the mechanical construction and electrical demands, all refine the steel by the same chemical process—by raising the temperature of the bath to 2500 deg. C. or better, by boiling the metal to eliminate the impurities, and by the introduction of the necessary refining agents to bring it up to the fineness desired.

Construction and Efficiency

All small arc furnaces are constructed on certain general mechanical lines, as follows: The furnace consists of a steel shell mounted on trunnions for tilting to discharge the molten metal. This jacket is lined with a slightly refractory lining, sufficiently thick to retain the heat; the lining and shell, however, are pierced with port-holes for the purpose of charging the furnace with steel, adding the refining agents, discharging the refined metal, and for inserting the electrodes, and all these port-holes furnish avenues of escape for the heated gases. The electrodes are secured in place by the holders mounted on the tilting shell, and the holder raises or lowers the electrode by hand operation, by hydraulic control or by electric motor control.

In spite of the fact that the electric furnace, to-day, is turning out small castings of a better quality and at a lower cost than by other processes, nevertheless, the over-all efficiency of the best furnaces on the market is far from 100 per cent. There are three principal sources of loss:

Sources of Loss

Electrical.—In the improper delivery of the energy to the metal.

Mechanical.—In the improper design of the furnace shell and ports, to exclude cold air and retain the heat.

Chemical.—The improper combinations of refractory materials, that should be inexpensive in first cost, withstand the intense heat long enough to avoid delays through the interruption of the manufacturing process and not introduce any chemical combination with the metal. Also, there should be found an electrode that will not waste away too rapidly through oxidation, within and without the furnace, as it comes in contact with the air and gases.

Electrical conditions can be improved by supplying the proper current at the proper potential. Mechanical conditions can be improved by re-designing detail portions of the furnace. The chemical conditions can be improved only by exhaustive research and careful study.

Refractories are of two kinds: the heat-resisting linings and the heat-producing electrodes. The heat-resisting linings may be either acid or basic, depending on the degree of heat required for the quality of steel to be turned out. The heat-producing refractories may be either carbon or graphite.

Temperatures and Lining

Merely to melt down steel scrap and turn out castings of semi-steel and low-grade castings of unknown quality does not require a temperature of 2500 deg. C., and for a furnace for this class of work an acid lining of silica is successfully used. To refine the steel, however it is necessary to use a basic lining of magnesite, at least where it comes in contact with the bath, or where the heat would be intense enough to melt down the silica and cause it to run down into the bath and combine with the metal bath or slag and the basic lining thereby changing their character.

The furnace linings can be placed in two ways: Built up with brick work, the bricks made to conform to the shape of the shell and laid up in a basic paste or coal tar binder, or the material for the lining may be made up into a mass and rammed into the shell. The brick lining offers some advantages, inasmuch as it has passed through a glazing process that should prolong its heat-resisting qualities, but it is expensive, particularly if special sizes and shapes are desired, and if the source of supply is remote, and the delivery uncertain.

The rammed lining should be superior from the fact that it is, if properly put in, a monolithic mass, hence there should be little danger of the bath breaking through to the shell, with the resulting damage to the furnace and loss of the batch.

Electrodes and Their Loss

Electrodes are of two kinds—carbon and graphite. Each has its merits. The carbon electrode is the less costly, but has less electrical carrying capacity than graphite, and consequently must be greater in cross-section to deliver the same amount of energy. It therefore has a larger amount of radiating surface, and consequently the saving in first cost of the carbon is offset by the loss in energy dissipated in heat. Owing to the intense heat of the electrode, its surface both within and without the furnace shell loses carbon by its surface contact with the air and resulting oxidation.

The graphite electrode, by virtue of its greater carrying capacity, is smaller in diameter, and offers less surface for radiation of heat and oxidation. The electrode within the furnace shell is subject to further attack by the passage of the electric current through the heated gases to the lining, which, at a temperature of 2500 deg. C., itself becomes a very good conductor of electricity.

Better Castings Outlook

Electric steel castings may be better in quality than those turned out by skilled operators with fuel furnaces, but small electric steel castings can be made at a still less cost were present conditions improved, as then the furnaces would be limited only by the capacity of the source of the supply of electrical energy.

The field has apparently no limitations, if the chemist can overcome the losses I have pointed out. Formulate a better refractory lining, an electrode that will not waste away except in heating the bath, and utilize the waste gases by manufacturing them into a by-product or by-products.

This certainly is the day for the chemist, and his greatest achievements will be in the electrochemical field. From a paper read at the Annual Meeting of The American Electro-Chemical Society, Washington, D.C.

Chilled Axle Box Query.—Could you give us some information on making chilled axle boxes, as we have a notion of going into that line of work. We have had trouble in getting the chills out. Information relative to the foregoing will be much appreciated.—Atlantic.

ROYAL CANADIAN INSTITUTE BUREAU OF SCIENTIFIC AND INDUSTRIAL RESEARCH

A BUREAU of Scientific and Industrial Research has been founded by the Royal Canadian Institute, Toronto, to carry on work in Canada on the same lines as that now carried on by the Mellon Institute of Pittsburg, Pa., and other like institutions in the United States and elsewhere. The Royal Canadian Institute is particularly fortunate in having for its president, during the formative stages of this bureau, Dr. John Cunningham McLennan, B.A., Ph.D., F. A. A. S., F. R. S. C., F. R. S., Professor of Physics and director of the Physical Laboratory, at the University of Toronto.

Associated with Dr. McLennan in the work, and as vice-presidents of the Royal Canadian Institute, are John Murray Clarke, K.C., who is well known throughout the country as a progressive leader and author, and Dr. Alexander Charles McKay, principal of the Central Technical School, Toronto, whose great object in life is the up-building of industrial education, in which sphere he has already attained marked success. The work has also the support and cooperation of a number of other prominent men, including three Fellows of the Royal Society.

Co-operation of Industry and Learning

The idea of the fellowship system in the application of science to industry was first thought out by the late Dr. Robert Kennedy Duncan, a distinguished graduate of the University of Toronto, the first director of the Mellon Institute, Pittsburg, after prolonged visits in Europe during 1904 and 1907. Through his visits to workshops, laboratories and universities of most of the principal countries of Europe, and through his talks with industrialists, Dr. Duncan became impressed with the spirit of cooperation which existed abroad between industry and learning, and which made for the advancement of both. The industrial fellowship system occurred to him as a sane, practical scheme of relationship between industry and learning, which would promote the efficiency of American industry.

Research Procedure

When a problem is assigned to the Institute, the director selects, after careful inquiry, the best available man who can be found for this particular work. The fellow, as this man is called, is one who has invariably pursued post-graduate work in a special field, and has shown a gift for research. This man, if the fellowship has been given by an operating concern, first spends sufficient time in the factory of the donor to become acquainted with the problem at first hand. In this way he gains a knowledge of the manufacturing conditions which must be met and, when the time comes, introduces the results of his research work into the factory. He then returns to the Institute and examines the literature of the subject under investigation, in order to familiarize himself with what others have done on the problem. After this preliminary work, he is assigned a laboratory, and begins what may be termed the test-tube scale of experimentation.

The fellowships which have come to the Institute have been on such diverse subjects as the chemistry of bread and baking, problems relating to petroleum, the corrosion of steel, the technology of soap and soap fats, the bleaching of animal and vegetable oils, problems relating to the manufacture of foods, the development of steam power accessories, the fixation of nitrogen, problems of hydro-metallurgy, the development of pharmaceutical preparations, the technology of glass, the production of nitrogenous and phosphatic fertilizers, and the utilization of mineral wastes.

The Institute is, as its name implies, an organization devoted to industrial research, and as such, it is in a position to assist industrialists in engineering fields as well as in the fields of pure and applied chemistry. Knowledge of the crying need existing for such an institution in Canada cannot be made too widely known. At present, with the comparatively small amount of manufacturing done in Canada, problems a-plenty are awaiting solution, but when once the development of Canada's enormous supplies of raw materials by means of her immense resources of power gets fairly under way, nothing but the most efficient organization will suffice if industry is to receive the impetus it should from scientific progress and research.

The Time Opportune

To-day industries are being established in America which have previously been the exclusive property of the European countries, especially Germany. The United States is at last awake to the necessity of fostering these industries by providing facilities for research, and if Canada is to have her fair share of them she must act at once. We must conduct propaganda to make our manufacturers and capitalists realize the creative power and earning capacity of industrial research. We must remember that after the military operations have ceased we will be at war with the most strongly fortified industrial position in the world. German commerce is not destroyed—merely have some of its antennae been lopped off. However, if we are willing to learn, the outlook is bright. We possess resources, to which Europe has nothing to compare, and with the impetus given by present war conditions, a little faith and sustained effort, and the development of and appreciation by our financiers and business men of the earning power of research, we may hope to develop a great chain of interlocking industries by science.

Mellon Institute Example

The Royal Canadian Institute, in founding the Bureau of Scientific and Industrial Research, is imitating the Mellon Institute of Pittsburg, because it has every reason to believe that this is the most practical plan for accomplishing their purpose yet devised. There is no reason why the same success should not attend it in Canada as in Pittsburg. That institution founded with only the most meagre support has, in less than a decade, grown so that over two score researches are continually in progress and a quarter of a million is annually disbursed in salaries and up-keep. The plan has shown itself sufficiently practical to encourage Pittsburg's two leading bankers to endow it and lend their names to it. The financial returns to manufacturers have already run into millions and on the human side scores of young men have had a chance to distinguish themselves in the field of applied science, at the same time contributing to the wealth and welfare of the people at large. In commenting on the scheme recently in England, Sir Wm. Ramsay and Prof. Henderson (of Glasgow), both recommended its adoption in England and called it "eminently practical."

When Dr. Duncan was founding the Mellon Institute, he met a few leaders of industry, the University of Pittsburgh, and some other interests sufficiently far-sighted to supply the $10,000, with which the institution carried on its early work. Surely Canadian manufacturers, and others will be sufficiently aroused to do as much. The Pittsburg men were asked to give to what then was an unknown experiment — now, the Royal Canadian Institute is asking support for an undertaking that has been tried and proved successful. In addition to the work of its bureau, the Royal Canadian Institute will continue its other scientific work. The Institute has to its credit many notable achievements including the establishment of standard time throughout the world and has been recognized as of national importance.

The Mount Lyell (Tasmania) Co., has erected a plant for the manufacture of caustic soda. The company is also experimenting to ascertain whether crude sulphur for use in the production of sulphuric acid can be profitably extracted from the raw pyrites. The result is understood to be very satisfactory.

Safety Rules for Iron and Steel Manufacturing Plants

Selected

The State of Ohio has drawn up the accompanying Code of Rules and Regulations with a view to their adoption by the management of Blast Furnace, Coke Oven, Steel-making and Rolling Mill Plants, within that territory. From a study of the proposals, not a few of the suggested enactments may be worth while of appropriation by similar institutions in Canada.

THE Industrial Commission of Ohio has formulated a code of Safety Rules and Regulations governing the operation of blast furnaces and steel plants and has published them in pamphlet form. A similar code proposed by the same commission relates to foundries and to the employment of women in core rooms. These sets of rules, as prepared by sub-committees, have been approved by a general advisory committee, but have yet to be approved by the Industrial Commission. They are being sent to foundries and steel plants in Ohio and about two months' time will be allowed for the receipt of criticisms and suggestions from operating companies. The proposed regulations for blast furnaces and steel works are as follows:

By-Product Coke Ovens

1.—Hoppers should be guarded in such a manner as to prevent man from falling.

2.—Exposed moving parts of coal and coke handling machinery to be guarded as prescribed by general code. (It is recommended that grease cups be extended to the outside of the guards to facilitate oiling.)

3.—Some method of shutting off power to be installed near coal hoppers to enable workmen to shut down hopper shakers in case of accident.

4.—All approaches leading to rooms or buildings where coal dust or gas may accumulate to bear warning signs forbidding smoking or open lights.

5.—All elevated walks, stairways and platforms to be guarded by standard railing. (Note exception under Rule 6.) Would recommend that "standard railing" be specified as follows: To be not less than 3½ ft. in height, with intermediate rail midway between top rail and floor, and shall have toe-board or toe-plate at base at least 3 in. in height.

6.—Exception to Rule 5 to be made for platforms at both front and back of coke ovens.

7.—Quenching cars and larry cars to be equipped with automatic warning signals.

8.—All power transmission machinery to be guarded by standard guards.

9.—Reversing machines and counterweights on oven platforms should be enclosed by solid or mesh guards.

Blast Furnaces, Docks and Ore Storage Yards

Section A.—General:

1.—These rules are intended to cover the fundamental safety requirements for blast furnaces, cast houses, stoves, gas cleaning apparatus, skip hoists, pig casting machines, stock houses and stock handling machinery.

2.—Valves, switches and operating levers that control the movement of machinery covered by this code shall be provided with devices which will permit them to be locked.

3.—Standard platforms, provided with permanent stairways or iron ladders, shall be installed at all elevated points where employees daily or frequently are required to go. This rule shall not apply to railroad structures.

4.—Some means for the quick resuscitation of men overcome by gas shall be provided at the blast furnaces.

5.—A signal system shall be maintained between each blast furnace and its blowing engine room.

Section B.—Blast Furnaces:

1.—Each blast furnace shall be equipped with a telephone or speaking tube connecting the top of the furnace with the cast house or blower's office. It is also advisable to have a means of quick communication between the cast house or blower's office and skip hoist operator's house.

2.—A removable shield constructed with a hole for the movement of the drill shall be provided when tapping the iron hole.

3.—The mud gun shall be equipped with a funnel shaped guard at least 6 in. high around the receiving hole of the mud cylinder.

4.—For all new construction, explosion doors on top of the furnace shall be of the bleeder type only, and so constructed as to prevent, as far as possible, the escape of anything but gas and fine material.

5.—Platforms shall be provided for all bleeder valves, and wherever practicable such platforms shall be standard.

6.—Bustle pipes shall have a railed walk with toe-boards and shall be equipped with stationary stairs or steel ladders.

7.—Provision shall be made to protect persons underneath the skip car tracks from falling material.

Section C.—Stoves:

1.—Means shall be provided so that before men are permitted to enter stoves for any purpose, the cold blast and gas burner valves must be locked shut, the chimney valve locked in proper position and the operating mechanism to the hot blast valve disconnected or locked.

2.—All manholes at or about the top of each stove shall be provided with platforms accessible by stairways or permanent ladders.

Section D.—Cast Houses:

1.—Casting holes where ladles are loaded under the floors, shall be railed, or where this is not practicable, a grating shall be provided.

2.—Two or more exits from opposite sides or ends of cast houses shall be provided by runways or stairs. Where the cast house floor is elevated permanent or removable railings (not necessarily standard) shall be provided.

3.—All permanent gates in iron and cinder runners shall be operated from a distance.

4.—All men in cast house crews shall wear eye protectors. Men operating or walking about acetylene, electric or oxygen burning apparatus must wear colored eye protectors.

Section E.—Gas Cleaners:

1.—All gas cleaners which may have to be entered while the furnace is in operation shall be provided with one or more valves by which the entering gas can be shut off.

2.—Operating devices for dust catchers shall be arranged to enable the employees to dump them at such a distance and in such a location as to avoid the probability of being burned by hot dust.

Section F.—Stock Houses:

1.—Scale cars and transfer cars shall be equipped with fenders or wheel guards, and warning signals.

Section G.—Pig Casting Machines:

1.—Shields or shelter houses must be provided for protection of the men at the pouring end of pig casting machines.

2.—All men at pig casting machines shall wear eye protectors during the pouring.

Section H.—Relining Precautions:

1.—For relining purpose hooks on brick hoisting lines shall be designed so that in case of fouling, the hook will not be disengaged. The well through which material is hoisted to the working scaffold should be so constructed as to prevent the probability of the bucket fouling, and provided with a toe board around the opening of each platform.

Section I.—Ore Storage Yards:

1.—Any live conductor bar or trolley wires, not a part of a machine, and so situated as to be touched by a person on the ground or permanent passageway, should be protected as far as practicable.

2.—Track fenders or wheel guards shall be installed on all traveling ore handling machinery, except steam shovels, locomotive cranes, and other standard railroad equipment.

Section J.—Docks:

1.—Life preservers and pike poles shall be maintained in conspicuous and easily accessible places on all water front docks.

2.—Snubbing posts shall, as far as practicable, be of a type that will lessen the probability of the lines slipping off.

Bessemer Department of Steel Plants

These rules are intended to cover the fundamental safety requirements for Bessemer converters, hot metal mixers, cupolas, strippers and other equipment pertaining to the manufacture of Bessemer steel.

Section A.—General:

1.—Valves, switches and operating levers that control the movement of machinery covered by this code shall be provided with devices which will permit them to be locked.

2.—Standard platforms provided with permanent stairways or iron ladders shall be installed at all elevated points where employees daily or frequently are required to go. This rule does not apply to railroad structures.

3.—All men engaged in the pouring or handling of molten metal or molten slag shall wear eye protectors.

4.—Pouring platforms and other places where men are endangered from molten metal shall be provided with at least two exits.

Section B.—Hot Metal Mixers:

1.—All mixers shall be equipped with counter balances or an automatic mechanical device which will either return the mixer to an upright position or prevent it from upsetting in case the power is off the tipping mechanism.

2.—All mixers operated by hydraulic power shall be equipped with an emergency valve, so arranged that if the main operating valve fails while the mixer is pouring, the emergency valve can be operated immediately to prevent the mixer from upsetting or to return it to an upright position.

3.—A warning signal shall be installed on each mixer to be sounded when the mixer is about to be poured.

4.—Automatic rail stops shall be placed on either side of the opening of the hydraulic hoists used for conveying iron to mixers, and the opening in the floor caused by the raising of the hoist shall be guarded by automatic gates.

5.—Auxiliary hoists on ladle cranes shall be equipped with a type of hook which can be attached by the craneman to tip the ladle after the ladle has been hoisted to pouring position.

6.—There shall be a signal system between the mixer operator and the operator of the transfer ladle to notify the operator when the pouring is finished and the ladle is ready to be moved.

7.—All cages on hot metal cranes shall be arranged to give protection to the cranemen in case of spilling or dropping a ladle of hot metal. The methods recommended are either to provide escape platforms on the outside of the building, which will be accessible from the crane cage, or to provide an enclosed fire-proof cage. Where an auxiliary enclosed fire-proof cage is installed for emergency purposes, it should be equipped with an auxiliary control for the bridge travel to allow the craneman to move the crane away from the immediate place of danger.

Section C.—Cupolas:

1.—Cupolas shall be covered at charging floor level where men may be at work in same, to prevent chargers from throwing in material, or material falling from stack on to men. These covers are to be constructed so as to allow ventilation to men working in cupolas.

2.—Provision shall be made to cover openings between cupola shell and charging floor.

3.—Drop chutes shall be enclosed as nearly as practicable. Preferably props shall be pulled by snatch block and cable, rather than by hand. Warning shall be given before bottoms are dropped.

4.—When cupola cinder passes through hole in the floor, this hole shall be guarded by a suitable shield or railing.

Section D.—Ladles:

1.—All ladles shall be bottom heavy, and ladle cars shall be equipped with safety devices to prevent ladle tipping.

2.—Iron transfer ladles shall be provided with a warning signal.

Section E.—Vessels:

1.—A signal shall be provided to give warning whenever a vessel is to be turned up or down.

2.—A signal system operated from the scrap charging floor shall be installed to give warning when the vessel is about to be charged with scrap. Signal shall also be sounded when the charging of scrap is finished.

3.—The hydraulic mechanism operating the vessels shall be equipped with an emergency valve so arranged that if the main operating valve fails while the vessel is pouring, the emergency valve can be operated immediately to control the movement of the vessel.

4.—Vessels shall not be blown into stacks.

Section F.—Handling Molten Metal:

1.—Hydraulic pouring cranes shall be equipped with safety automatic devices that will hold the crane jib and ladle suspended in pouring position if the pressure should fail.

2.—The uncapping stand shall be equipped with a barrier to provide cooling of the ingots before they are uncapped.

3.—Ingot mold cars shall be equipped with coupling devices designed so that it will not be necessary under ordinary conditions for men to stand between the cars to couple.

Section G.—Bottom House:

1.—A mechanical means shall be provided for removing material from dry and wet mixers while they are in motion.

Open Hearth, Crucible and Electric Furnaces

1.—Tapping platforms, charging floors and other elevated points should be guarded by standard rails with the exception of pouring platforms.

2.—The opening in railing at tapping platforms for spouts or runners to be provided with a suitable removable guard to protect same when not in use.

3.—Charging machines must be provided with warning signals.

4.—When tearing out a furnace beneath the floor a tight boarding must be built around the furnace to prevent material from falling on workmen below. This should apply when a furnace is to be completely torn out and the uptakes and division walls removed, otherwise a floor in the uptake is sufficient.

5.—Provision shall be made such that when a furnace is down for repairs the gas can not be accidentally turned into the furnace.

6.—All cages on hot metal cranes shall be arranged to give protection to the cranemen in case of spilling or dropping a ladle of hot metal. The methods recommended are either to provide escape platforms on the outside of the building, which will be accessible from the crane cage, or to provide an enclosed fire-proof cage. Where an auxiliary enclosed fire-proof cage is installed for emergency purposes, it should be equipped with an auxiliary control for the bridge travel to allow the cranemen to move the crane away from the immediate place of danger.

7.—In new construction, charging buggies shall be equipped with coupling devices designed so that it will not be necessary under ordinary conditions for men to stand between the cars or pans to couple.

8.—Provision shall be made such that when a producer is shut off from a main pipe or when furnace is cut out, gas can not be accidentally turned on again.

9.—In crucible practice a safety cable or chain shall be provided at the edge of pouring platform to prevent men engaged in pouring from falling into ladle.

Blooming, Billet, Plate, Bar and Mechanically Operated Mills

1.—Subways or bridges shall be provided when passageways across tables, conveyors or other mill machinery are required.

2.—All gearing or dangerous shafting on roll tables shall be guarded.

3.—Coupling boxes, spindles and wabblers shall be guarded.

4.—Suitable means shall be provided for reaching the top of housings.

5.—Guards should be placed at the dead end of all roller tables to prevent material over-riding the end of the table.

6.—Scale tunnels shall be arranged so that scale can be removed without subjecting workmen to danger of falling hot scale, or if this is not practicable, men shall not go in pit when mill is in operation.

7.—Wherever practicable means shall be provided to protect men working about the rolls from flying scale and cinder.

8.—Power must be shut off pit covers while soaking pits are being repaired.

9.—The sides of bosh tank for quenching crane dogs shall be not less than 36 in. above the floor level.

10.—Counterweights must be guarded.

11.—Means shall be provided to warn the engineer of overspeeding reversing engines.

12.—It is recommended that straight running mill driving engines of 100 h.p. or over, be provided with a speed limit control and engine stop.

13.—Valve, switches and operating levers that control the movement of machinery covered by this code shall be provided with devices which will permit them to be locked.

14.—It is recommended that all platforms, runways, aisles, doors, stairways or ladders be kept as clean as possible.

Hand Operated Merchant and Rod Mills

1.—Spindles, coupling boxes, pinions and wabblers to be guarded.

2.—Danger from uneven or broken floor plates or gratings to be eliminated as far as possible.

3.—Subways or bridges shall be provided when passageways across hot beds, runways, spindles or tables are required.

4. Adjustable guards to be provided at outside of hot beds and skids to prevent material falling off.

5. Hot and cold saws shall be guarded, and means be taken to reduce the number of flying sparks.

6. On small mills where long bars are being rolled in more than one pass at a time, safety posts to be used where practicable, to protect roll hands from being caught in the loop.

Pipe Mills

Section A.—General:

1. These rules are intended to cover the fundamental safety requirements for lap weld mills, butt weld mills, coupling shop, galvanizing plants and all other equipment pertaining to the manufacture of pipe.

2. Standard platforms, provided with permanent stairways or iron ladders should be installed, where practicable, at all elevated points where employees are daily or frequently required to go. This rule does not apply to railroad structures.

3. All machinery, not otherwise mentioned and covered by this code, is to be safeguarded as specified for rolling mills or in general code.

4. Charging and discharging openings in welding and heating furnaces should be provided with shields to protect men from heat and flames.

5. There should be a signal system between the charging and drawing ends of all bending and welding furnaces.

7. Hot and cold saws shall be guarded, and means be taken to reduce the number of flying sparks.

8. Moving parts of threading and finishing machinery should be guarded as prescribed under general code.

9. A means should be provided to notify operators around the furnace when gas is to be reversed.

Section B.—Gas Producers:

1. All openings level with the ground, used for burning out gas flues, should be protected by railings or gratings when flues are being burned out.

2. When men are engaged in repairing gas producers or gas flues, when other producers in the same battery are in operation, suitable gates or valves shall be provided, by which all gas can be shut off.

Section C.—Lap Weld Mills:

1. Solid welding balls should not be used, as holes for the passage of gas should be provided.

2. Forced ventilation should be provided for the men working in intense heat.

3. Space between ends of troughs, conveyors, or tables and roll stands should be barred to prevent passage.

Section D.—Butt Weld Mills:

1. Movable draw benches and chains should be so constructed or guarded as to protect men's feet.

2. Stops or guards should be provided at the delivery end of cross roll troughs.

Section E.—Galvanizing Plants:

1. Where practicable, all tanks shall be protected.

2. Special attention shall be given to the ventilation of galvanizing plants to remove as much of the fumes and steam as possible.

3. Galvanizing kettles shall be railed or shielded.

Section F.—Coupling Shop:

1. Shields should be provided at welding hammers and rolls to reduce the number of flying sparks.

2. All coupling shop machinery should have the moving parts guarded as prescribed under General Code.

Section G.—Job Shop:

1. All machinery used for special work in job shops should have the moving parts guarded as prescribed in the general code.

Wire Mills

These rules are intended to cover the fundamental safety requirements for the wire drawing, rolling and fabricating departments of wire mills.

1. Standard platforms, provided with permanent stairways or iron ladders, should be installed, where practicable, at all elevated points where employees daily or frequently are required to go.

2. It is recommended that all platforms, runways, aisles, doors, stairways, ladders, fire escapes, or fire apparatus be kept as clean as possible.

3. Where practicable, all tanks or tubs should be protected.

4. Wire drawing, rolling and fabricating machines shall be equipped with means, conveniently located for quickly shutting down the machinery in case of emergency.

5. Screens or railings should be provided to protect open pot annealing furnace while being repaired or not in use.

6. Passageways under hot wires from annealing furnaces shall be protected.

Sheet and Tin Mills, Tinning and Galvanizing

1. Shearmen, openers, loaders and machine feeders should be required to wear gloves or hand leathers, and proper protection to the forearm.

2. It is recommended that all tools, furnished either by the employer or the workmen should be kept in a condition of good repair and it is the workmen's duty to report all unsafe tools or equipment to his employer.

3. It is recommended employees should take proper precaution to prevent cold or wet objects coming in contact with molten metal.

4. Workmen shall wear eye protectors when grinding, chipping and attending galvanizing pots and tinning pots, unless other protection is provided.

5. Standard railings shall be provided around flywheels and drives. Cross-overs or bridges with hand rails should be provided when passage from one side of the mill to the other is necessary.

6. Wabblers on the end of the roll train shall be guarded, also the entering side of mill couplings when more than one roll is driven.

7. Shields shall be placed over furnaces doors to protect workmen from heat.

Puddling Mills, Busheling or Scrap Furnaces

It is recommended that the following shop rules be adopted:

1. When furnaces are to be fired, the dampers must always be pulled up before the blast is turned on.

2. Before charging a furnace, the cinder on the bottom of the furnace shall be permitted to cool off until it is non-fluid.

3. All obstructions must be cleared off the standing before charging a furnace.

4. When tools are taken from the bosh, they must be dried off before placing in hot metal.

5. When throwing scale into the heats of hot metal, care must be taken to see that the damper of the furnace is pulled up its full height.

6. After a heat of iron has been drawn from the furnace, the damper must be pulled up or adjusted to full draft before cooling off or fixing the furnace.

7. When throwing water into a furnace to cool off the cinder, it should be used in small quantities and extreme care taken to see that there is no bosh cinder or other solid bodies in it. At no time is any wet or damp material to be thrown into a furnace when there is melted cinder on the bottom of the furnace, when the damper is down, or the draft is shut off.

8. The throwing of water on balls of iron when taking out of furnaces to the hammer or squeezer is strictly forbidden.

9. No water shall be allowed to accumulate on the standings of furnaces, or along the mill races that the hot iron is run over to the squeezer or hammer.

10. In putting iron in the squeezer, great care must be exercised not to put the basket or tongs between the drum of the squeezer and the ball. In the event that tongs or baskets are caught the workmen must let go of same at once.

11. Furnaces are not to be fired without slacking the blast sufficiently to keep flames from the fire chamber burning the men working about the furnace.

12. Hot taps must not be placed near water.

13. When dumping tap buggies, care must be exercised to not allow cinder to come into contact with damp or wet ground.

14. Water must not be thrown on hot taps.

General

1. All bloom boys and roll hands must wear goggles or copper wire face masks.

2. All dampers and doors on furnaces must be properly balanced and balance weight must be adjusted by the workmen and securely fastened each time.

3. Where switches are in use on a telepherage system sufficient light must be provided by which to change switch.

4. When ash pits are two or more feet deep, safe and substantial means of access to and egress from pits shall be provided.

5. Muck mills shall be protected in accordance with rules pertaining to hand-operated rolling mills.

BLACKING AND WAXING SMALL CASTINGS

FOR a good many purposes it is neither necessary nor desirable to paint iron castings. In such cases blacking and waxing usually fills the bill, and being very simple can be carried out anywhere. After being cleaned off and dressed up, the castings are blacked and polished with some good stove polish, or fine black lead wetted down with turpentine, and after being polished are made hot and thinly coated with beeswax or other tough form of wax. When cold they are again brushed up. As a general thing they will then resist rust in all ordinary indoor positions. The wax appears to attach itself very firmly to the hot metal and prevent air and moisture reaching the surface, while a very small quantity need be used. Hard waxes such as carnauba wax, and paraffin, do not seem to be so effective as beeswax, and can therefore be left alone in regard to this kind of work.

CASTING METALS IN IRON MOULDS

By W. J. May.

UNDER suitable conditions and with certain forms of castings, all metals can be cast in iron moulds of some amount of thickness, but, owing to the cost of the moulds, this can only be done economically where very large numbers of precisely similar castings have to be made. Up to the present time no very great progress has, consequently, been made, "die-casting," as it is called, having been restricted to the casting of soft metals by a few firms who have had courage enough to break away from the old-fashioned methods of doing foundry work. In the result, however, they appear to have had a fair amount of success. That there is a demand for this class of work is becoming apparent.

Of course, casting in metal moulds is not a new process, as type has been always cast in such moulds, and tube and strip ingot for drawing and rolling is cast in iron moulds. It is simply the extension of a somewhat old process to a wider field of operation that has to be arranged for amongst mechanics not trained for the work. In the near future, however, it is practically certain that there will be greater standardization of work and in such things as permit of it, increased cheapness of production will be sought, even where this increases the wages of the individual worker. Really, it does not matter what a man earns so long as he reduces the cost of the articles he produces. Permanent mould casting and machine forging in dies will have, very largely, to take the place of handwork, and the sooner this is recognized the better for all concerned, as both mean considerable reductions in the cost of production.

Metal Moulds and Sand Moulds

In dealing with metal moulds a great many people seem to think that they have the same conditions as with sand or loam moulds; but in this they are working on wrong lines. In sand or loam moulds, gases and air pass into and through the mould itself, and in this way the exact state of the metal poured is not so stringently important, because up to a certain point there is a fairly free escape for all gaseous matters formed or contained in the moulds and metal. With the metal mould there is no escape for any gas unless vents are provided. In the case of dirty metals likely to throw off gases this is a serious matter, because if the escape vents are insufficient or wrongly placed the gases become occluded and porous castings result. It, therefore, becomes necessary to design moulds to prevent such troubles.

Every case must be dealt with according to local conditions, however, and no strictly hard-and-fast lines can be laid down. So far as the metals and alloys are concerned, they must be clean and free from oxides or other gas-forming matters, and they must be fluid. As a rule, freshly melted metal is necessary, and in addition it should be melted quickly. In many cases some deoxidant flux will be required, and this must be an effective one.

On the economic side of the question, permanent moulds have to be kept busily at work during the time they are in use, and to get good results it is necessary that a number of moulds and a sufficiency of crucibles to keep them going should be employed. It is of no use to pour on chance occasions for one or two castings, as this is certain to prove a failure, and generally it is useless to work for less than full days, and then only with a group of men and boys selected for the job. To obtain economy in working, a regular routine must be followed for fairly long periods. As a rule, iron moulds do not work well at first, as some change takes place in the machined surfaces for some time. For this reason part of the first lot of castings are practically certain to be useless, although eventually, with careful working, very few wasters are produced.—Practical Engineer.

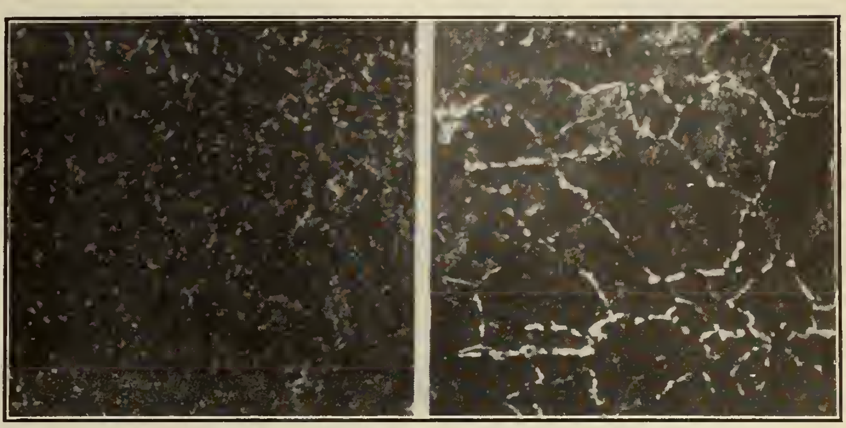
EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

HEAT TREATMENT OF STEEL

By "Melter"

AT the moment, when the majority of manufacturers in the mechanical trades are engaged in turning out munitions of war it may be of interest to explain the "why and wherefore" involved in the heat treatment and working of alloy, and steel materials. Primarily a comprehensive understanding of the fundamentals of metallurgy must be acquired and the success of the practical results obtained will largely depend on the degree of knowledge attained in this very important branch of mechanical engineering.



A—UNANNEALED. B—ANNEALED.
Magnified 50 Diameters.

Steel-Making Processes

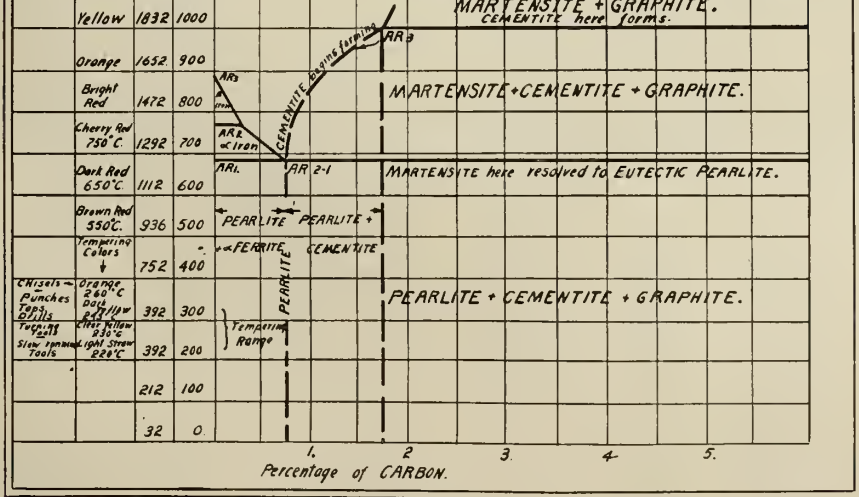
Steel should be considered first as it is the product most widely used. It is principally made by four different methods—Bessemer, Open Hearth, Crucible and Electric. The Bessemer process is not very largely used now except for special purposes—as making sheet metal. The Crucible process is extra and more expensive than Open Hearth or the Bessemer and the product is used where an extra fine material is required such as for tools or dies. Electric processes are rapidly emerging from the experimental stage, but the product is still somewhat expensive.

The Open Hearth process is used in making steel for shrapnel shells. It is the most widely used of all processes, and while there has been a lot of discussion as to whether the acid or basic open hearth process is the better for all practical purposes there is no vital difference. Results of exhaustive published tests have shown acid open hearth to be slightly the superior.

The qualities of the steel which may be in use do not therefore depend so much on the type of furnace used in the manufacture, as on the ingredients in the steel and the way in which the steel is manufactured.

Carbon is the most important element, as on the quantity of this element, and the state in which it exists, depends the distinction between wrought iron, cast iron and steel. Wrought iron is pure iron (or ferrite as the metallurgists call it) crystallized in many shapes and forms. In addition to ferrite there are elongated particles of slag. Low carbon steel is wrought iron without the slag and in addition to the ferrite there is a little more carbon. Now carbon does not exist as carbon but combines with the iron forming a carbide of iron, and it is on the state of this carbide that all the properties of steel depend. This carbide when combined with ferrite in segregated areas and not disseminated through the mass as it is in mild steel is called pearlite from its appearance under the microscope.

Carbon may be introduced into steel up to a certain point when all the ferrite will have combined with it and the whole will be pearlite (as it is in tool steel). If still more carbon be introduced there will be an excess of the carbide. This saturation point occurs when about 0.8 per cent. carbon has been absorbed.



ROBERTS-AUSTEN DIAGRAM ILLUSTRATING EFFECT OF HEAT ON IRON WITH VARYING PERCENTAGES OF CARBON.

Effects of Heat

The results obtained by heat treatment are caused by critical changes which occur within certain narrow temperature limits. These limits are called calescent points sometimes written Ar. 1, 2, 3, and Ac, 1, 2 3 and represent points where definite charges take place. These changes are chemical, structural, and physical, and when the temperature is ascending the pearlite becomes broken up, its carbides going into solid solution in the ferrite. It will be noted that some steels have more than one of these points if reference be made to the Roberts Austen Diagram.

The term annealing means breaking up these dissolved carbides and distributing them through the mass, and to do this properly, slow cooling from slightly above the decalescent point is necessary. If on the other hand steel is heated above these points where all the carbides are in solid solution and cooled very quickly a new state of matter is obtained. It is this new molecular formation called Martensite which imparts the hardness to steel and by referring again to the diagram it will be seen just how high a temperature must be attained for varying amounts of carbon to obtain a certain structure. It must be borne in mind however, that if it is desired to anneal or harden steel it must be heated just above the critical temperature. The higher it is heated above this point the coarser will be the grain. Slow and undisturbed cooling from just above the critical point produces the finest grain.

Photograph A. shows a piece of steel heated considerably above the critical temperature and B. shows a piece cut from the same bar, heated just above the decalescent point and allowed to cool slowly.

To sum up:—1. Steel heated above the critical point has the finest possible structure at that point, but the further it is heated beyond it the larger the grain size.

2. For any given temperature above the decalescent point, a certain grain size is normal.

3. When cooling occurs after being overheated, the grain is not reduced in size and in order to make any change in the structure the steel must be reheated slightly beyond the decalescent point.

Influence of Carbon

As we have seen from the above that the qualities of steel depend largely on the treatment and state of the carbon it may be of interest to look at Table 1 where the results are given of tests, with varying percentages of carbon, on commercial bar steel made in Canada.

Table 2 gives results which demonstrate clearly the great benefits which may be obtained through suitable heat treatment.

TABLE 2.—EFFECT OF HEAT TREATMENT.

Carbon	Manganese	Heat Treatment	Elastic Limit	Elongation in 2 inch	Reduction in area
.05	.05	None	32,020	42.5	53.8
.18	.40	Annealed	39,460	35.0	62.6
.18	.40	Heated 1650) Drawn 750) Oil quenched	45,390	33.0	64.6
.18	.28	Annealed	43,010	34.0	63.4
.26	.28	Heated 1650) Drawn 975) Oil quenched	52,230	28.0	65.3
.35	.50	Heated to 1500-1550) Drawn 600 to 1200)	45,000 to 80,000	....	....

The rate of quenching has a very important bearing on the physical properties, for if the cooling is not rapid we do not obtain the desired martensite but an intermediate structure which is not so hard.

Quenching Mediums

Experiments have shown that different quenching mediums give different degrees of hardness, tensile strengths, etc. The effect of different oils on pieces cut from shrapnel shell forgings follows:

Carbon %	Tensile strength lbs. per sq. in.	Elongation in 2 in. %	Kind of Oil.
.32	129,000	16	Seal oil
...	118,000	20	Rape oil
...	134,000	18	Seal oil
...	125,000	20	Rape oil

The oils used showed the following physical properties:

	Viscosity at 60° F. Saybolt seconds	Specific gravity
Seal oil	131	.924
Rape oil	261	.915

The desired effects of quenching mediums seem to be better obtainable from those liquids which possess high specific gravity, low viscosity and the power of creating as little vapor as possible thus allowing the liquid to be in more intimate contact with the steel, and exert its cooling effect more efficiently. The size of the test piece has an important bearing on the results obtained. In commercial practice very often the time is not taken to heat a piece slowly, uniformly and for a sufficient period for the heat to soak into the center of piece without overheating the exterior.

Some tests have shown that when the work has been proceeded with on a commercial scale, even with the greatest care there will be a variation of as much as 33 per cent. from results obtained with a half inch diameter and a 1¾ in. diameter test piece. Consequently if a larger piece of steel is to be used a higher and more careful heat should be given.

Temperature and Mass

Recently published results of investigations give some interesting data on the effect of temperature and mass. These results show that for each increase of 1-16 in. diameter the temperature should be increased 5 degrees. Some heading and indenting punches for brass cartridge cases were made of 1.25 per cent. carbon steel, water quenched, but the metal took a permanent set under working conditions so that the only way in which results could be obtained was to build up the punches with 1 in. thick sections bolted together. This effect of treatment on mass causes specifications to call for location of test pieces as is done in shrapnel cases. For example nose of shell being of a different thickness to body, the heating temperature and effect of quenching medium would give different results.

The effect of overheating mild steel shows that for the first 100° F. overheat there is a reduction in foot lbs. resistance on an impact test, of 50 per cent., and for each further increase in temperature of 100° there is a reduction of 60 per cent., 90 per cent. and 99 per cent.

TABLE 3.—EFFECT OF HOT WORK AND QUENCHING ON MILD STEEL.

Treatment	Tensile strength lbs. per sq. inch	Elongation in 8 inch
Normal	55,000	13%
Worked at 1150° F. air cooled slowly	65,000	13%
Worked at 1300° F., quenched and annealed at 900° F.	66,000	12%
Worked at 700° F., cooled slowly	75,000	6%
Worked at 950° F., quenched water	98,000	11%
Worked at 1300° F., quenched brine	120,000	1%

TABLE 1.—COMMERCIAL BAR STEEL WITH VARYING PERCENTAGES OF CARBON

Carbon	Phosphorous	Manganese	Sulphur	Tensile strength lb. sq. inch	Elongation in 8 inch	Reduction in area
.11	.04	.51	.03	56,300	28.1	56.8
.15	.05	.48	.04	62,900	26.5	46.0
.16	.03	.40	.03	58,800	28.1	46.3
.18	.02	.55	.03	60,000	26.5	46.6
.24	.03	.46	.02	66,000	21.8	40.3
.24	.03	.39	.02	62,800	21.8	45.7
.26	.03	.49	.03	67,000	23.3	44.0
.37	.05	.45	.02	65,700	25.0	44.5
.24	.04	.56	.02	74,500	18.7	35.0
.27	.05	.54	.03	71,300	15.6	38.0
.41	.01	.56	.02	76,400	21.8	43.7
.38	.02	.57	.03	75,000	17.9	36.6
.50	.02	.55	.03	86,600	19.5	36.6
.50	.02	.50	.03	86,300	18.7	33.0
.53	.05	.53	.03	102,200	14.0	17.3
.55	.02	.69	.03	103,800	10.9	17.3
.64	.03	.65	.02	127,200	3.1	....

Effect of Hot Water and Quenching on Mild Steel

Great care should be taken in handling steel at a blue heat, say 400° to 650° F. for it has been proven when elongated 1.7 per cent. that the brittleness has been increased 33 per cent. Table 4 shows some interesting figures on tests made at different temperatures.

TABLE 4.—HOT AND COLD TESTS ON IRON AND STEEL.

Material	Temperature	Diameter	T/s lbs. per sq. in.	Reduction in area	Elongation in 8 in.
Mild steel	0° F.	1"	61,700	53.05%	27.05
"	70° F.	1"	61,100	53.90%	31.40
"	360° F.	1"	57,300	54.70%	28.00
"	0° F.	1⅛"	61,450	63.20%	31.20
"	70° F.	1⅛"	60,500	62.75%	32.50
"	360° F.	1⅛"	57,900	64.15%	12.25
Iron	0° F.	1"	53,800	42.30%	27.50
"	70° F.	1"	52,250	45.05%	29.80
"	360° F.	1"	49,000	41.75%	20.25
"	0° F.	1⅛"	53,800	29.50%	21.25
"	70° F.	1⅛"	52,950	43.20%	28.50
"	360° F.	1⅛"	49,850	44.50%	24.80

PIECE WORK SYSTEMS—I.

By R. R. Clarke

THE economic principle of factory operation sanctions nothing that does not favor increased output at reduced expense. Every practice or change of practice in the operation of all systems can be traced to this actuating desire. "More for less" seems to have been the slogan of the masters from the earliest dawn of the labor question down to the present and has been answered by the murmur "too much for too little already," from those whose lot it has been to serve.

While the world lasts, some will work; other be worked. Nor does this mean that any one class or either side has been doing all the work or suffering all the woes of the "being worked" class. Bright men sit at the desk but those just as bright work at the bench. Between them it is a big game of checkers, each side studying the board and planning its move, wondering all the while what the other fellow is going to do next. For this, corporation interests have banded and met their resistance in the unions of men; on the one side brains; on the other brains and brawn. Time has passed when trickery gains much. Something higher in principle, more honorable in conception must be substituted. Employer and employee must meet on grounds congenial to both. Advantages must be mutual or the party on the long end of the business chuckles while the other fellow kicks and squeals.

Piece Work an Equalizer

The piece-work system is in part a solution of the problem. In the foundry it is of special advantage. That it entails some evil we have no doubt, but that it yields benefits far in their advance we have as little doubt.

The most praiseworthy feature of a good piece-work system is that it places every man on his own resources and stamps him for exactly what he is worth. To the employer it offers increased production and protection against the careless, lazy, or indifferent workman, while it yields to the workman the advantage of increasing his daily earnings and applying his aptitude to his own profit. Yielding this dual advantage it appeals with reasonable attractiveness to both sides and offers a respectable avenue of escape from more than one difficulty.

It is, however, not without its difficulties. The setting of piece-work prices has a tendency to call forth many contentions between the foreman and the workman. In this the foreman's lot is, indeed, a hard one. Having his own conscience, the firm and the workman all to satisfy, his position is not always an enviable one. Determining bad work and fixing the blame therefore often brings coremaker, furnace-man, helper, moulder, foreman and inspector together in stormy seance. The system often superinduces in the man a tendency to dishonest practice, which from both a moral and business standpoint is a serious thing. It also favors development of a class of inferior workmanship due to what for want of a better we shall name the "hogging" instincts of the man. In fact our experience in this has been such as to strengthen the opinion that piece-work moulders are inclined to make castings just good enough to pass and very often insist on having their own let judgment decide the issue.

These disadvantages, however, all lie within the province of elimination, or at least satisfactory adjustment. That some have failed to realize such and decry the system in consequence is no conclusive evidence against it.

Necessary Conditions

We believe in the piece-work system, the equitable adjustment of piece-work prices and reasonable demands for high standards of workmanship in the absence of which the casting is scrapped and the workman at fault made to suffer the loss. We favor piece-work prices that will enable the honest and average workman to increase his daily earnings at least 25 per cent. over the day-work figure, such increase carrying with it the demand for nothing but merchantable castings. We believe in a just and trustworthy inspection, also an equitable and competent inquiry into all circumstances and conditions to which the loss of the casting may possibly be traced, and the closing of all arguments with the decision that good judgment derives therefrom. At the same time we maintain that no workman should be made to suffer any loss arising from an error of judgment on the part of the management and deem no man fit for management who, to cover up his own error, would attempt to cast reflection on the workman, or attribute the loss of the castings to any other cause. That such a system will meet with opposition at its inception is a foregone conclusion, but a firm yet courteous determination will bring harmony out of discord and work benefits for all.

ECONOMIES IN SHOP MANAGEMENT

By H. Womersley.

JUST as we possess "fixed opinions," "set notions," etc., regarding the greater problems of life, so we possess a multitude of set notions regarding the best form of machinery and best methods of conducting a manufacturing business. Many of these notions have been acquired without careful thought. They have just been absorbed from our experience and environment. In some cases we may have assumed that someone has previously given the matter proper consideration, and that the existing conditions are the result of their conclusions. As a matter of fact, many of the conditions now existing in the machine shop are the result of allowing old practices to continue after conditions have changed, and this has taken place without the attention of anyone.

There is no desire to belittle the opinions of others; in fact, we must depend on others for most of our opinions; but there are so many things that have been left to "others," apparently by everybody, that it is well for us to do some independent thinking, especially on our own immediate problem, and cast a glance at least at some of our notions, just to see if they bear proof of having been thoughtfully produced, or unthinkingly allowed to take form. For years engineers have concentrated energies on the steam engine of the reciprocating type. The master minds have made important improvements in the design, and many have given up their entire existence to the science of analysing the effects of each variation in conditions of working the steam. Our text-books, our teaching, our observation, all concentrated our attention on this type.

Opportune Application

For some reason Gustav De Laval and

C. A. Parsons broke away from this spell, and now we have the steam turbine engine. These two individuals are endowed with master minds, but the task of producing the turbines was probably no greater than the task of others in improving the reciprocating type. In one case a great step has been taken; in the other, we have an example of men of undoubted ability laboring hard for entire lifetimes with relatively small gain. This example applies to more than the inventors' world. It has many parallels in the cold businesss management of a manufactory or one of its departments. Business management requires the same kind of reasoning and getting away from the spell of environment.

The best plan of management cannot be obtained from history. The vast store of data of correct practice of former times will not serve the purpose. A record of the practice of even the last decade is inadequate, for rules of the game are continually changing.

The investment in a machine building plant and business is not wholly protected by fire proof buildings and ultra conservative management. The security must be protected by conducting the business on profitable lines. Safeguarding the money tied up in machinery equipment and buildings is important but should not lessen the consideration of elements which have to do with the expense of operating. A plant and business is useless when not in motion, and when under headway requires money. Money must be poured into it steadily. The amount every year generally equals the total capital in the business. Money invested in plant is not very safe if there is a tendency to squander the energies over too many problems.

Variety Product Handicap

The manufacture of a great variety of articles in response to a demand by the selling organization of a company is a relic of other days. Our notions about methods for selling must be changed over to fit the modern scheme. They must be kept up-to-date. The survival of the fittest will eliminate all, excepting specialists or groups of specialists.

The entire cost of conducting a business may be lowered by simply continuing along with the same men. This applies to the entire organization from the workmen to the salesmen. Changes should be made to keep up a wholesome spirit of progress. Men should be advanced from position to position as the opportunities afford and their endowments allow. Others unfortunately must be dropped out from the organization; but both the advancements and the weeding out must be carefully considered.

The management's chief business should be to take men as they are found on earth; mould as much as possible, and place each one where he will accomplish the best results for both the organization and the individual.. Barring the disgruntled, the uncongenial and the habitually inattentive, almost all men may be and should be profitably employed, the prime requisite being reasonably close attention to business. The thoughts must not habitually wander away from the work.

The management does not "manage" if it perpetually changes its men. It should bolster up the men who lack self confidence; it should puncture false ambitions, and it should use men as they are found in the organization. It should not be inclined to "go back on" a man who has blundered or who has been found lacking in understanding. It should not be over ready to embrace a stranger just because his faults are not known.

All business is pushed forward by men who have confidence in the project and in the product. If these men lose their faith in their own business, they not only lose their usefulness as pushers and managers, but they become drags on the industry, and remain so until restored to normality.

Suppositious Knowledge

The designer may have had almost complete knowledge regarding the best way to make each part, just how each fit should be made, and just how the machine should be operated under each combination of conditions, but it is more probable that the designer never had all this wonderful knowledge. If he knew all this, it would be of value providing he had some perfect way of imparting his knowledge to each individeual worker. We know, however, that this is impossible, even with the most thoroughly organized companies. It takes years to get each piece made as it should be made, even with no change of design, and this is not accomplished by any other process than continual practice, which is only acquired by making these pieces. The quality and speed of production increase with this experience and are not acquired without it.

A Rational Policy

The art of assembling and operation of the machine is developed in the same way. There are other means that facilitate, but nothing that takes the place of practice. The knowledge of the machine must be not only in the designer's head; it is not even enough to have it thoroughly known by all officers, including foremen; it must be patiently transmitter to the real workers.

One of the most satisfactory policies of management is that which tends toward getting the best return or profit per dollar of investment. The best scheme of management for profit is one that puts the capital where it will do most good. One of the most common errors in this respect is the one that regards the reduction of labor costs as the paramount consideration. Reduction in labor cost has been the war-cry. The labor bill has been talked about so much that it has seemed to be the whole thing. What is the gain if the means for reduction of the net labor cost reduces the profit more than the saving in labor? If doing so results in an actual loss of profit, why is it done?

The cost of the product of the average plant may be divided into three nearly equal parts: the material, the labor and the burden; or, in four equal parts, if a reasonable interest charge is made for the use of the capital invested. The material is the iron, steel and other substance entering into the construction of the machine, and it is taken in the condition in which it usually comes to the machine shop. The burden includes all expenses and salaries necessary for the maintenance of the buusiness. About one-half the amount paid for labor goes to the men who run the machine tools, therefore the cost of labor is either one-sixth or one eighth of the total cost. On top of the net cost of the product there should be a profit. If it is not there, the sooner something happens the better. If it is there, then it is proportioned to the volume of the output. Therefore, both the size of the output and the labor cost should be kept in mind.

Stock Turnover

The dividing line between excessive and insufficient stock must be drawn in each individual case. An excessive stock of this or that piece, or of all pieces, means that much capital is idle, and it also tends to slackness of management. Frequently it is the outcome of carelessness. If money is to be retained in the business, it should be put into changing over the system to one which will conform to the plan of putting the money where it will bring the best return. The excessive stock in process is an outcome of blind progressiveness—the blindness that fails to see that there is as much money tied up in stock in process and in finished product as there is in the entire machinery equipment.

An adaptable equipment facilitates keeping down the amount tied up in stock in process. The modern plant should take advantage of these modern methods and machines which tend toward profitable use of capital. Such machines are highly developed and true to the controlling ideal of adaptability and largest output per dollar of investment.

ELECTRIC FURNACES

RAPID progress is being made in the adoption of electric furnaces by metal manufacturing concerns in Britain, a number of units for ferrosilicon as well as steel having been recently installed by the Snyder Furnace Co., Chicago. During a recent visit by W. K. Booth, vice-president of company, four ferrosilicon furnaces were installed in a remodeled plant, having a power consumption of 1,800 k.w. and producing silicon with a purity of 97.25 per cent. Recent British purchasers of Snyder electric furnaces include: Thwaites Brothers, Bradford, two 12-ton basic furnaces; Thos. Summerson & Sons, Darlington, one ditto; Daimler Motor Car Co., Coventry, special grey iron furnace for automobile cylinder castings; National Steel Foundry Co., Leven, Fife, special 5-ton basic furnace.

CANADA'S TRADE

CANADA'S whole trade for the month of April reached the remarkable total of $106,585,334, as compared with $65,221,031 for the corresponding period of the previous fiscal year. Being for the first month of the new fiscal year these figures seem to promise well for a record-breaking trade period. The increases are shown in both exports and imports. Merchandise entered for consumption amounted to $50,147,830, as compared with $28,391,640. These imports show a substantial increase in the free list as well as in dutiable goods, the free imports increasing from $11,776,319 to $21,218,746.

The grand total of imports, including coin bullion, amounted to $50,612,619, compared with $28,963,756.

Exports of foreign and domestic goods amounted to $55,372,720, as compared with $36,257,275 in the corresponding month of the last fiscal year. Exports of manufactured products increased from $13,221,658 to $21,573,078, and agricultural exports from $6,618,443 to $21,305,977. Mineral exports increased from $2,975,002 to $3,690,744, and forest exports from $1,929,440 to $2,287,939.

Another large increase is shown under animals and their produce, exports of which amounted in April, 1915, to $3,312,498, but which amounted in April of this year to $5,112,105.

DOMINION STEEL CORPORATION

THE president of the Dominion Steel Corporation, Mark Workman, accompanied by Wm. McMaster and W. G. Ross, has been at Sydney, N.S. looking over the steel and coal properties of the company. His visit was in connection with matters relating to the compilation of the yearly figures.

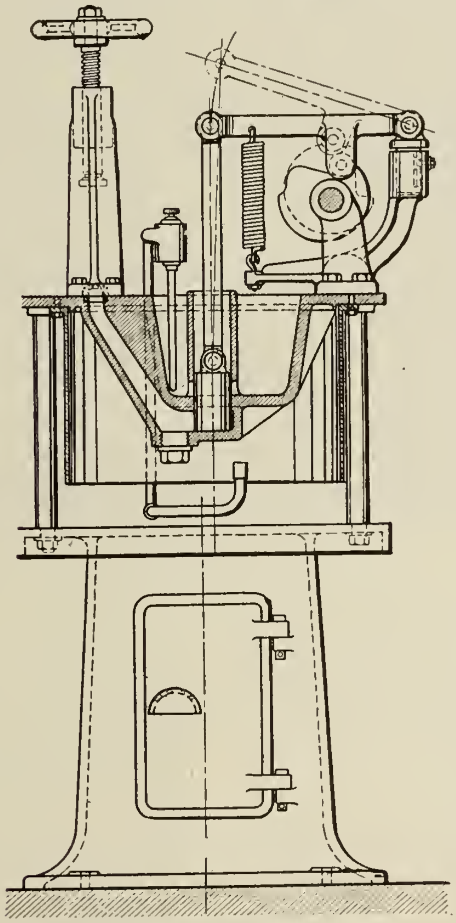
"I find there are a number of problems to be overcome," says Mr. Workman, when asked for a statement. "Our coal business is being handicapped by various difficulties, the chief of which is the fact that we have scarcely any steamer tonnage to transport the product of the mines. The Admiralty found it necessary to requisition the majority of our coal carriers for war purposes.

"Take Montreal, for instance; in normal times we would be shipping large quantities of coal up the St. Lawrence River at this season of the year, but under present conditions it is very difficult for us to fulfill our obligations with our customers in that district, among whom are many munition factories, which are now finding their output endangered from this cause.

"As regards the steel company," continued Mr. Workman, "we are hoping for a reasonable output of our products to offset as far as possible the increased cost of the necessary raw materials used in our various operations. Prices of supplies required for steel making purposes have advanced enormously since the outbreak of the war, and this in itself constitutes quite a difficult problem."

NEW DIE-CASTING MACHINE

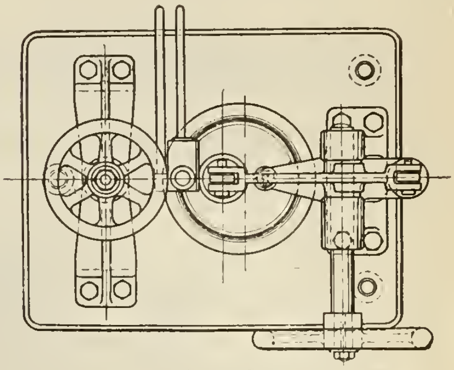
AN interesting design of die-casting machine has been recently patented and placed on the market by the Monometer



DIE-CASTING MACHINE, ELEVATION.

Manufacturing Co., Birmingham, Eng., who have constructed it with a special view to the use of aluminum and its alloys, while giving equally as good results with other metal alloys.

The apparatus consists of a gas-fired melting pot with suitable extruding mechanism and die clamp mounted on a cabinet base as indicated in elevation in the illustration. The melting pot, shown in section, is provided with a hollow cylinder extending upwards from the centre of the bottom, port holes on the sides allowing metal from the pot to



DIE-CASTING MACHINE PLAN

enter the cylinder when the piston is elevated, and an inclined passage connecting the lower end of cylinder with the die clamped in place on top of discharge orifice.

The movement of the piston is controlled by a hand operated cam-shaft which elevates the rocking lever to the position shown by the dotted lines thus causing the piston to rise past the ports and allow the metal to enter the passages. The cam is of such a shape that the piston is raised slowly and then returned with a sudden drop due to the pull of the spring on the rocking lever, it being claimed that the rapid injection of the metal produces very sound and homogeneous castings.

The pot is made of metal of a special composition which resists the action of molten aluminum, while the gas supply to the burners is controlled by thermostatic device which automatically controls the temperature at a given point.

STEEL AND MALLEABLE IRON CASTINGS

THE choice between steel and malleable iron castings is dictated by their respective properties, partly by price, and partly by the limitations of the processes by which malleable iron is made. As pointed out in a paper read before the International Engineering Congress, steel is, in its nature, a more homogeneous metal, and, therefore, tougher and stronger than malleable iron. Moreover, castings of malleable iron are somewhat prone to actual porosity or sponginess at the centre, especially in certain portions of irregular castings, so that for this reason also a steel casting is stronger and more reliable. Finally, malleable iron can be made only into castings of quite light sections, whereas there is almost no limit to the size and weight of steel castings that can be produced.

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OUR AWAKENED BUSINESS SENSE AND WHAT'S BACK OF IT

WHEN we consider the number and variety of metal-working plants that have either sprung into existence or have been materially extended as a result of war orders more or less varied and large, and when thought is given to the certain eventuality that this business will one day sooner or later cease, nothing is more natural than that the minds of those responsible for the maintenance and developments of our commercial and manufacturing activities, should be exercised in the endeavor to seek new opportunities while simultaneously cultivating more intensely the old. It may be said that the latter is quite normal with respect to the former.

Canadian manufacturers have, so to speak, found their feet, as a result of war-made opportunities right to their hand, by which we mean that they have become alive to their capacity for doing things, and, in consequence, have developed an expertness that was aforetime believed non-existent, and still much less appreciated as being simply latent. Their business sense has been quickened and their outlook broadened, being just comprehensive enough now to manufacture competitive lines of commodities here in Canada to meet the every requirement of our people and share in those of nations further afield.

Our mineral and lumber resources, our steel production, and our manufactures of steel and wood commodities, our harbor, port and navigation facilities and aids, indicate clearly that we possess natural material and locational advantages. In the realm of steel-making, mention may be made of the Steel Company of Canada, with its plants at Hamilton, Fort William, Belleville, Brantford, Gananoque and London, Ont., and at Montreal and Lachine, Que.; the Dominion Steel Corporation, Sydney, N.S., with which is incorporated the Dominion Coal Co., etc.; the Algoma Steel Co., at Sault Ste. Marie, Ont.; the Canadian Steel Foundries with their plants at Montreal and Welland; the Nova Scotia Steel & Coal Co., New Glasgow, N.S., etc.

In the sphere of shipbuilding and marine engineering, in addition to Canadian Vickers plant on the St. Lawrence, we have the Davie Drydock and Shipbuilding Co. at Levis, Que., while on Lake Ontario we have the Kingston Drydock and Shipbuilding Co., the Polson Iron Works, Toronto, the shipyards and drydocks of Muir & Sons, and M. Beatty & Sons at Port Dalhousie and Welland, Ont., respectively. On our Upper Lakes—Superior and Georgian Bay, the shipbuilding plants of the Western Drydock & Shipbuilding Co., and of the Collingwood Shipbuilding Co., have the distinction of being capable of building the largest lake vessels afloat. On our Pacific Coast, shipbuilding and ship repair plants of varied capacity are to be found, while, as a result of the new conditions arising out of the war and the projected service to be afforded by the Panama Canal, steps are being taken to secure a further increase in establishment.

Other directions in which Canadian industrial and manufacturing enterprise has made special headway are those of freight car and locomotive building, heavy marine and other purpose steel casting and forging production, heavy and powerful hydro-electric and its kindred mechanical equipment, electrical instrument and specialty work, machine tool and accessory apparatus, also steam power plant main and auxiliary engines, boilers and contributory mechanisms, agricultural machinery of wide and varied application, etc.

CAPTURING ENEMY TRADE

WE are inclined to think that up to the moment little headway has been made, or more properly speaking, little enemy trade has either been appropriated or negotiated. True it is that much organization toward that end has been created, organization at once influential both from the nature of the commercial interests concerned and from the Governmental recognition exemplified in Trade Commission appointments.

It is quite evident that German trade competition after the war is being anticipated, whether the latter arise from known facts in the possession of those whose official positions necessarily keep them posted as to our enemy activities, or whether it be simply a logical deduction based on enemy experience in the past. No scheme of real practical value has yet been evolved, much less launched, whereby the end sought has been brought appreciably nearer to fulfilment. Suggestion, doubtless, has been plentiful, but all of it displays a lack of knowledge of what there is intended to combat and conquer.

Most of the schemes propounded are, it seems to us, much too ambitious and are indicative of the "wish being father to the thought." They have further the somewhat undesirable tendency to, if not frustrate individuality, at least stifle it, with the result that inaction on the part of commercial and manufacturing managements ensues. Initiative in the unit sense ceases to be a factor, and the impression grows that the task of capturing enemy trade is so gigantic as to require some drastic legislative enactment or something of an equally stupendous nature.

Trade and commerce are constitutionally complex, and in a world-sense are very much so; they are, however, readily amenable to individuality of operation. Their essence is individual enterprise and will continue so to be irrespective of any national or Empire plan of campaign to capture enemy trade. It follows therefore that each Canadian manufacturer should act his own part in the latter direction—in a word set about securing his particular share, and in the event of collective organization or Government enactment materializing, appropriate what further aids these may afford.

It has been said that each manufacturer can think out a plan to develop some part of his business a little more than has yet been done or has even been attempted, and this without waiting for ambitious and all-comprehensive schemes that are probably beyond the ken of human to evolve. Each can be keenly alert and active to seize the many opportunities—big and little now presenting themselves, and by so doing not only help himself, but contribute the quota necessary to our national and Imperial achievement.

INDUSTRIAL NOTABILITIES

DONALD HUGH McDOUGALL, general manager, Dominion Steel Corporation, Sydney, N.S., director, Nova Scotia Construction Co., is a native of Nova Scotia, having been born at Cape Breton, September, 1879, son of John and Alexis McDougall. His education was received at the Government Mining School, Glace Bay, N.S., International Correspondence Schools, and Dalhousie College Summer Schools (Mining Course), after which he occupied the positions of: Apprentice mechanic; assistant mine and railway surveyor; mine surveyor; civil engineer; engineer in charge

DONALD HUGH McDOUGALL,
General Manager, Dominion Steel Corporation.

of construction, Dominion Iron & Steel Co., 1900; assistant resident engineer, New York Central and Hudson River R.R., 1902; manager, Wabana Mines, Nfld., 1904; superintendent mines and quarries, Dominion Iron & Steel Co., 1907; assistant general manager Dominion Coal Co.; superintendent of mines and quarries, Dominion Iron & Steel Co., and assistant general manager Sydney & Louisburg R.R., 1910; present position since January, 1916.

Mr. McDougall's new position carries with it the responsibility of directing the energies of 16,000 employees, and controls the activities of what ranks among the largest single enterprise in Canada.

He is president of the Mining Society of Nova Scotia, a vice-president of the Canadian Mining Institute, a member of the Institution of Mining Engineers (England), and a member of the Canadian Society of Civil Engineers.

Mr. McDougall married Clara E. Gillis, daughter of John Gillis, in 1906, and resides at King's Road, Sydney, N.S.; his family consisting of four sons and one daughter.

His clubs are: Royal Cape Breton Yacht; Halifax City; St. John (Nfld.).

—Photo, Courtesy International Press.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

UNSOLVED ELECTRO-PLATING PROBLEMS

By G. B. Hogaboom.

IN the evolution of electro-plating solutions there have been three marked periods—the complicated, the extremely simple and the efficient. The day of the complicated solution has passed, as it was not efficient, while the simple solution lacked some of the good qualities of the complicated one. Now the electro-plater enters into the third stage and his quest is for an efficient electro-plating bath. A list of the unsolved problems, as they appear to the writer, are as follows:

1—To what extent is the nature of the electro-deposit influenced by the physical structure of the metallic base, such as steel, copper, brass, Britannia, German silver, etc.? (It has been proven beyond doubt that the character of the deposit is materially affected by the structure of the metal receiving the deposit; especially is this true of steel and German silver).

2—What is the best cleansing process to use on buffed German silver flatware, also steel and hollow-handle table cutlery, to produce 100 per cent. perfect plating?

3—What is the best method of obtaining a smooth adherent silver deposit upon perfectly cleansed German silver flatware?—(a)—By placing directly in silver strike?—(b)—By use of mercury dip followed by silver strike?—(c)—Striking in nickel bath followed by silver strike?

4—What is the best method of obtaining smooth, adherent silver deposit upon steel and hollow-handle table cutlery? Is it best to strike the silver on direct or place in nickel bath and strike with silver afterward?

5—What composition of silver bath will produce the most efficient deposit, viz., most smooth and rapid, upon German silver flatware, hollow ware, deposit work, table cutlery, and what is the highest current density that can be used in this bath to obtain smooth deposits at 65 deg. F. (18 deg. C.), also what agitation is best?

6—What simple, rapid and convenient method is there for determining the amount of nickel and free acid in the nickel bath?

7—What simple method is there for determining the cause of nickel solutions working dark or otherwise unsatisfactorily, and what is the remedy?

8—How can the rusting of silver-plated cutlery, while in use, be prevented?

9—What causes silverware to "spot out" before it reaches the consumer, also brass, copper, and bronze-plated objects? Pitting of nickel deposits is another problem, and it may be caused, and very probably is so, by the adherence of gas bubbles. It has, in a measure, been prevented by agitating the solution with air or keeping the cathode in motion. If a bath is agitated, however, the sludge will cause rough deposits, and, unless pure nickel anodes are used, iron with which nickel anodes are alloyed, will be deposited with the nickel.

10—How can nickel deposits be made to adhere firmly to tin or tinned articles? There is no difficulty in depositing nickel upon tin so that it will stand buffing, but if the deposit becomes broken it can be peeled off in strips very easily. The condition is true of imported nickel-plated tinware as well as domestic.

11—What are the factors controlling the hardness or stiffness of copper deposit? It is well known that this is dependent upon the rate of deposit, amount of free acid in the bath, temperature, impurities, etc. Why is the deposit hard or soft? The hardness is not essentially accompanied by either fine or coarse-grained deposits. The problem is to get a hard deposit independently of the rate of the latter, and at will.

12.—A practical solution for the deposition of chromium is greatly desired. Chromium deposits are less susceptible to the action of the air and moisture than nickel, and therefore tarnish less easily.

13.—A positive rust-proof coating is wanted, black in color, for iron and steel, without the use of excessive heat.

14.—A dip is required, to produce a brass coating on iron and steel by simple immersion, similar to a copper dip.

15.—Why will a single nickel salt solution plate zebra-like black with white streaks when the work is given a mechanical motion during the deposition, and plate satisfactorily, white and smooth, when used as a "still" solution?

16.—A substitute for platinum chloride is needed to produce the same color effect upon silver. Platinum black is the only durable and satisfactory color for "oxidized" and "French gray" finishes at the present time.

17.—Arsenious acid added to a cyanide brass solution brightens the deposit, as well as materially decreasing the efficiency of the bath. It is well known that the presence of arsenic in copper wires injures its conductivity. Does it affect the deposition of copper from a brass solution in the same manner?

18.—If a cyanide copper solution is made from an alkali cyanide, copper cyanide, and a small amount of soda ash, the anode efficiency cannot be maintained at 100 per cent. unless the free cyanide content is kept at such a point that a slight decrease in the metal content will cause blistering of the deposit. What salt can be added that will corrode the anode, producing a compound that will be easily soluble in the free cyanide, and thereby keep the anode clear? Bisulphate of soda is recommended by Roseleur, Langbein, Barclay and Hainsworth and other writers on electroplating. That salt decomposes the free cyanide and decreases the cathode efficiency. Large amounts will result in only a slight film of copper being deposited. Watts recommended bi-tartrate of potassium, which is very expensive and would increase the cost of production. Miller advises aqua ammonia, the effect of which is soon lost in a hot solution.

19.—Wanted a successful cyanide of zinc solution, one in which there would be a fairly good anode corrosion so that the bath could be kept uniform in metal content.

20.—A plating rack is desirable, or a covering for one that would be coated with metal except at the points of contact with the articles to be electroplated. Tons upon tons of metal are deposited upon racks every year which must be refined at a heavy expense or be sold as scrap metal.

21.—A satisfactory solution is required for the deposition of a true bronze, i.e., copper and tin. Field recommends a double ammonium oxalate solution, and, in experimenting with this solution, Mathers found that at "first such a bath gives a rough copper, then a bright copper and then a bronze which gradually becomes whiter until it is as white as tin." He was unable to maintain conditions required for a rich uniform bronze.

22.—A brass solution is wanted from which the metal can be deposited as efficiently as copper can be from an alkali cyanide bath and not be coarse or brittle. One in which the anode efficiency will approximate 100 per cent. without the addition of large amounts of aqua ammonia or any ammonium salts which either quickly decompose or decrease the cathode efficiency.

23.—What is the comparative value of

cyanide of potassium and cyanide of sodium in relation to the corrosion of the anode, solubility of the compound formed at the anode, and conductivity, in the commercial electroplating solutions generally used?

In view of the foregoing rather formidable list it is quite evident that the closest co-operation is desirable between electroplaters and electro-chemists.

NICKEL PLATING RESEARCH DATA

THE purest nickel anodes obtainable should be used. Strips of electrolytic nickel cathodes, 98.8 per cent. pure, used directly as anodes, dissolve irregularly and with pitting, but no impurities are introduced into the bath. Very much of the trouble with badly colored deposits and with sludge is caused by the iron from impure anodes. The addition of two per cent. of magnesium or nickel chloride makes the anode corrosion approximately theoretical.

Nickel anodes, supported by lead hooks, may be completely immersed in the solution, thereby greatly reducing the amount of scrap metal from the anodes. The anodes should be placed in bags in order to catch loosened particles which cause pitting if they reach the cathode. The addition of 0.2 to 0.3 per cent. of ammonium citrate keeps the solution clear and free from sludge, whereby a more shallow tank and a less volume of solution may be used. The bath should be stirred or mixed thoroughly at intervals but not within eight to ten hours of the time of using if any solid particles from the anodes are present.

The greater the ratio of nickel sulphate to nickel ammonium sulphate the brighter and more shiny the deposit. The more acid the solution (to the point of acidity to Congo red) the more shiny the deposits. Boric acid increases the current that can be used without blackening or burning the deposit.

The following bath seemed to be the best: Nickel ammonium sulphate, 4 per cent.; nickel sulphate, 10 to 14 per cent.; boric acid, 1 to 3 per cent.; magnesium chloride, 2 per cent., and ammonium citrate, 0.2 to 0.3 per cent. A current density of 1.6 amp. per square decimeter (14.8 amp. per square foot) which plates a thickness of 0.0025 cm. (0.001 in.) in 1.25 hours may be used.

SILVER-PLATING

IN a paper on addition agents in the electrodeposition of silver from silver nitrate solutions, Prof. F. C. Mathers and J. R. Kuebler state that in their experiments with the ordinary addition agents, such as glue, peptone, clove oil, aloin, etc., these were found to be either without appreciable effect or prevented only partially the formation of crystals, and in no case was a thick, smooth deposit obtained. Tartaric acid was far superior to anything else tested.

Tartaric acid is the most effective substance for producing solid, firm deposits of silver from the ordinary silver refining bath containing silver nitrate and nitric acid. A good composition of the bath is 3 per cent. each of silver as silver nitrate, nitric acid and tartaric acid. The further addition of 0.01 per cent. of glue twice daily makes the deposit much smoother and of a darker, more shiny color. The addition of 2 per cent. ferric nitrate to the above baths makes the deposits much smoother, darker and more shiny. Analysis of a cathode showed 0.086 per cent. of iron.

If economy in addition agents is desirable at the sacrifice of some smoothness in the deposit, 0.5 per cent. tartaric acid and 0.01 per cent. of glue twice daily can be used. More tartaric acid must be added after about 100 grams of silver have been deposited from each 100 cc. of solution, otherwise loosely adhering crystals are formed. A current density of 22.4 amp. per sq. ft. (2.45 amp. per sq. dec.) in a vigorously stirred bath gave a firm, smooth deposit which was a little heavy on the edges. A current of 35 amp. per sq. ft. (3.8 per sq. dec.) gave a firm deposit with still rougher edges. In a bath only gently mixed or stirred, 7.4 amp. per sq. ft. (0.8 amp. per sq. dec.) gave the best results. With 6 per cent. silver solutions, 14.8 amp. per sq. ft. (1.6 per sq. dec.) could be employed.

The ordinary addition agents as glue and peptone, by themselves, only partly restrained the crystalline structure and did not produce smooth deposits. Metaphosphoric acid caused the deposit to be hard and non-crystalline, but the bath soon deteriorated. The weight of tartaric acid used up is 0.005 of the weight of silver refined, and the maximum cost of the tartaric acid and the glue at present prices is 0.23 cent. per pound of refined silver. The deposit is brittle, hence it is of no value in plating.

The foregoing articles embody the substance of three papers read at the 29th Annual Meeting of the American Electrochemical Society.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

Officers:

President—John A. Magill, 591 St. Clarens Ave., Toronto.

Vice-President—William Salmon, 48 Oak Street, Toronto.

Secretary—Ernest Coles, P.O. Box 5, Coleman, Ont.

Treasurer — Walter S. Barrows, 628 Dovercourt Road, Toronto.

PLACE AND DATES OF MEETING.

The Occident Hall, corner of Queen and Bathurst Streets. Fourth Thursday of each month, at 8 p.m.

PICKLING CASTINGS

AT times the machine shop gets castings which are nearly as bad as emery wheels, so far as lathe and other tools are concerned, and unless there is a sand-blast handy, it is expensive to deal with such things. Pickling will, however, often put a better face on matters if properly done, and most machine shops dealing with iron castings do well to keep a pickling bath handy. Pickling can be done with hydrochloric acid, and there even is such a thing as hydrofluroic acid, to attack more or less siliceous surfaces. A 6 per cent. solution of fluroic acid and water used warm is very effective indeed in dissolving out siliceous matter. In suitable cases one may use sulphuric acid and water, a solution of from 7 per cent. to 10 per cent. of acid attacking the metal strongly and improving the "cut" of the metal very much, to the advantage of the tools. The pickling takes several hours to be effective, and in all cases the castings have to be well rinsed and dried after being treated in the bath. Generally, however, if sand-blastings can be adopted, and the necessary apparatus is already in the place, all iron castings, and many alloy castings, are the better for being made bright, as this operation removes most of the sand and siliceous matter which otherwise dull the machine tools unduly.

LUSTROUS WHITE ALLOY

AN alloy of high lustre, capable of taking a brilliant polish and closely resembling silver in appearance, and patented by E. Smith, London, England, is claimed to have the property of withstanding atmospheric conditions to a great extent. The mixture is as follows:—Copper, 40 lbs. ;nickel, 8½ lbs.; zinc, 5 lbs.; tin, 2½ lbs.; lead 1 lb. The nickel is first melted with a flux of silica, and half of the copper added gradually and mixed, after which the remainder of the copper is added. The zinc is then quickly plunged beneath the surface of the molten metal, which is stirred rapidly till the whole is melted. The lead and tin are added last. The metal is stirred and brought up to 1,700 deg. F., then poured into ingot molds.

SUBSTITUTE FOR SULPHURIC ACID IN PICKLING

A CIRCULAR issued by the Research Mfg. Co., Philadelphia, points out that the elimination of sulphuric acid fumes is accomplished and many other advantages are attained in the pickling of metals for the removal of scale or oxide by the use of a compound which was perfected in the mills of the Ellwood Ivins' Tube Works, Philadelphia. It has been in use in the tube works for some time, but until recently was held as a shop secret. It has been named Edis Compound.

The compound is shipped in the form of dry cakes or lumps which are dissolved in water almost up to the boiling point. It is essential that the solution be very hot, and when being worked about 200 deg. should be maintained. To accomplish this end, the Research Mfg. Co. have suggested that the free end of a live steam pipe be inserted into the pickling tub, letting the steam condense in the solution. Where the tubs are very long the pipe may be tapped in several places. A piece of copper pipe should carry the steam into the solution.

It is also recommended that the tubs be covered, as this serves to keep the solution hotter, though this is entirely a measure for economy. It is pointed out that it is desirable to make the covers in sections to permit of easier handling. The solution is applicable to iron, steel, brass, copper, etc.

GLAZING OF GRINDING WHEELS

WHEEL glazing is one of the commonest troubles the grinding wheel user has to meet. A wheel glazes when the points of the abrasive grains wear flat without the surrounding bond being disturbed. Its causes and remedies are as follows:

Wheel too hard for the work in hand, therefore dressing is only a temporary remedy. A softer wheel must be used to cure it effectually.

Wheel running too fast; having the effect of making the wheel appear harder. The speed should be altered to between 4,000 and 6,000 revolutions per minute.

Too much surface contact between wheel and work; therefore, if possible the work should be jockeyed in front of the wheel so that at any one moment a small surface only is presented to the wheel.

Not enough pressure of work on wheel; requiring in consequence more pressure so as to disturb the bond and dulled grit.

Using wheels bonded with rubber, cement or shellac where such bonding is not desirable; the only remedy being frequent dressing, if impossible to change the wheel.

Variation in hardness of material being ground; this is unavoidable and the only remedy is dressing as required.

LUTES AND CEMENTS

by S. S. Sadtler

IN the accompanying article which has been taken in part from a paper read before the American Institute of Chemical Engineers, the words "lutes" and "cements" are used together, although on account of their temporary and permanent applications respectively, they really have different meaning values. The formulae given have been proved by the author, for the most part.

The Material Available

Of the chief bituminous substances available, we have pitches, asphalts, gilsonite and blown petroleum residues, also mixtures of these substances and mixtures of same with inert material. Of the asphalts I prefer a substance like refined Bermudez, as it is nearly pure bitumen and forms homogeneous solutions with suitable solvents. A minor percentage of boiled linseed oil or blown petroleum oil is useful sometimes for tempering or fluxing. For solvents heavy naphtha is generally used. It does not dissolve all the asphalt, such as the so-called asphaltene portion, but it thins out the asphalt well enough. Coal-tar naphtha is better but more costly. As voids are very apt to form in a painted asphalt coating, some form of filler is generally employed. The natural mineral filler of Trinidad asphalt may serve the purpose of such filler. Lutes of boiled linseed oil, thickened with clay, asbestos, red or white lead, etc., are waterproof, if thick enough from the filler added. Flaxseed meal made into a stiff paste with water is also useful as a lute for steam connections and is easily applied.

For making small experimental electrolytic cells, etc., for demonstration purposes, I have found it desirable to use white iron-free Portland cement and white plasters' sand that has been sieved. If a one-to-two mixture is made with the prescribed quantity of an approved waterproofing substance, such as the product of the Newberry patent, and care is taken to work out voids and the article in the green is kept moist, a substantial waterproof container can be made. It will also stand dilute acids or alkalies, but not the two alternately. For large articles wire-mesh reinforcement is often desirable, and if the vessel is used for dilute acids this might well be made o fa mesh of Monelmetal, etc.

Oil-Proof Mixtures

Several of the best known lutes I am placing under the oil-proof catagory, although they might be classified elsewhere. In parts by weight they are as follows:—

Good glue	2
Glycerine	1
Water	7

The glue is first softened by the water, then liquefied by heat and the glycerin incorporated. This lute renders corks vacuum tight, and stops small leaks of almost anything except water and steam, has been found useful in laboratories and in the works for oil vapors.

The next lute to be mentioned is among the best known and most useful, its proportions being as follows in parts by volume:—

Glycerine	90
Water	10

It can also be made into a stiff putty with litharge and red lead of 90 and 10 parts by weight respectively. It takes several hours to stiffen and about a day to set.

Acid Proof Mixtures

The asphaltic preparations referred to are largely acid proof. Black putty is made by intimately mixing equal weights of China clay, linseed oil and gas-tar. The ingredients must be anhydrous, so it will probably be best to take a tar residuum or very soft pitch of thick, so-called creosote oil. Rubber cements may have varied composition but I will only refer to two which are, perhaps, extremes. If equal parts of fresh unvulcanized rubber are used, the mass is so stiff that it would be probably used alone. If as much as four parts of linseed are used, considerable filler can be incorporated to make a workable putty.

Equal weights of rubber and boiled oil are taken; the rubber is first dissolved in carbon disulphide in the proportion of 4 c.c. carbon disulphide to 1 gr. of cut-up rubber. Boiled linseed oil is then mixed in, and the mixing is facilitated if the oil is warm. The solvent is generally not removed by evaporation until the paste is applied. The other formula, to which reference has been made, differs in having four times as much boiled linseed oil and then fire clay or other filler, such as silex, is used. In parts by weight its constitution is as follows:—

Crude, finely cut rubber	1
Linseed oil, boiled	4
Fire clay	6

Melted sulphur with fillers of stone powder cement, sand, etc., may be used, the undermentioned finding, an application when dealing with hydro chloride acid vapors. In parts by weight it consists of:—

Rosin	1
Sulphur	1
Fire clay	2

Linseed oil (boiled) and fire clay stand most acid vapors, while according to Davis, red lead and litharge in boiled oil stand acid vapors (even nitric acid), in the following proportions:—

Litharge	80 lbs.
Red lead	8 lbs.
Flock asbestos	10 lbs.

This should be fed into a mixer, a little at a time, with 6 qts. of boiled linseed oil.

There are numerous acid-resisting mixtures possible in which silicate of soda is used. This is possible, in spite of the strong basic character of silicate of soda, because the silicate is superficially changed to colloidal silica which continues the cementing work, at first effected by the silicate of soda.

Barium sulphate, powdered glass, China clay, etc., are used with silicate of soda slightly diluted with water. A strength of about 30 deg. Be. is close to what is best for the purpose. The following in parts by volume, I have used with success for dilute hydrochloric acid:

White China clay	1
Fine white sand, or powdered quartz and sand	2

These are mixed thoroughly and worked up with just enough silicate of soda, diluted with an equal volume of water, to make a paste. The mixture can be rendered more impervious to water by the judicious incorporation of organic colloids. If a little fine casein be incorporated with the silicate of soda in a mixer so that the mixture is quite smooth the mass will be better. About 5 per cent of fine, dry casein powder is added, based on the weight of silicate. If fresh milk curd be used, corresponding to the same dry weight of casein, and allowances made for the water contained, a mechanical mixer may not be needed.

Plaster of Paris

This series of lutes and cements is highly important, and individual formula given serve to prevent the escape of hydrocarbon and other gases in furnace work. Soluble sulphates form double sulphates with calcium sulphate and with water. They set harder and are more impervious than calicum sulphate (plaster of Paris) alone. It is desirable not to take equal molecular quantities to form the full double sulphates, but about half of these quantities. Sodium, potassium and aluminum sulphates are used for this purpose.

According to Sigmund Lehner, a little borax in the water used makes hard cements and regulates the setting: Twelve volumes of water to one volume saturated borax solution sets in 15-20 min. at 10 deg. C.; while eight volumes water to one volume saturated borax solution sets in an hour. The same author gives a formula credited to Viotti for a weather-proof plaster cement, which consists of 1,500 grams of borax and 150 grams of magnesium oxide melted together and powdered. The powder is then mixed with 75 grams of plaster of Paris. Borate of magnesium thus predominates and protects the plaster from being washed away by water.

Marine Glue

A standard preparation of this class of lutes (which are applied hot to crevices, etc., and get firm but not brittle when cold), is composed as follows in parts by weight:

Crude rubber	1
Shellac	2
Pitch	3

The rubber is first dissolved in carbon disulphide or turpentine before mixing with the heated (not superheated) mixture of the other two. The advent of blown petroleum residums has made it possible to make up hard but flexible compounds without rubber. Grahamite is a good base to which fluxs such as these mentioned, or soft asphalts, are added.

Machinist Cements

Machinist cements are the well known red and white leads. The former is generally diluted with an equal bulk of silica or other inert substance so as to make it less powdery on drying. To accomplish this, add rubber or gutta percha to the oil in parts by weight as follows:

Linseed oil	6
Rubber or gutta-percha	1

The rubber or gutta-percha is dissolved in sufficient carbon disulphide to give it the consistency of molasses, then mixed with the oil, and left exposed to the air for about 24 hours. The red lead is mixed to a putty. Oxide of iron makes less brittle cements than red lead.

Leather Cements

Equal parts of good hide-glue and American isinglass, softened in water for 10 hours and then boiled with pure tannin until the whole mass is sticky, makes a good leather cement. The surface of the joint should be roughened and the cement applied hot.

Further leather cements consist of one kilo of finely shredded gutta-percha digested over a water-bath with 10 kilos of benzol, until dissolved, 12 kilos of linseed oil varnish being afterwards stirred in. The Journal of the Society of Chemical Industry is responsible for the following, the different ingredients being melted together:

Gutta-percha	8 oz.
Pitch	1 oz.
Shellac	1 oz.
Olive oil	1 oz.

These are melted together.

Iron Cements

When iron in a fine state of division, as in fresh oil-free filings or cast-iron borings that have been powered, is mixed with an oxidizing agent, such as manganese dioxide or a substance electronegative to iron, such as sulphur, in a good conducting solution like salt or salammoniac, galvanic action sets in very rapidly, ammonia is given off (if sal ammoniac be used), and the iron swells, by forming iron oxide, and cements the mass together. It is best diluted with Portland cement. A formula which I give from memory consists as follows:—

Iron filings	40 parts
Manganese dioxide, or flowers of sulphur	10 parts
Sal-ammoniac	1 part
Portland cement	...20 to 40 parts
Water to form a paste.	

These cements are used extensively in foundries, etc.

Crucible Cements

For crucible cements, mixtures of clay and borax in which the clay predominates, are employed. Silicate of soda and powdered glass or sand are the best known compounds for cementing lids on crucibles, etc. Sometimes the "iron cements" are used for such purposes, or iron filings and a little manganese dioxide are added to the above compositions for crucible cements. Probably the best known cement for graphite is fire clay, which with water binds the graphite fairly well and itself stands high temperatures.

In some cases it is desirable to have an all-carbon binder, and for this purpose tars or soft pitches are used. Very little binder must be employed, however, or the material will crack when heated, as the carbonizing of the pitch shrinks the binder somewhat. Starch paste has been recommended for this purpose, but the shrinkage is greater and the binding is not as good.

A strong, waterproof cement that will stand high temperatures may be made by mixing powdered silica or fine sand and powdered silica with a solution of magnesium chloride of about 10 per cent. strength. This composition is applied as a putty and then painted or soaked in a solution of silicate of soda of about 30 per cent. strength. This forms magnesium silicate as a binding material for the silica.

Magnesia Composition for Furnaces, etc.

For furnaces, magnesia burned at incandescent heat or hard-burned, 80 per cent., is employed, also magnesia light burned (just sufficient to drive off carbon dioxide (dull redness), 20 per cent. The composition is made into a stiff putty with water, and shaped as desired. The water must be driven off very slowly. A small proportion of good asbestos fibre may be worked in to keep from cracking.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey Forge, Pittsburg	$18 45	
Lake Superior, charcoal, Chicago	19 25	
Michigan charcoal iron	28 00	
Ferro Nickel pig iron (Soo)	25 00	
	Montreal.	**Toronto.**
Middlesboro No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1	27 00	24 00
Victoria, No. 2X	27 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL

Per Pound to Large Buyers.	Cents
Iron bars, base	3.00
Steel bars, base	3.25
Steel bars, 2 in. and larger, base—	5.25
Small shapes, base	3.75

METALS.

Aluminum $	.66
Antimony	.43
Cobalt 97% pure	1.50
Copper, lake	32.00
Copper, electrolptic	31.75
Copper, casting	31.50
Lead	.9½
Mercury	100.00
Nickel	50.00
Silver, per oz.	.68
Tin	.54
Zinc	.21

Prices Per Lb.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$ 17 00	$17 50
Copper, crucible	20 50	21 00
Copper, heavy	20 75	21 00
Copper wire	20 75	21 00
No. 1 machine, compos'n	16 00	16 00
No. 1 compos'n turnings	13 75	14 00
No. 1 wrought iron	11 75	11 75
Heavy melting steel	9 00	10 00
No. 1 machin'y cast iron	14 75	14 50
New brass clippings	15 25	14 00
New brass turnings	15 25	14 00
Heavy lead	6 75	7 25
Tea lead	5 75	6 25
Scrap zinc	12 50	14 00
Aluminum	36 00	35 00

COKE AND COAL.

Solvay foundry coke, on application	
Connellsville foundry coke	$7.02
Yough steam lump coal	....
Pittsburgh steam lump coal	4.30
Best slack	3.87

net ton f.o.b. Toronto.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	60 00

PROOF COIL CHAIN.

¼ inch	$9.00
5-16 inch	5.90
⅜ inch	4.95
7-16 inch	4.55
½ inch	4.30
9-16 inch	4.20
⅝ inch	4.10
¾ inch	3.95
⅞ inch	3.80
1 inch	3.70

Above quotations are per 100 lbs.

MISCELLANEOUS.

Solder, guaranteed	0.31
Babbitt metals	.11 to .60
Putty, 100-lb. drums	3.00
Red dry lead, 100-lb. kegs, p.cwt.	13.87
Glue, French medal, per lb.	0.16
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls.	0.68
Linseed oil, raw, single bbls.	0.80
Linseed oil, boiled, single bbls.	0.83
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7 00
Lead wool, per lb.	0.13
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½
Lard oil, per gal.	1.35

SHEETS.

	Montreal.	Toronto.
Sheets, black, No. 28	$4 15	$4 00
Sheets, black, No. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 50	4 50
Canada plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized)	7 00	7 00
Queen's Head, 28, B.W.G.	7 75	7 75
Fleur-de-Lis, 28, B.W.G.	7 35	7 35
Gorbal's best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	7 00	7 00
Premier, 10¾ oz.	7 30	7 30

ELECTRIC WELD COIL CHAIN B.B.

3-16 in.	$11.70
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60; headers, 60; flanged unions, 55; malleable bushings, 60; nipples 72½; malleable, lipped union, 60.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy.	.35
Copper sulphate,	.30
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130 per cent.	.42
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.37 to .40
Tin	.58 to .60
Silver, per oz.	.60 to .65
Zinc	26 to 28

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck	.90
Emery, in kegs, American	.05
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.07 to .08
Emery composition	.09 to .10
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

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HAMILTON, ONTARIO

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Toronto, Ont., June 5.—Business continues active, being considerably better than last year around the corresponding period. The outlook as far as demand is concerned is bright but as regards production the situation is not so favorable. The difficulties that are being experienced in getting raw materials and the scarcity of labor due to enlistments are already tending to curtail production. For these reasons and also because of the increased cost of raw materials, high prices on all kinds of machinery products composed of iron or steel will obtain for some time to come.

It is understood that further contracts for 8 in. and 9.2 in., shells have recently been placed in Canada and as a result enquiries for large swing lathes have been sent out. Machine tool makers are very busy and the trade is in a prosperous condition. There are some price changes to note in the steel market affecting steel bars and boiler tubes, advances being registered in both cases. The ingot metal markets are weaker throughout the list and all metals are lower with the exception of lead which is unchanged.

Steel Market

Although there is still a tendency towards higher prices for steel products, there are indications that the market is reaching the high water mark. There is, however, no falling off in demand and deliveries are, if anything, getting more backward. There is, therefore, little probability of any pronounced weakness developing for some time to come, and prices, no doubt, will be maintained at a high level for the rest of the year. The steel market in the United States is steadier and if this condition is maintained, the effect is bound to be felt in Canada.

The market for sheets continues strong and prices are being well held. Deliveries from most sheet mills are running into the latter part of the third quarter while production is being delayed owing to the insufficient supply of sheet bars, and delays in deliveries from the steel mills. The market for galvanized sheets is steady and the situation generally unchanged. Although spelter has declined, the price is not low enough to materially benefit the galvanizing trade.

Pig Iron

The market continues strong with quotations firm but unchanged. Foundries are buying carefully but the tonnage is increasing. The importations of pig iron from Great Britain are increasing in volume, the tonnages for April being valued at about $123,168 as against $24,000 for the corresponding month of last year.

Scrap Materials

There is nothing of particular interest to note in the scrap market. The situation is generally much the same as during the past month. Quotations on copper and brass are a shade weaker, otherwise prices are unchanged. There is a fair demand generally for old materials and the market is steady.

General Supplies

Business continues active and prices are still very firm. There have been comparatively few price changes last month, the more important being on linseed oil and turpentine which have both declined. The oil market is weak on account of very light demand, the price quoted now being 82c for raw, and 85c for boiled oil. Turpentine is being quoted at 68c per Imperial gallon.

Metal Market

The metal markets are dull and prices in many cases have declined. One of the reasons for the easier tendency in most metals, with the single exception of copper, is that production has been increased to a degree equal to the present demand. The dullness in copper is a result of the buying movement having been succeeded by a period of inaction, the position of this metal is nevertheless, a strong one. The tin market has been influenced by the weakness in other metals and has declined. The spelter market is very weak and lower on light demand. The "Trust" price for lead is unchanged but the outside market is a shade lower than it was recently. Antimony and aluminum are weak and quotations are lower. Solders are unchanged but have a weaker tendency.

Copper.—The market has declined in London owing to a recent Government order which prohibits speculative trading in copper on the London Metal Exchange after May 31. The New York market is steady but dull at unchanged prices. The buying movement in copper appears to have come to an end for the time being and the market is, therefore, less active and easier. The position of copper is as strong as ever and a recovery may be looked for. Locally, quotations are nominal at 31½c per pound.

Tin.—The market is weak and lower for spot tin due to an increase in visible supplies and falling off in demand. The market for futures is firmer and quotations unchanged. Tin quotations are nominal at 52c per pound.

Spelter.—The market is lower both in London and New York. The demand for spelter is very light and price recessions are being made. Spelter is quoted at 19c per pound.

Lead.—The demand for lead is light and the market has a weak tendency. The "Trust" price is unchanged at 7.50c New York, but the outside market is lower. Prices in the outside market are being established by second hands, who are offering small tonnages at concessions. Lead is unchanged locally at 9½c per pound.

Antimony.—The market is neglected and buyers show no interest, despite reduced prices. Quotations are lower and nominal at 42c per pound.

Aluminum.—The market is weak and lower, and, while the demand is somewhat better, the supply is larger. Aluminum is quoted at 66c per pound.

Foundry Supplies and Chemicals

Taken altogether, the situation in the foundry supply business is unchanged; the market, however, is considerably steadier than it has been for some time. Prices generally are very firm and in some lines advances are looked for, particularly in equipment composed of iron and steel or any kind of metal. Leather is still high in price and leather products consequently have an upward tendency; quotations are unchanged meantime. Turkish emery is higher at 10c, but American emery is unchanged at 6c per lb. in kegs. Compositions have advanced on some lines, crocus being now quoted at 8c and emery composition at 10c per lb.

As regards chemicals, the situation continues much the same, with little prospect of any immediate improvement. Prices are high, and there is a serious shortage in some lines. A great scarcity of borax is reported, due to European supplies being cut off; practically the entire demand has, therefore, to be filled by producers in California, who have control of the market. As the demand for borax is unusually heavy and the sources of supply restricted, a scarcity has developed, resulting in high prices.

WELSH TIN-PLATE PRACTICE

THE London correspondent of the Iron Age writes as follows:—"A new tinplate plant has gone into operation in one of the Welsh works and has attracted considerable attention. The finished black plates as they come from the cold rolls and annealing furnaces are passed, without any handling, through the pickling, washing, tinning and cleaning processes, and the finished plates are piled

up as completed, ready for boxing and shipment. One pot which has been running a few weeks under ordinary working conditions is turning out about 2,200 base boxes a week, and another pot, just started up, made even a better output. The innovation is said to be the most important since that of the Morewood pot.

Trade Gossip

Albert C. Smith, president of the Smith Foundry Co., Fredericton, N.B., died recently.

Guelph, Ont.—F. Callandar will shortly begin the construction of a foundry here to cost about $7,000.

Toronto, Ont.—The Sheet Metal Products Co., will build an addition to their plant to cost about $6,000.

Montreal, Que.—The Canada Stove Co. will build an extension to their factory at St. Laurent near here.

Ottawa, Ont.—The City Council have awarded the National Ironworks of Toronto, a contract for a quantity of cast iron pipe.

Penetang, Ont.—The Dominion Stove & Foundry Co. is making extensive additions to its plant, and will install equipment for the manufacture of furnaces, etc.

Thomas Roden, of Roden Bros., Toronto, has been elected chairman, and **L. L. Anthes,** of Anthes Foundry, vice-chairman of the Toronto branch of the Canadian Manufacturers' Association.

Ontario Mining Room.—The value of the production of metalliferous mines and works in Ontario in the first three months of 1916 is $14,276,382, as compared with $9,358,210 for the corresponding period last year .

St. John, N.B.—Work has started on the foundaton for the new foundry and machine shop for the T. McAvity & Sons, Grant and Horne of this city are the contractors for the new buildings which will cost over $100,000.

Hamilton, Ont.—The Dominion Sheet Metal Co. is adding two buildings to its plant—one 20 ft. x 100 ft., for storing metals and by-products, and one 40 ft. x 80 ft., for additional black sheet storage.

Copper Refineries.—The ten copper refineries of the United States will have a combined annual capacity of 2,461,000,000 pounds upon the completion, within a few months, of increased facilities. The plants of the American Smelting and Refining Co. and the Anaconda Copper Mining Co. will contribute the principal gains, the six refineries of these two companies to have a capacity of 144,000,000 lbs. of copper a month.

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

TO OUR READERS--Use this Directory when seeking to buy any foundry or pattern-shop equipment. You will often get information that will save you money.
TO OUR ADVERTISERS—Send in your name for insertion under the headings of the lines you make or sell.
TO NON-ADVERTISERS—A nominal rate of $5.00 per line a year is charged to non-advertisers.

ABRASIVE MATERIALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.

AIR COMPRESSORS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Osborn Mfg. Co., Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

ANODES, BRASS, COPPER, NICKEL, ZINC
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.

BARRELS, TUMBLING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

BOILER GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.

BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
P. H. & F. M. Roots Co., Connersville, Ind.
Woodison, E. J., Co., Toronto, Ont.

BLAST GAUGES—CUPOLA
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

BRAKE SHOES, WHEEL TRUEING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.

BRASS MELTING FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

BRICKS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.

BRICKS, RUBBING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.

BRUSHES, FOUNDRY AND CORE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

BRUSHES, ALL KINDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
Osborn Mfg. Co., Cleveland, O.

BUFFING AND POLISHING MACHINERY
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.

BUFFING AND POLISHING COMPOSITIONS
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.

BUFFS
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.

BURNERS, CORE OVEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

CARS, CORE OVEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.

CASTINGS, NICKEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.

CARS, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Woodison, E. J., Co., Toronto, Ont.

CHAPLETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Osborn Mfg. Co., Cleveland, O.

CHARCOAL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

CHEMISTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Toronto Testing Laboratory, Ltd., Toronto.

CHEMICALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.

CLAY LINED CRUCIBLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCulloch-Dalzell Crucible Co., Pittsburg, Pa.

CORE BINDERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Robeson Process Co., New York City.
Woodison, E. J., Co., Toronto, Ont.

CORE BOX MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

CORE CUTTING-OFF AND CONING MACHINE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CORE COMPOUNDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Robeson Process Co., New York City.
Woodison, E. J., Co., Toronto, Ont.

CORE MACHINES, HAMMER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Mumford, E. H. Co., Elizabeth, N.J.

CORE-MAKING MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Mumford Molding Machine Co., Chicago, Ill.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

CORE OILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Holland Core Oil Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

CORE OVENS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

CORE WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.

CORE WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
United Compound Co., Buffalo, N.Y.

CRANES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.

CRANES, TRAVELLING AND JIB
Can. Hanson & Van Winkle Co., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.

CRANES, ELECTRIC AND HAND POWER
Can. Hanson & Van Winkle Co., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Woodison, E. J., Co., Toronto, Ont.

CRUCIBLES, RESERVOIR, TILTING FURNACE, BOTTOM POUR, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Seidel, R. B., Philadelphia.
McCulloch-Dalzell Crucible Co., Pittsburg, Pa.

CUPOLAS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Northern Crane Works, Ltd., Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.

CUPOLA BLOCKS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM.
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.

DIPPERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.

DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Osborn Mfg. Co., Cleveland, O.

DYNAMOS
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.

DUST ARRESTERS AND EXHAUSTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.

DRYERS, SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.

ELEVATORS, FOUNDRY, HYDRAULIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

EMERY STANDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton.
Woodison, E. J., Co., Toronto, Ont.

EMERY WHEELS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Ltd., Hamilton, Ont.

FANS, EXHAUST
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

FILLERS (METALLIC)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

FILLETS, LEATHER AND WOODEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

FIRE BRICK AND CLAY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Wm. Penn Silica Works, Wm. Penn P.O., Pa.
Whitehead Bros. Co., Buffalo, N.Y.

FLASKS, SNAP, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY COKE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY EQUIPMENT
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
E. H. Mumford Co., Elizabeth, N.J.
Northern Crane Works, Walkerville, Ont.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY PARTING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY GRAVEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
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FURNACE LINING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Monarch Eng. & Mfg. Co., Baltimore.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES, BRASS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton,
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

GOGGLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.

GRAPHITE PRODUCTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Jonathan Bartley Crucible Co., Trenton, N.J.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.

GRAPHITE, ANTI-FLUX BRAZING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.

GRINDERS, DISC, BENCH, SWING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.

HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.

HOISTING AND CONVEYING MACHINERY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.

HOISTS, ELECTRIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J. Co., Toronto.

HOISTS, HAND, TROLLEY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

IRON CEMENTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
J. W. Paxson Co., Philadelphia, Pa.

IRON FILLER
Can. Hanson & Van Winkle Co., Toronto, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

JOLT MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Mumford, E. H., Co., Elizabeth, N.J.

JOLT SQUEEZERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Mumford, E. H., Co., Elizabeth, N.J.

JOLT AND SQUEEZE SPLIT PATTERN MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Mumford, E. H., Co., Elizabeth, N.J.

JOLT STRIPPING PLATE MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Mumford, E. H., Co., Elizabeth, N.J.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Wm. Penn Silica Works, Wm. Penn P.O., Pa.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Eng. & Mfg. Co., Baltimore.
Osborn Mfg. Co., Cleveland, O.
J. W. Paxson Co., Philadelphit, Pa.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
J. W. Paxson Co., Philadelphia, Pa.
Seidel, R. B., Philadelphia.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Inspection & Testing Laboratories, Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.

METALLURGISTS
Can. Inspection & Testing Laboratories, Montreal.
Charles C. Kawin Co., Toronto.
Toronto Testing Laboratories, Toronto.

MIXERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
J. W. Paxson Co., Philadelphia, Pa.

MOLDERS' TOOLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
E. H. Mumford Co., Elizabeth, N.J.
Midland Machine Co., Detroit.
Osborn Mfg. Co., Cleveland, O.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

PATTERN SHOP EQUIPMENT
Can. Hanson & Van Winkle Co., Toronto, Ont.
Osborn Mfg. Co., Cleveland, O.

MOLDING SIFTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Osborn Mfg. Co., Cleveland, O.
Whitehead Bros. Co., Buffalo, N.Y.

OVENS FOR CORE-BAKING AND DRYING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Osborn Mfg. Co., Cleveland, O.
Monarch Engineering & Mfg. Co., Baltimore, Md.

OIL AND GAS FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

PATTERN SHOP EQUIPMENT.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

PIG IRON
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Stel Co., Sydney, N.S.
Steel Co. of Canada, Hamilton, Ont,

PHOSPHORIZERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Whitehead Bros. Co., Buffalo, N.Y.

PLUMBAGO
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

PLATING AND POLISHING SUPPLIES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Osborn Mfg. Co., Cleveland, O.
W. W. Wells Toronto.
Woodison, E. J., Co., Toronto, Ont.

PYROMETER SHIELDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.

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CANADIAN FOUNDRYMAN

AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields

Vol. VII. TORONTO, JUNE, 1916 No. 6

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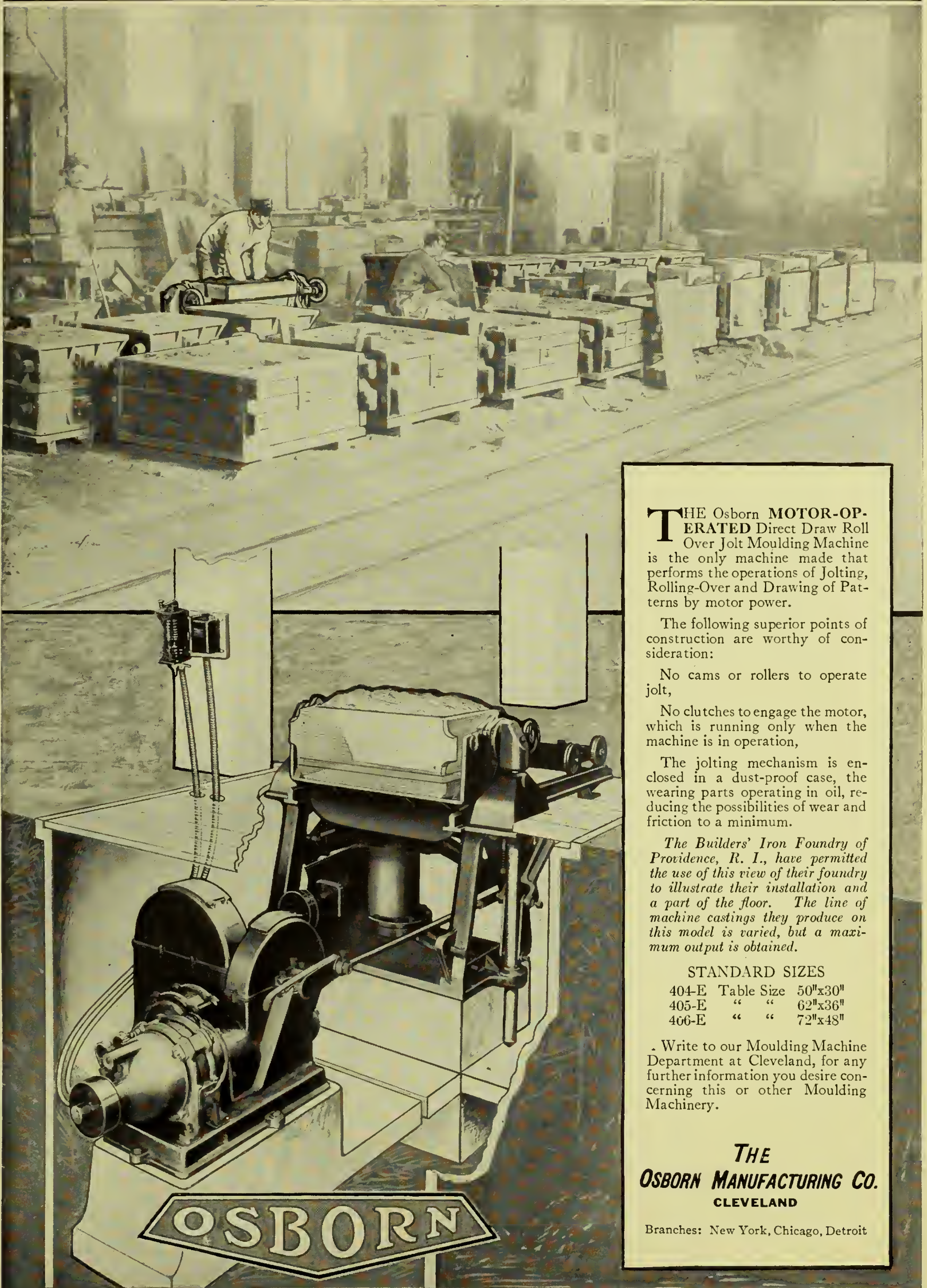

THE Osborn **MOTOR-OPERATED** Direct Draw Roll Over Jolt Moulding Machine is the only machine made that performs the operations of Jolting, Rolling-Over and Drawing of Patterns by motor power.

The following superior points of construction are worthy of consideration:

No cams or rollers to operate jolt,

No clutches to engage the motor, which is running only when the machine is in operation,

The jolting mechanism is enclosed in a dust-proof case, the wearing parts operating in oil, reducing the possibilities of wear and friction to a minimum.

The Builders' Iron Foundry of Providence, R. I., have permitted the use of this view of their foundry to illustrate their installation and a part of the floor. The line of machine castings they produce on this model is varied, but a maximum output is obtained.

STANDARD SIZES

404-E	Table Size	50"x30"
405-E	" "	62"x36"
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. Write to our Moulding Machine Department at Cleveland, for any further information you desire concerning this or other Moulding Machinery.

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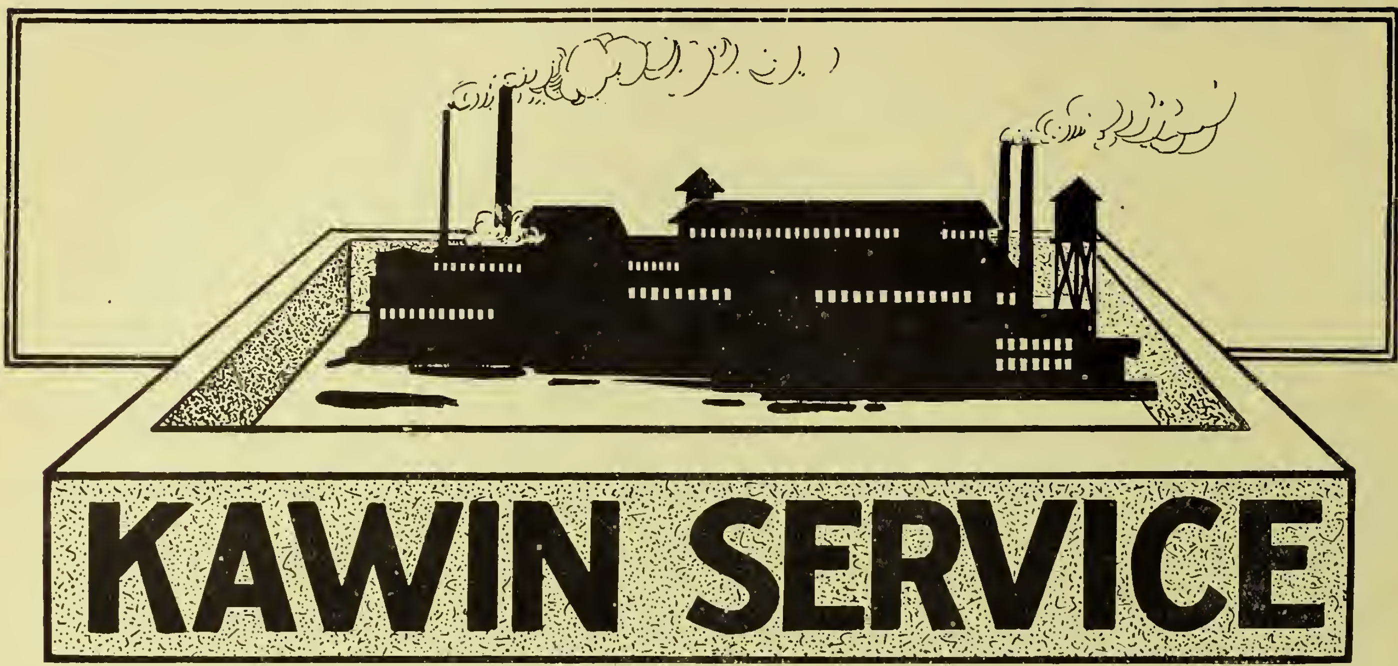
CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company Limited, Toronto, Montreal, Winnipeg, and London, England

VOL. VII. PUBLICATION OFFICE, TORONTO, JULY, 1916 No. 7


KAWIN SERVICE

The Publisher's Page

The Shortage of Labor

WE have just received from one of our circulation representatives a report on conditions as he found them in a large foundry in Western Ontario.

"This foundry," the report runs, "is extremely busy on a very large order for stoves. Like many other shops and foundries it has lost many men through enlistments, over fifty of their employees having joined the colors.

"In this foundry as in other places, I noticed a good deal of new equipment which was evidently installed to compensate in a measure for the shortage of manual labor. In this particular plant over $10,000 worth of equipment has been purchased and the superintendent intimated that they were not all through by any means."

This report differs only in detail from other reports we have received from time to time. They all tend to show that there exists a well developed tendency to purchase and install the most efficient labor-saving machinery. The most urgent necessity may have proved an irresistible incentive while the presence of financial prosperity made inclination the more easily followed.

With the establishment of new industries in Canada, with new plants springing up, with export trade developing and other changes taking place, the labor situation will very likely remain acute for a long time to come. Canadian manufacturers now have both the opportunity and the necessity for equipping their plants in the most up-to-date manner, both as a solution of present problems and as an insurance for the future.

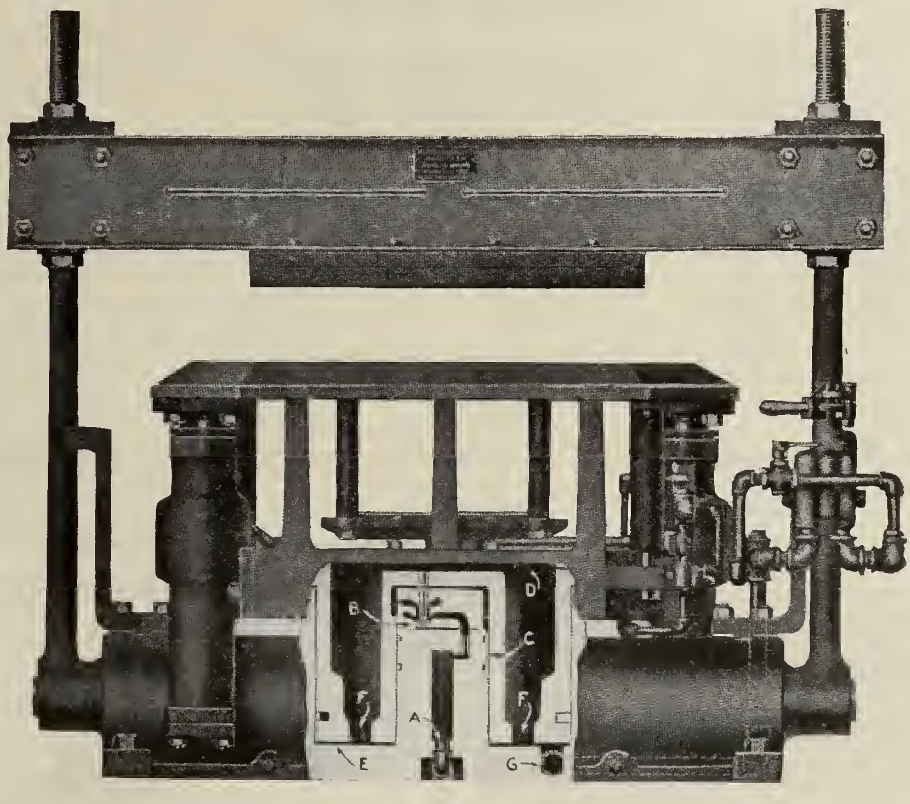
CANADIAN FOUNDRYMAN

143-153 UNIVERSITY AVE., TORONTO, CANADA

Montreal Winnipeg London, England Boston New York Cleveland Chicago

Mumford Jolt and Squeeze Ramming Split Pattern Machine

Power Jolt—Power Squeeze—Hand Starting.
Power Pattern Draft Adjustable up to ten inches.



A—Air for Jolt Ramming. B—Automatic Single-piece Valve for Jolt Ramming. C—Exhaust from Jolt Rammer. D—Open joint between plunger and ramming head of machine through which exhaust escapes. E—¼" leather sheet serving as impact surface during jolting and valve closing surge ports FF during squeezing. F—Surge ports to prevent suction and cushion under squeeze plunger during Jolt Ramming. G—Air inlet port for squeezing.

A new Mumford invention with exclusive features that prevent any approach to its advantages in any other machine. Saving of time, labor and expense make a cold and inadequate description of its value after you have used or beheld this machine in operation.

Valves are Necessary in Jolt Ramming Machine

A single-piece valve, for example, allows a small internal cylinder to take the place of the entire squeezing area for the work of jolt ramming. On a 14" x 16" machine you use a 4½" jolt cylinder instead of 12" squeezing cylinder and save six-sevenths of the area. The action of our valve is to automatically gauge the air used to the load.

We can equip your plain squeezer or split pattern machine of our make with the jolt feature.

We have no branches.

E. H. MUMFORD COMPANY

**70 Franklin Street
ELIZABETH, N.J.**

The Nova Scotia Steel & Coal Co.

Wabana Nfld., Sydney Mines and New Glasgow N.S.

By The Editor

The history of "Scotia" from its inception down to the present is a fascinating one, because full of life, energy and optimistic determination. In bringing Canada's coal, iron and steel industries to their present degree of successful achievement, the Nova Scotia Steel & Coal Co., it will be observed, has at no time been lacking in prominence of contributory effort.

AROUND the growth of the Nova Scotia Steel & Coal Co. and its parent organizations is woven in large measure the record of Canada's coal and iron industries' achievement.

The Coal Side

The history of the company down to the present—1916—dates back nearly three centuries to the time when Nicholas Denys, then Governor of Eastern Acadia, was granted certain concessions that included the whole of Cape Breton Island, one of the richest coal fields in the world. Although at that early day coal was known to exist at Sydney, this immense property was not systematically developed until the organization, in the early part of the nineteenth century, of the General Mining Association of London, England. The first shaft was sunk in 1830 and, from that time onward, coal mining in Cape Breton has been marked by a steady growth. In 1900, the holdings of the General Mining Association were taken over by the Nova Scotia Steel & Coal Co., in whose control the property still remains.

COL. THOMAS CANTLEY, PRESIDENT AND GENERAL MANAGER.

The Steel Side

Equally interesting as the coal feature is the story of the rapid growth of the iron and steel branches of this now great industry. Starting in 1872 with a capital of $4,000 and a working force of eight men, the little Hope Iron Works of New Glasgow quickly developed. Six years later, in 1878, a larger plant having become necessary, the whole undertaking was removed from the centre of the town of New Glasgow to a point two miles down the East River, then called Smelt Brook, but now known as Trenton or North New Glasgow. There was begun the manufacture of railway car axles. In 1882 it was decided to engage in the manufacture of steel, and the Nova Scotia Steel Co. was organized with a capital of $160,000, an increase in ten years to forty times the original capital. One year later a Siemens-Martin open-hearth steel plant was completed, and a 26-inch blooming mill installed—the first of its kind in Canada—together with a 22-inch plate mill. Two years later a bar mill was added. In 1889, the Nova Scotia Forge Co. and the Nova Scotia Steel Co. were amalgamated under the name of the Nova Scotia Steel & Forge Co.

The New Glasgow Iron, Coal & Railway Co. was organized in 1890 with a capital of $1,000,000. Extensive iron ore lands were purchased, including a valuable section on the East River, near Pictou, a line of railroad from Ferrona Junction to Sunny Brae was constructed and many other improvements made, the most important of which was the building of a large coal washing plant, coke ovens, and modern blast furnace at Ferrona.

In 1894, the New Glasgow Iron, Coal & Railway Co. acquired the now famous iron ore deposits of Bell Island, Conception Bay, Newfoundland, and added a new name, Wabana, to the list of the world's shipping ports. The mines were opened up, machinery installed, and a double track ropeway, storage pockets and pier were constructed. The first shipment of ore was made on Christmas Day, 1895. Since then about 13,000,000 tons of ore have been shipped from Wabana.

Consolidation of Interests

The Nova Scotia Steel & Forge Co. and the New Glasgow Iron, Coal & Railway Co. were consolidated in 1895, the new concern being known as the Nova Scotia Steel Co. After the purchase in 1900 of the coal and other properties of the General Mining Association, the corporation now known as the Nova Scotia Steel & Coal Co. was formed.

Merged, therefore, in the latter are the companies that mined the first coal and smelted the first steel in Canada, and being first in the field, it is in a measure but natural to expect that no effort would be spared to keep right in the van of further development and progress. That such has been the experience, the record of continuous and substantial expansion and increased earning power makes amply evident, besides indicating careful forethought in administration and planning.

The whole trend of events in the evolution of the Nova Scotia Steel & Coal Co. has been relative to, and has taken cognizance of, the two essential elements making for national industrial greatness—i.e., coal and iron. Recognition besides of the unrivalled economic locations of the various plants in the matter of tidewater facilities for reaching the markets of the world on a low freight rate basis as well as of the ease with which Canada's domestic requirements could be catered to through the medium of railroad transportation have in no less degree been a determining factor.

NEWFOUNDLAND, SHOWING LOCATION OF WABANA ORE MINES.

Steel Making at Sydney Mines

Upon acquisition of the Cape Breton coal fields, and owing to the short water carriage from their Newfoundland ore mines, the company decided it was advisable to erect a new blast furnace and open-hearth plant near their coal mines, which are situated on Sydney harbor. In 1904 a new blast furnace and open-hearth plant were put into operation at Sydney Mines. To further improve the quality of their open-hearth product, in 1911 a Harmet fluid compression plant was installed in connection with the open-hearth installation. During the same year there were also added two steam hydraulic forging presses, one of 4,000 tons and the other of 600 tons.

UNLOADING IRON ORE FROM NORTH SYDNEY SHIPPING PIER.

Car Plant Established

To take care of the increased output in the most profitable manner, and to meet the growing demand for railroad cars in Canada and elsewhere, a subsidiary company was formed in 1912. This is known as the Eastern Car Company of New Glasgow, N.S., the control of which is vested in the Nova Scotia Steel & Coal Co.

"Scotia," as the company is more familiarly called, has now become one of the largest industries in Canada, as well as a very important world factor in the production of iron and steel. Five distinct industries are combined in its operation:

1—The Iron Mines at Wabana, Newfoundland.

2—The Coal Mines at Sydney Mines, N.S.

3—The Blast Furnaces and Smelting Works at Sydney Mines, N.S.

4—The Steel Works at New Glasgow, N.S.

5—The Car Works at New Glasgow, N.S.

Wabana—Island of Iron

The Wabana (Newfoundland) iron properties are the largest on this continent, if not in the world. Available reserves of ore, as estimated by experts, are between 2,000,000,000 and 3,500,000,000 tons, an amount which at present rate of mining will not be exhausted for more than 3,000 years. By comparison with the next largest holdings on this continent, those of the United States Steel Corporation (1,300,000,000 tons), an idea of the magnitude and great wealth of this Wabana field can be formed. Equally important is the excellent quality and richness of the ore, which is a fine grade of red hematite, averaging from 51 to 55 per cent. pure iron on all three seams worked.

Only in recent years was this valuable property discovered and developed, but just how attention was first attracted to the deposits is not known. Bell Island, the site of the Wabana deposit, is some six miles long by two miles wide, and is elliptical in shape, as its name signifies.

The property in any case eventually came into the hands of Messrs. Butler of Topsail, who, after vainly endeavoring to interest other capital in the venture, finally leased the deposit to the Nova Scotia Steel Co. in 1893. Two years afterwards that company commenced to mine the ore in a small way.

INTERIOR OF CHANGE HOUSE, SUBMARINE PLANT, WABANA, NFLD.

The work, at first, consisted entirely of opencut mining, the earth covering being stripped off the deposit as it lay in the ground and the ore carried by an endless rope tramway to a pier on the south side of the island. This pier was nothing more than a block set out some distance from the shore and connected with it by a suspension bridge. Later, however, this was supported by a trestle.

At first the ore was used solely to supply the Ferrona blast furnace of the Nova Scotia Steel Co., and large quantities were not required. The Wabana plant, therefore, consisted merely of a hopper pier of two thousand tons capacity, and the tramway. This, however, met all the requirements, for the mining was quarry work and did not need a more elaborate outfit.

Three years later the possibility of shipping ore to European markets called for an enlargement of the plant. Storage pockets were built, giving an increase of from twelve to fifteen thousand tons storage capacity. At the same time a horizontal ore conveyor was installed, tracks were laid, and a number of other additions made.

In the year 1899, work began in earnest. Twelve hundred men were employed during that season in mining from the old property and developing the new. Tramways were constructed and a new pier built, since when the "Scotia" Company has gone ahead producing ore without a single break.

For two years after opening this new bed, the ore was secured by stripping and quarrying the deposits lying near the surface . In 1902, however, work was commenced sinking two slopes on the land areas. Operations were carried on rapidly, and, within a year, the two mines had been opened up and were being worked in a manner similar to the room-and-pillar method of coal mining.

Both these slopes were sunk to a considerable height above tide-water and one of them was driven so as to come out on the shore above high water mark, thus forming an adit. The other slope, Scotia No. 2, was destined eventually to be driven under the sea.

Developing the Submarine Areas

About the year 1905 the possibilities of developing the submarine areas began to attract the attention of the "Scotia" Company. Further additions to its under-water holdings were secured, making the total of submarine property held approximately 35 square miles.

After deciding to drive a couple of slopes to the submarine fields, an arrangement was entered into with the Dominion Iron & Steel Co. for piercing their section which divided the Scotia fields. Work on this began in May, 1906, and in two and one half years the feat was accomplished, the "Scotia" Company entering its own property.

Bore-holes were sunk and proved that the same beds that out-cropped on the surface extended under the sea with an appreciable increase in the thickness of the mineral. The "Scotia" areas were entered at a distance of about 4,000 feet from the shore, and conditions were found to be more favorable than had been hoped for. Since that time the slopes have been driven a considerable distance further, and mining is now being done on a larger scale.

The under-ground excavations extend several miles beneath the sea, where electric shovels, hurrying trams and the rush of large 20-ton skips present an ever busy and noisy scene. Co-mingled with the deafening sound of these are the sharp rattle of air drills, the hum of modern electric pumps and the whirr of the large fans that carry fresh air to the most remote parts of the mine.

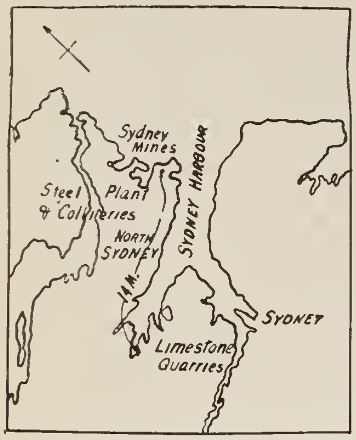
The surface equipment at the Wabana Mines consists of a deckhead and accessory hoisting engines, ventilating fans air compressor, and power generating plant.

The cars, as they come loaded from the mine, pass on to the deckhead, where they are dumped one by one in an end-revolving tipple, the ore passing over a "grizzly" and into a gyratory crusher which delivers a 4-inch ring product on to an inclined 36-inch rubber picking belt. The ore is finally delivered into a storage bin and loaded from time to time into tramline cars which carry it to the shipping pier at the south side of the Island. Direct transportation as above is made to the shipping pier in summer.

EXTERIOR OF CHANGE HOUSE, SUBMARINE PLANT, WABANA, NFLD.

Stock Piling Ore

During the winter, from January to April, when navigation is closed, the ore is stock-piled by means of a system originated and patented by engineers of the Company. The method is unique



SYDNEY HARBOR, SHOWING LOCATION OF LIMESTONE QUARRIES.

inasmuch as no trestle work is required, although at times the pile reaches a height of 75 feet. The stock-piling is accomplished through the instrumentality of a side-dump car propelled by a main and trail rope which is driven by a single drum engine. The steel rope is led from the engine which is placed a short distance to one side of the feeding chute, to a sheave wheel some three or four hundred feet distant, thence across a second sheave wheel to the line on which it is desired to pile the ore, and down this line to the car at the chute. From the other end of the car the rope passes around a sheave wheel back to the engine. This car is of the ordinary side dump type, possessing the necessary mechanism to open the doors when engaging a stop set in the track.

The car runs on a track at an inclination of about twenty degrees, which track is kept ahead of the pile a couple of car lengths by means of a wooden frame, the lower end of which is of sufficient weight to keep the loaded car from upsetting. The only labor necessary, excepting that of an engine driver, is when it is required from time to time to move the wooden frame ahead, and even then the heavy work is performed by the engine. By this means the ore is readily handled, as fast as it comes from the mines, up to 1,500 tons per day, and at the cost of under one cent per ton.

The ore stockpiled in the winter is picked up in the busiest part of the shipping season, and sent over the tramway to the shipping pier in the already mentioned fashion.

The rehandling of this ore can be done by steam shovel or, as is the current practice with the Scotia Company, by means of a scrape or drag bucket, controlled by a wire rope passing through a sheave pulley which runs back and forth upon a suspended steel cable, one end of which is fastened upon the top of a wooden tower. This tower contains a bin of from 30 to 40 tons capacity and the necessary chutes, etc., and is supported upon wheels, thus enabling the bucket to be operated along all the radii of the circle covered by the stockpile. The drag bucket is equipped with a tripable bottom door, opened by a curved tail striking against a plate situated in the tower frame, immediately above the bin. The bucket is operated by a double-drum duplex hoisting engine of the ordinary type, and the cycle of operations may be described as follows:

The bucket is lowered to the ground at the foot of the inclined pile of ore and its latch closed. A combined hoisting and forward motion is then imparted to the bucket, its nose being thus constantly kept against the pile until loaded. The engine is next reversed and the loaded bucket rapidly conveyed upon the suspended wire back to the tower, when it is automatically dumped immediately over the bins in the manner already mentioned. This accomplished, the bucket is rapidly lowered and the cycle of operations repeated.

LOADING PIER, SHOWING CONVEYORS AT WABANA, NFLD.

TRAMWAYS AND TIPPLES, WABANA, NFLD.

Surface Haulage System

To transport the ore from the mines to the shipping pier situated on the south side of the island, slightly more than two miles distant, a double-track tramway operated by an endless cable is employed. The tramway is in the form of the letter "T," the head of

STOCK PILE AND DECK HEAD, SUBMARINE MINE, WABANA, NFLD.

which lies parallel and close to the outcrop of the "Scotia" ore bed, tapping the various surface pits and the mines, No. 1 to the west and No. 2 to the east of the long leg which stretches in a straight line in a southerly direction across the Island to the shipping pier. The tramway is of 2 ft. gauge and has two tracks, one for loaded cars and the other for empties. Steel rails of 28 and 18 pounds per yard are used on the respective tram tracks.

At a point located midway between the mines, where the tramway separates in three directions, and locally called the "bottom," the grades are so arranged that, by ungripping the cars, they move by gravity each in the required direction; the loaded outgoing cars falling from the east and west "full" tracks into the pier or main full track, and the empties on either the east or west toward their respective empty track on either the east or west branch for distribution to the mines.

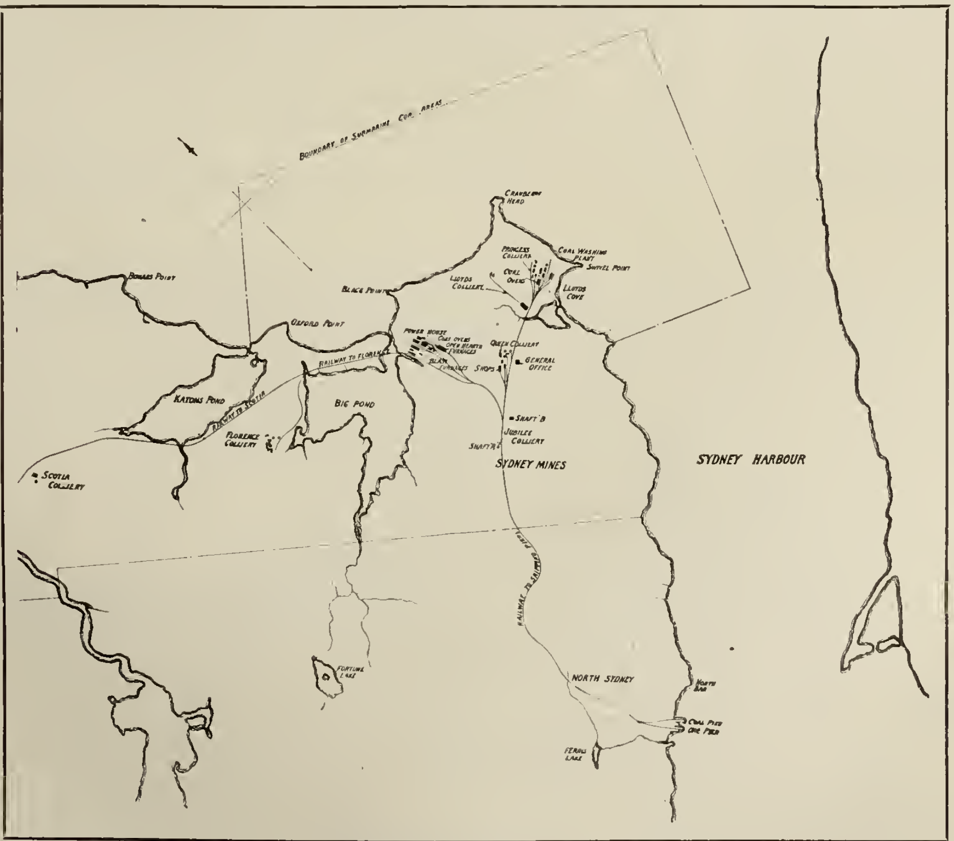
The cable of one-inch diameter "Lang Lay" plough steel, is supported upon wood rollers at short intervals, and by Hadfield cast manganese steel wheels at the crest of each rise. The cable is slightly over seven miles long, its tension being uniformly maintained by means of balance weights, placed near the haulage engine at the pier, and at the east and west extremities of the tramway. The tramway is operated by a compound condensing steam engine of 125 h.p., geared down to a driving bull-wheel to give a cable speed of 350 feet per minute. The power plant site is located alongside the shipping pier.

The cars, built of steel, have an average capacity of 1.8 tons of ore, as loaded from the chute. They are of 30 cubic ft. measurement, and are attached to the cable by means of grips, consisting of a series of levers readily operated by a plain wrench with a 30-inch handle.

ENGINE HOUSE AND DECK HEAD, SUBMARINE MINE, WABANA, NFLD.

Two of the grips, one at each end, hold the car securely to the cable upon the steepest grade on the line and may be used upon a grade up to 10 per cent.

Under existing conditions, the actual capacity of the line, allowing for all stops, is 3,000 tons per day; indeed, frequently by working overtime, the daily tonnage has been maintained at 4,000 tons per day for weeks at a time.



SHOWING LOCATION OF COLLIERIES, BLAST AND OPEN-HEARTH FURNACES, ETC., CAPE BRETON ISLAND.

Submarine Equipment

The development of the submarine areas has necessitated large additions to the equipment. A deck-head of an absolutely new type, in which the cars are handled without any horizontal landing, has been completed and is now in operation. The cars, each containing twenty tons of ore, are hauled up out of the mine by a rope one and one-eighth inches in diameter and eight thousand feet long. They dump their contents automatically, thus reducing to the minimum the number of men required to attend their operation.

The hoisting is done by a Fraser & Chalmers first motion, duplex, steam hoisting engine equipped with the most modern overwind and automatic braking devices. It is capable of considerable speed, rushing the big cars up the two-mile slope at the dizzy rate of thirty miles an hour. The cars are filled in the mine from bins, which in turn are supplied by small 2-ton mine cars.

Drilling, hoisting and pumping are all carried on through the instrumentality of compressed air. When mining was started on the land areas, two compressors were installed — a 1,200 cub. ft. capacity Norwalk machine and a 2,500 cub. ft. Norberg machine. Since then a Walker compressor of 3,500 cubic ft. capacity has been added. The pipe connections of all three machines are such that they may be operated as one plant or individually when it becomes necessary.

From April to December inclusive, numerous cable cars transport the ore from the mine or stock-pile to the shipping piers some two miles distant. What appears like a never ending string of cars coming and going on the double track road bring their loads to tipples at a point some 250 feet above sea level, the tipples in turn emptying the car contents into great natural gorges that have been modified to serve as receiving pockets. Two great endless chains of buckets convey the ore from the pockets to a point where it falls through chutes and automatic trimmers, a distance of 90 feet to the ship's hold underneath.

Recently there has been installed a modern electrical plant of considerable power, built on piles at the shipping pier and adjacent to the coal discharging plant. It consists of up-to-date water tube boilers and mechanical stokers, which supply steam to Belliss & Morcom vertical, forced lubrication type engines, operating Brown Boveri generators, producing 60 cycle, 3 phase current at 6,600 volts. At this voltage it is transmitted to the various points of distribution for transforming and service in both the land and submarine mine spheres of operation.

NORTH SYDNEY SHIPPING PIER FROM ELEVATED TRACKS.

Piers

Wabana loading records, we understand, have never been equalled working under similar conditions, i.e., with a single loading chute. During the season of 1909, between April 19 and December 23, 460,000 tons were loaded in vessels at the Scotia pier in 308 loading hours. This calculation also includes the time spent in moving the vessels, therefore, the ore was loaded in ship's hold at the average rate of 1,500 tons per hour. On numerous occasions this rate has been very considerably increased on single vessels, a rate of over 2,200 tons per hour having been attained on a 7,000-ton ship. These figures apply of course to loading through a single chute. Since 1913, when the east pier was put into service, the time of loading has been cut almost in half, and ships of the company carrying 12,500 tons each have been fully loaded in 3½ hours.

Power Dock

Immediately to the west of the pier from which the ore is shipped there is a large wharf for receiving incoming supplies, etc., and here is located a modern steam driven coal gantry for economically handling coal to operate the plant and to bunker ore steamers with despatch when coal is required by them. This apparatus can be operated by a single man and has a capacity of 1,000 tons per ten-hour day continuously.

Welfare Work

About 500 men are employed in and about the mines at Wabana, and for their accommodation there have been erected a large number of houses which are rented at a low monthly rate. The property of the "Scotia" company surrounding the plant is attractively laid out in streets and building lots, and West Wabana is rapidly becoming a town of considerable size and importance. A water system for fire and domestic supply purposes has been installed.

For the proper care and treatment of sick and injured, there has been built and equipped a small hospital. A well stocked dispensary and the necessary instruments and apparatus found in any well appointed institution of the kind are provided; also, the work in connection with it is in the care of a competent physician and nurse. Every man susbcribes a small monthly fee for hospital purposes, this providing him with free medical treatment in case of sickness or injury. First aid boxes are placed at various points on the plant surface and underground for rendering prompt assistance to the injured.

PRINCESS COLLIERY, SHOWING SURFACE EQUIPMENT AT SYDNEY MINES.

The duty of providing safety arrangements and appliances about the workings is in the hands of a committee of the staff, who make weekly visits to different parts of the plant, and by study, recommendations, and regulations they seek to obtain the greatest immunity from accident and personal injury in all departments of the work from blasting to operation of machinery, tramming, etc. A large clean concrete change house has been built at a convenient point on the surface, where in a warm, well-lighted room, supplied with hot and cold water, the men may change their clothes, wash, or bath. Underground, large clean and well-lighted lunch rooms are maintained, and hot and cold drinking water are supplied for the use of the workmen there.

DOMINION STEEL CORPORATION RECORD

IN keeping with the record-breaking statements that have been coming forward from the steel industry all over this continent, Dominion Steel Corporation reports for the year ended March 31 last the largest profits in its history, net manufacturing earnings rising to $7,004,316, an increase of $3,433,258, or 97 per cent. over the previous year, and an increase over the banner year ot 1912-13.

Records in Output

Dealing with the year's operations, Mr. Workman, the president, reviews the difficulties encountered in the coal trade as a result of the shortage of ships and the drain on men resulting from the recruiting campaign. As to the latter, he says that representations were finally made to the Government and in view of the fact that a sufficient supply of coal and steel "is as important as the enlistment of men, orders were issued to discontinue recruiting in and about the collieries. It is estimated that upwards of three thousand men left the collieries and steel works to serve in the Allied armies, the collieries contributing the larger proportion. Vacancies at the steel works have been filled from various sources, and so far there has been no diminution of output."

After dealing with the wage adjustment of January and the recent general advance of 10 per cent., the president gives the production figures for the year. The coal output was 5,261,198 tons, against 4,550,512 the previous year, and 5,051,603 in the active year of 1912-13. Last year's requirements of coal for the steel works amounted to about 400,000 tons more than the previous year.

The tonnage of pig iron produced—329,664 tons, against 187,262 in 1914-15, was slightly less than in 1913-14, when the output was 333,919. The year just past, however, holds the record for the largest production of steel ingots, the total having been 371,086 tons, against 243,313 the previous year. Comparisons of production for two years follow:

	Year ending March 31 1916.	1915.
Pig iron	329,664	187,262
Steel ingots	371,086	243,313
Blooms and billets for sale	142,282	38,231
Rails	35,197	99,929
Wire rods for sale	55,106	14,277
Bars	8,017	14,310
*Wire	36,058	27,175
Nails, etc.	19,262	11,679

*This includes wire used in manufacture of nails shown in next line.

Factor of War Orders

Discussing the general aspects of the year's business, Mr. Workman says: "The most important elements in the steel business continue to be those which have resulted from the war. One-fifth of the steel shipped from the works was in forms suitable for the manufacture of shells. One-half the total output was exported. The destination of the greater part of this was Great Britain or France, but considerable tonnages were sent to South Africa, Australia and United States. British consignments included many parcels for re-shipment to India and the Far East. The benzol works and the 16-inch mill referred to in last year's report were completed and have been kept steadily in operation."

MACHINABLE ACID-PROOF IRON

A CAST iron, claimed to be easily machinable and acid-proof and known as Corrosiron, is made by the Pacific Foundry Co., San Francisco. It is high in silicon and can be cast in difficult shapes. Many pieces have been made with bars of iron or steel cast within the metal, giving added strength. Because the alloy is inclined to be brittle it must be handled carefully. Its strength is reported to be half that of cast iron, a bar $1 \times 2 \times 24$ in. giving a transverse strength of 1,200 lb., with a deflection of about 0.14 to 0.18 in. The fracture is described as similar to that of ice, with long, flat crystals, but not granular. The shrinkage is 3-16 in. to the foot, about that of brass. Flat surfaces are avoided in designing, corners are rounded and the sections of metal are kept as even as possible. The greatest loss in some corrosion tests was 0.58 per cent. in 17 days' immersion in concentrated hydrochloric acid, while the smallest was 0.0015 per cent. in 7 days' immersion in various strengths of nitric acid.

MAXIMUM PRICES OF IRON IN GREAT BRITAIN

THE question of the price of material used and produced in Britain's iron and steel industries has been under the consideration of the Minister of Munitions for some time past; and, after consultation with the representatives of the principal trade associations, the following maximum prices for the various products have been fixed until June 30, 1916, and thereafter until further notice.

The makers may sell for delivery after June 30, 1916, on the understanding that the fixed maximum prices ruling on the first day of any month during the period of the contract will apply to all deliveries made during that month. These maximum prices are based upon the abnormal costs and conditions now prevailing, and must not be assumed to be indicative of any difference in relative values which may have obtained in the several districts before the war and may obtain again after the war. This intimation must not be taken to authorize any sale or purchase or other dealing prohibited under the Defence of the Realm Regulations:—

CLASSIFICATION

	Per Ton Net F.O.T. Makers' Works. £	s.	d.
Hematite Pig-Iron (West Coast)			
Mixed Nos. 1, 2, and 3	6	7	6
Special quality, containing under 0.03 of phosphorous and sulphur	6	15	6
Special quality, containing under 0.02 of phosphorus and sulphur	7	0	0
Hematite Pig-Iron (East Coast):			
Mixed Nos. 1, 2, and 3	6	2	6
Special quality, containing under 0.03 of phosphorus and sulphur	6	15	6
Special quality, coutaining under 0.02 of phosphorus and sulphur	7	0	0
Hematite Pig-Iron (Scotch):			
Mixed Nos. 1, 2, and 3	6	2	6
Special quality, containing under 0.03 of phosphorus and sulphur	6	15	6
Special quality, containing under 0.02 of phosphorus and sulphur	7	0	0
Hematite Pig-Iron (Welsh):			
Mixed Nos. 1, 2, and 3	6	2	6
Special quality, containing under 0.03 of phosphorus and sulphur	6	15	6
Special quality, containing under 0.02 of phosphorus and sulphur	7	0	0
Lincolnshire Pig-Iron			
Basic or foundry	4	7	6
Cleveland Pig-Iron:			
Mixed Nos. 1, 2 and 3	4	2	6
Northamptonshire Pig-Iron:			
Forge	4	2	6
Foundry numbers	4	5	0
Derbyshire Pig-Iron:			
Forge	4	5	0
Fouudry numbers	4	7	6
North Staffordshire Pig-Iron:			
Forge	4	10	0
Foundry	4	12	6
Basic	4	15	0
South Staffordshire Pig-Iron:			
"Part Mine" forge	4	10	0
"Part Mine" foundry	4	12	6
Common Staffordshire	4	5	0
"All Mine" forge	5	10	0
"All Mine" foundry	5	15	0
"Warm Air" forge	7	0	0
"Warm Air" foundry	7	10	0
Special quality, Lord Dudley's silicon	7	17	6
Cold-blast iron	8	17	6
Scotch Foundry and Forge Pig-Iron			
Nos. 3, 4 and lower grades of Monkland, Dalmellington, Eglinton, and Govan	5	14	0
Nos. 3, 4 and lower grades of all other brands	5	15	6
No. 1 quality			

In all cases to be 5s. per ton above these prices.

Foundrymen's Convention and Exhibition at Cleveland, Ohio

Contributed

It will be noted from what follows that not only are the executive plans well developed for the 1916 Foundrymen's Convention and Exhibition, but the mass of detail arrangement necessary to making the double function a huge success from either or all of the educative, business and social viewpoints, may be said to be more or less finally worked out and completed

THE exhibition of foundry equipment and accessories, machine tools, etc., to be held at Cleveland, Ohio, during the week of September 11, concurrent with the annual meetings of the American Foundrymen's Association and the American Institute of Metals, will, it is expected, surpass in magnitude any similar undertaking. This is indicated by the large number of manufacturers who already have made resertions for space. Fully 90 per cent. of the exhibition area of the Coliseum has been disposed of, and since 10,000 additional square feet will be required to meet the needs of prospective exhibitors, it has been decided to erect a temporary building on a lot directly across the street from the Exhibition Hall. At a meeting of the exhibition committee of the American Foundrymen's Association, held at the Hotel Statler, Cleveland, on Saturday, June 24, the erection of this annex was authorized.

The two buildings will be connected by a runway, making it necessary for the visitors to descend to the street when passing from one to the other. In the temporary structure it is planned to place all of the large operating machines requiring heavy foundations, and it is probable that several different types of melting furnaces will be shown in operation. The annex will be converted into a temporary foundry, where molds will be made and poured. Since the Coliseum was erected, many shows have been held there. The structure affords 60,000 square feet of floor space, but this industrial exhibition will be the first to overflow its generous dimensions, making necessary the erection of a temporary annex to provide space for all of the manufacturers who contemplate making exhibits. This industrial exhibit will, it is believed, be the biggest and most complete show of its kind ever held in Cleveland, and the local interest now manifested points to an unusually large representation of Cleveland products.

Reservations Made

Although more than two months still intervene before the opening of the exhibition, 95 manufacturers already have made reservations, and the indications are that this total will be swelled to 150 when the doors of the Coliseum and the annex are thrown open on Monday, Sept. 11. At Atlantic City last year there were 102 exhibitors, and never before in the history of the exhibition movement has as much space been reserved so far in advance of the opening of the show as this year. The complete list of manufacturers who have made application for space follows:

American Gum Products Co., New York.
Arcade Mfg. Co., Freeport, Ill.
Armstrong Cork Co., Pittsburgh.
Atkins, E. C., & Co., Indianapolis.
Ayer & Lord Tie Co., Chicago.
B. & B. Mfg. Co., Indianapolis.
Berkshire Mfg. Co., Cleveland.
Besly, Chas. H., & Co., Chicago.
Birkenstein, S., & Sons, Chicago.
Blystone Mfg. Co., Cambridge Springs, Pa.
Brass World Publishing Co., New York.
Brown Specialty Machinery Co., Chicago.
Carborundum Co., Niagara Falls, N.Y.
Cataract Refining & Mfg. Co., Buffalo.
Chicago Pneumatic Tool Co., Chicago.
Cleveland Blow Pipe & Mfg. Co., Cleveland.
Cleveland Pneumatic Tool Co., Cleveland.
Coale, Thomas E., Lumber Co., Philadelphia.
Curtis Pneumatic Machinery Co., St. Louis.
Davis-Bourneville Co., Jersey City, N.J.
Dixon, Joseph, Crucible Co., Jersey City, N.J.
Excelsior Tool & Machine Co., East St. Louis, Ill.
Federal Foundry Supply Co., Cleveland.
Felt & Tarrant Mfg. Co., Chicago.
Gardner Machine Co., Beloit, Wis.
General Electric Co., Schenectady, N.Y.
Gibb Instrument Co., Pittsburgh, Pa.
Gisholt Machine Co., Madison, Wis.
Goldschmidt Thermit Co., New York.
Graceton Coke Co., Graceton, Pa.
Great Western Mfg. Co., Leavenworth, Kans.
Hardy, F. A., & Co., Chicago.
Harriss, Benjamin, & Co., Chicago.
Herman Pneumatic Machine Co., Pittsburgh.
Herold Bros. Co., Cleveland.
Hill-Brunner Foundry Supply Co., Cincinnati.
Hoevel Mfg. Corporation, New York.
Ingersoll-Rand Co., New York.
Iron Age, New York.
Jennison-Wright Co., Toledo.
King, Julius, Optical Co., New York.
Lehigh Coke Co., South Bethlehem, Pa.
Lincoln Electric Co., Cleveland.
Lupton's, David, Sons Co., Philadelphia.
McCormick, J. S., Co., Pittsburgh.
MacLean Publishing Co., Toronto, Ont.
Macleod Co., Cincinnati.
Mahr Mfg. Co., Minneapolis.
Malleable Iron Fittings Co., Branford, Conn.
Manitowoc Electric Implement Co., Manitowoc, Wis.
Metal Industry, New York.
Midland Machine Co., Detroit.
Moldar Co. (Richey, Brown & Donald), Maspeth, N.Y.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Engineering & Mfg. Co., Baltimore.
Motch & Merryweather Machinery Co., Cleveland.
Mott Sand Blast Mfg. Co., Chicago.
Mumford, E. H., Co., Elizabeth, N.J.
National Engineering Co., Chicago.
New Haven Sand Blast Co., New Haven, Conn.
Norma Co. of America, New York.
Norton Co., Worcester, Mass.
Obermayer, S., Co., Chicago.
Oliver Machinery Co., Grand Rapids Mich.
Osborn Mfg. Co., Cleveland.
Oxweld Acetylene Co., Chicago.
Pangborn Corporation, Hagerstown, Md.
Penton Publishing Co., Cleveland.
Pickands, Brown & Co., Chicago.
Portage Silica Co., Youngstown, O.
Pridmore, Henry E., Chicago.
Pyrotectite Co., Chicago.
Robeson Process Co., New York.
Rogers, Brown & Co., Cincinnati.
Sand Mixing Machine Co., New York.
Sly, W. W., Mfg. Co., Cleveland.
Smith Facing & Supply Co., Cleveland.
Smith, R. P., & Sons Co., Chicago.
Smith, Werner G., Co., Cleveland.
Snyder Electric Furnace Co., Chicago.
Standard Sand & Machine Co., Cleveland.
Sterling Wheelbarrow Co., West Allis, Wis.
Stevens, Frederic B., Detroit.
Strong, Kennard & Nutt Co., Cleveland.
Sullivan Machinery Co., Chicago.
Superior Band Co., Chicago.
Thomas Elevator Co., Chicago.

Titanium Alloy Mfg. Co., Niagara Falls, N.Y.

Union Steam Pump Co., Battle Creek, Mich.

U. S. Graphite Co., Saginaw, Mich.

U. S. Molding Machine Co., Cleveland.

Wallace, J. D., Chicago.

Warner & Swasey Co., Cleveland.

White & Bro., Philadelphia.

Whiting Foundry Equipment Co., Harvey, Ill.

Woodison, E. J., Co., Detroit.

Papers and Reports

The papers and committee reports to be presented at the annual meeting of the American Foundrymen's Association promise an unusually valuable and interesting programme. Separate sessions will be held for the discussion of topics relating to the manufacture of gray and malleable iron and steel castings. The opening meeting will be held at the Hotel Statler, Monday afternoon, September 11, and will be followed by morning sessions only, the convention closing Friday, September 15. This arrangement will afford the foundrymen more opportunity to inspect the exhibition than has been the case in former years with two sessions daily, although the length of the programme will necessitate several simultaneous meetings. Three symposiums will feature the programme, the subjects of which follow:

"Results of Closer Co-operation between the Engineer and the Foundry as relating to Gray and Malleable Iron, Steel and Non-ferrous Metals."

"The Influence of Gating on Castings, including Gray and Malleable Iron, Steel and Non-ferrous Metals."

"Electric Furnace Practice as Relating to the Production of Steel Castings."

Four authors will present papers for each of the symposiums, and every phase of these respective subjects will be discussed. Several interesting papers on sand reclamation also will be presented, covering investigations made among all of the members of the American Foundrymen's Association and by the United States Bureau of Standards. A partial list of papers promised follows:

Miscellaneous

"Sand Reclamation," by H. B. Swan, Cadillac Motor Car Co., Detroit.

"Progress Report on Sand Reclamation," by C. P. Karr, associate physicist, U.S. Bureau of Standards, Washington.

Symposium on "The Results of Closer Co-operation between the Engineer and the Foundry," as relating to

"Gray Iron," by D. W. Sowers, Sowers Mfg. Co., Buffalo.

"Steel," by John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N.J.

"Malleable Iron" (author not yet determined).

"Non-Ferrous Metals," by C. E. Chase, Modjeski & Angier, Chicago.

Symposium on "The Influence of Gating on Castings," including

"Gray Iron," by B. D. Fuller, Westinghouse Electric & Mfg. Co., Cleveland.

"Steel," by William Gilmore, Hubbard Steel Foundry Co., East Chicago, Ill.

"Malleable Iron," by A. M. Fulton, Fort Pitt Malleable Iron Co., Pittsburgh.

"Non-Ferrous Metals," by R. R. Clarke, Pennsylvania Railroad Co., Pittsburgh.

"The Significance of the Fire Waste," by Franklin H. Wentworth, secretary National Fire Protective Association, Boston.

"Profit Sharing in the Jobbing Foundry," by C. E. Knoeppel, New York.

"What the Pratt Institute Has Done, Is Doing, and Hopes to Do, in the Training of Men for the Foundry Industry," by Samuel S. Edmands, Pratt Institute, Brooklyn.

"The Installation of Uniform Cost Systems by Members of Technical Societies," by Clinton H. Scovell, Clinton H. Scovell & Co., Boston.

"Report of the Committee on Foundry Costs," by B. D. Fuller, chairman, Westinghouse Electric & Mfg. Co., Cleveland.

"Report of the Committee Advisory to the U. S. Bureau of Standards," by Richard Moldenke, chairman, Watchung, N.J.

"Report of the Committtee on Safety and Sanitation," by Victor T. Noonan, chairman, Industrial Commission of Ohio, Columbus.

"Report of Representatives on the Conference Board on Training of Apprentices," by B. D. Fuller, chairman, Westinghouse Electric & Mfg. Co., Cleveland.

Gray Iron

"The Effect of Different Mixtures on the Strength of Chiller Car Wheels," by G. S. Evans, Lenoir Car Works, Lenoir City, Tenn.

"The Manufacture of Semi-Steel Castings," by David McLain, McLain's System, Milwaukee.

"The Use of By-Product Coke in Foundry Operations," by George Long, Pickands-Brown & Co., Chicago.

"How Certain Cleaning Room Problem Have Been Solved," by H. Cole Estep, The Foundry, Cleveland.

"The Use of Borings in Cupola Operations," by James A. Murphy, Hooven, Owens & Rentschler Co., Hamilton, O.

"One-third of a Century in a Gray Iron Foundry," by A. O. Backert, Penton Publishing Co., Cleveland.

"The Experimental Foundry," by H. K. Hathaway, Tabor Mfg. Co., Philadelphia.

"Report of Committee on Standard Methods for Coke Analysis," by H. E. Diller, chairman, General Electric Co., Erie, Pa.

"Report of Committee on Standard Specifications for Foundry Scrap," by G. E. Jones, chairman, Whiting Foundry Equipment Co., Harvey, Ill.

"Report of Committee on General Specifications for Gray Iron Castings," by W. P. Putnam, chairman, Detroit Testing Laboratories, Detroit.

Steel

Symposium on "Electric Furnace Practice for the Manufacture of Steel Castings," by F. T. Snyder, Snyder Electric Furnace Co., Chicago; A. B. Clarke, Buchanan Electric Steel Co., Buchanan, Mich.; John A. Crowley, John A. Crowley Co., New York.

"Making Electric Steel in the Rennerfelt Flaming Arc Furnace for Foundry Purposes," by C. H. Vom Baur, Hamilton & Hansell, New York.

"Crucible and Electric Steel Compared," by T. S. Quinn, Lebanon Steel Foundry, Lebanon, Pa.

"Converter and Electric Steel for Casting Purposes Compared," by Peter Blackwood, Monarch Steel Casting Co., Detroit.

"Manganese Steel Castings," by W. S. McKee, American Manganese Steel Co., Chicago, Ill.

"Titanium in Steel Castings," by W. A. Janssen, Bettendorf Co., Davenport, Iowa.

"Report of Committee on Steel Foundry Standards," by Dudley Shoemaker, chairman, Atlantic Steel Casting Co., Chester, Pa.

"Report of Committee on Specifications for Steel Castings," by John Howe Hall, chairman, Taylor-Wharton Iron & Steel Co., High Bridge, N.J.

"The Small Open-Hearth as a Flexible Unit for Either Large Steel Foundries or General Jobbing Shops," by Frank Carter, Milwaukee.

"The Presence of Alumina in Steel," by G. F. Comstock, Titanium Alloy Mfg. Co., Niagara Falls, N.Y.

"The Particular Application of Green Sand Molding in the Steel Foundry," by A. F. S. Blackwood, Monarch Steel Casting Co., Detroit.

"Theory and Practice of Heading and Gating Steel Castings," by Ralph H. West, West Steel Casting Co., Cleveland.

"Acid versus Basic Steel for Making Castings," by E. F. Cone, The Iron Age, New York.

"Alloy Steel Castings," by David Evans, Chicago Steel Foundry Co., Chicago.

Malleable Iron

"The Application of Malleable Iron Castings in Car Construction," by Frank J. Lanahan, Fort Pitt Malleable Iron Co., Pittsburgh.

"Commercial Side of the Malleable Iron Industry," by W. G. Kranz., National Malleable Castings Co., Cleveland.

"Report of Committee on Specifications for Malleable Iron Castings," by

Enrique Touceda, chairman, Albany, N.Y.

Papers will be presented on various subjects relating to malleable iron practice, by the following authors:

Edwin F. Leigh, Marion Malleable Iron Works, Marion, Ind.

S. H. Standish, North-Western Malleable Iron Co., Milwaukee.

G. Meehan, Ross-Meehan Foundry Co., Chattanooga, Tenn.

Enrique Touceda, Albany, N.Y.

W. A. Forbes, Rockford Malleable Iron Works, Rockford, Ill.

Entertainment and Plant Visitation

To provide for the entertainment of the visiting foundrymen and to direct them in plant visitation, local committees have been organized, the chairmen of which held their first meeting at the Hotel Statler, Cleveland, on Saturday, June 24.

F. B. Whitlock, Interstate Foundry Co., has been appointed chairman of the general directing committee, which consists of the chairmen of the other committees, as follows:

Plant Visitation—J. S. Smith, Smith Facing and Supply Co.

Entertainment — Sterling Hubbard, Rogers, Brown & Co.

Reception—Herbert Boggis, Taylor & Boggis Foundry Co.

Golf—W. B. Greene, Palmer & De Mooy Foundry Co.

Finance—J. C. Brainerd, Johnston & Jennings Co.

Ladies' Entertainment—Mrs. W. C. Sly, 13474 Lake Avenue.

An unusually complete entertainment programme is being developed, which includes the annual banquet of the American Foundrymen's Association and the American Institute of Metals, at the Hotel Statler, Thursday evening, Sept. 14. Every opportunity also will be afforded for plant visitation. Cleveland is one of the leading foundry centres of the United States, and practically all of the castings manufacturers will permit the inspection of their plants during convention week.

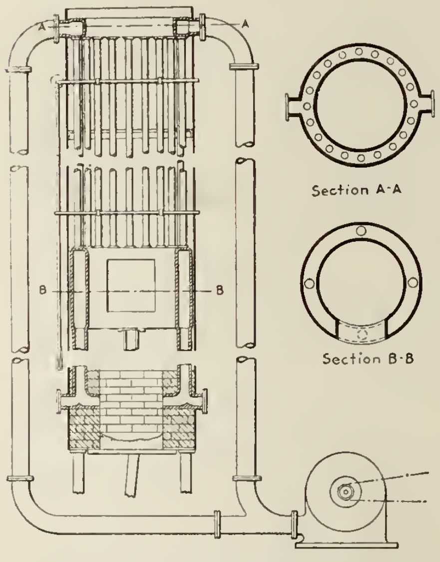
In view of the great activity prevailing in the foundry industry, making necessary the almost continuous service of every available employee, many foundry operators are planning the vacations of their plant executives for convention week. That the attendance will eclipse all previous records is indicated by the interest already manifested, and large delegations of foundrymen will travel in a body from Detroit, Pittsburgh, Chicago, Milwaukee, Buffalo and Philadelphia.

CORED CASTINGS FOR CAPSTAN LATHE WORK

IN all cases where castings have to be turned up, it is essential that the metal shall cut freely according to its class, hard or soft castings having to be made to suit varying duties, but without exception more care has to be given to work dealt with in capstan lathes, as in these the tools have to be changed as seldom as possible. Sand or siliceous matters embedded in the metal give the most trouble, and to prevent annoyances in this direction, the moulds should be faced with plumbago worked up to a fine surface with a soft brush, and cores should be coated with a wash composed of about 80 per cent. finely ground plumbago and 20 per cent. china-clay, if procurable, or some other clay free from sand in other cases. Necessarily, the cores will be in a dried condition when the wash is applied, and will be again dried before placing in the moulds. Plumbago, when properly put on, prevents the adherence of sand, and produces a softer skin to the casting. The use of it adds to the foundry expenses, but against this there is a large decrease in machining costs which more than compensates for the increase in foundry costs.

BLAST PREHEATING CUPOLA

A NEW type of cupola, in which the blast is preheated before coming in contact with the fuel, is described by J. A. Parsons in a recent issue of the Journal of the South African Institute of Engineers. The air passes through a series of tubes in the chimney of the cupola, after which it is blown through the tuyeres to the fuel. When the blast is first started, the air reaches the fuel bed only slightly warm. Within a few minutes it reaches the temperature of melting lead, and at the end of about 20 minutes it attains a temperature about one-third of that to be imparted to the iron.



ARRANGEMENT OF BLAST PREHEATING CUPOLA.

Economy in the use of coke is obtained by means of the preheater, due to the fact that only about one-half of the coke is burned to CO_2 in the neighborhood of the tuyeres, the other half being burned to CO which later burns to CO_2 in the chimney. The burning of the coke to CO generates 4320 B.t.u., and the burning of CO to CO_2 generates an additional 10,220 B.t.u. Inasmuch as this additional heat is generated after the CO has passed the iron in the cupola, its heating effect is lost. The preheater located in the chimney recovers a large portion of this heat and returns it to the cupola in the blast. The economy in coke claimed for the preheater, as the result of several months' operation, is 30 to 39 per cent., according to the duration of the cast.

It is also claimed that the quality of the metal is improved, and that the tuyeres do not clog up. The furnace can be temporarily held up, by diminishing the blast, yet the remainder of the blast comes in so hot that the melting can be reduced in proportion and without cooling the furnace unduly. This latter feature permits of great flexibility of operation. Furthermore, the capacity of the cupola is much increased. A 24-in. cupola can handle up to 2 tons of iron per hour with a 6-oz. blast. After some seven months' operation no deterioration of the preheater is noticeable. This results in a low first cost and small repair charges.

BUNDLING PRESSES FOR SCRAP METAL

THE prolonged activity in the engineering and metal industries brings with it many problems for the works engineer, not the least troublesome of which is the manipulation and disposal of the large quantity of scrap metal which so quickly accumulates. This scrap was bundled, but the old-fashioned way of hand bundling is totally inadequate to deal with the situation under the present conditions. Hydraulic power has now been found to be the most efficient and economical method of bundling the metal ready for re-melting or for handing over to the dealers.

Very successful bundling presses on the market are those made by Hollings and Guest, of Birmingham, England, who have specialized in this class of machinery. Three designs of presses are represented, one for bundling brass, copper, or aluminium; one for dealing with wrought-iron scrap and clippings; and another for briquetting swarf and borings. Since the outbreak of the war these machines have been installed by numerous munition works, metal rollers and scrap merchants, repeat orders having been received in several cases. There has also been a large demand for these presses from the French munition and ordnance works.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

PIECE WORK SYSTEMS—II.

by R. R. Clarke

IN the foundry, bases for three different system of piece-work arrangement are practicable, namely: Set day's work and proportionate increase in daily earnings for increase in output; set price per flask and set price per individual pattern.

Remunerating Increased Day Work Output

The first-named system retains features of the day-work idea. In foundries employing it moulders are usually paid so much money for so many hours' work, as for instance $3.60 for 9 hours, the management stipulating that so many, say 10 flasks or pieces, off a certain pattern constitute a 9-hour day's work. The moulder is at liberty to reduce the time in making these castings to whatever figure he is capable or to increase the number of pieces or flasks when demands in the foundry justify regardless of the number of hours falling within the prescribed figure. Following out this system moulders make what they term a day, a day and a quarter, a day and a half, etc. This system is extensively used and finds its most useful application where the larger castings are ordered in extensive quantity. It is, however, more or less limited in application, and not an entirely satisfactory universal system. In a jobbing shop where small and mixed work in erratic quantities predominates, its use presupposes more or less difficulty.

Price Per Flask

The price-per-flask system is kindred in execution to the set day's work method. It consists in fixing the price on a basis of flask dimension as for instance a flask 16 in. x 16 in. x 10 in. deep over all would pay 20 cents; 24 in. x 24 in. x 12 in., 30 cents etc.

Such a system has been tried and discarded by more than one firm. Its chief difficulty consists in the fact that it determines wages on the basis of sand handled rather than amount of castings produced. Especially is this true in the mixed work. The loss in metal melting is a feature of brass foundry operation sufficiently important to warrant that every gate be made to produce its maximum of casting output. This gate remelting loss constitutes a necessary evil in consequence of which the wide-awake foundryman will reduce this loss to a minimum by making every gate used produce its full quota of merchantable castings.

And therein is discovered a serious weakness of the price-per-flask system. Moulders will not take sufficient interest in filling the flask to its pattern capacity unless constantly watched and constant watching breeds constant trouble. We know of one foundrry where the contention arising from this feature alone became so monotonous that the system was abandoned. In the sum-total of the day's work the man's worth is the quotient arising from a division of his production into his wages regardless of sand handled and the failure of this system to take care of this feature is sufficient evidence to warrant serious consideration beore adopting it.

Price Per Individual Pattern

From these systems and their difficulties we turn to a consideration of a more congenial practice, namely, the price-per-individual-pattern method. This to our mind is the all around logical system. It consists in determining the price per casting from a consideration of its size, weight, and moulding complexities, and paying for those castings only which satisfy the reasonable demands of a close inspection. It puts the question of wages, output, and casting and gate melting loss fairly and squarely up to the man. If good, he will make good, and if not the firm will have little to regret at his departure. It is the practicability of universal application along with the incentive given the man to produce to full gate and flask capacity good, solid, castings that recommends this system to preference, it of course being understood that all opposition will be courteously yet firmly silenced.

This system, employed in a very progressive foundry known to the writer, and to the maximum of advantage is subject to the following method of control: First, the patterns, all of which are given designating numbers, are taken from their recorded placement, tagged with a service tag, and then given to the moulder who preserves the tag keeping his daily record on the back thereof. On his daily and dated service card the moulder states the number of pieces made from each pattern and computes the earnings of each, totalling the amount thus computed on the bottom of his card. He then signs his card and deposits it in the office at the end of each day.

From each days' card a daily and dated inspector's card is made, recording each man's work, and then handed to the inspector who counts and inspects the castings, placing the amount of good castings found opposite the amount the moulder claims to have made. Completing this card, the inspector shows each moulder his itemized account to acquaint him with his loss and then hands the card back to the office clerk. From the amount found, the clerk notes any and all differences between that and the amount claimed, computes the value of these differences and adjusts the service card correspondingly. In executing this method it might be well to remark that clear and concise records of all piece-work prices are kept, that the prices put on the card by the moulder are carefully checked against these records and that the computations on all cards are carefully gone over to detect and adjust any errors that may have occurred thereon. It might be of interest to remark further that the complementary systems in this foundry are so perfected that each day's work is cleaned up and taken to the shipping room by afternoon of the day following its making, thus eliminating all possibility of getting one day's work mixed up with another.

As to the qualifications of the inspector our notion is that he should be a moulder or one acquainted with the principles of the trade, thus enabling him to give just decisions on the cause of defect in castings, and to arrive at the seriousness of the defect through the auxiliary knowledge of any error in making. A heavy scale on the side or bottom of a casting when chipped off may evidence no surface defect, yet the moulder knows that sand dislodged therefrom is somewhere hidden in the casting. The quantity of dirt, the position of casting and the vicinity of clean metal demanded will be more accurately determined and mean more to the trade-knowing man than to one not acquainted therewith, howsoever bright he may otherwise be.

Originating Equitable Piece Prices

Before concluding this series of articles, I cannot refrain from submitting a few remarks, on the premises from which an equitable piece-price is derived, and we throw our sincere belief in the spotlight when we assert that none except a man thoroughly acquainted with the ins and outs and closest details of the trade along with that of the local equipment is competent to pre-judge the worth of any piece of work to the doing of which that trade applies. We are not a foe to the efficiency expert or his aim, though in all candor we deplore many methods complementary to his system. We firmly believe in a test but we believe as firmly that the stop-watch man never made a fair one, neither to the man or the firm in whose interests he operated. To the realization of such the confidence and co-operation of human nature is absolutely essential, and that time the stop watch has never ticked nor can it ever. Our idea of a fair test differs from that of a man who watches a man 10 minutes, stops his watch, counts the output, multiplies by 60 and divides the product into 300 cents to arrive at a fair piece-price, and we are satisfied that the great underlying principles of human nature, troubled and resentful thereto, establish the justice of our differing opinion.

Determining a Fair Price

We remember a test to the supervision of which we were once assigned. The object was to derive a fair price on an improved machine connected with foundry production. The idea pre-conceived by the manager was that the machine was at least a 50 per cent. all around improvement over the one it displaced. The figure capacity of the old machine was 300. Giving the workman ample time to become thoroughly acquainted with the new machine, a test was decided on. The evening before the day chosen, I examined the machine and found it in good order. On the morning of the day's test I walked over to the machine shortly before 7 a.m., called the workman to one side, and told him that the object of the day's work was to make a fair test of the reasonable capacity of the machine, that a piece adjustment would follow, that in making the test I expected no breakneck speed, and at the same time would tolerate no unreasonable delays. I closed this preamble by expressing the hope that there would be no occasion for recurring to the subject and the test was on.

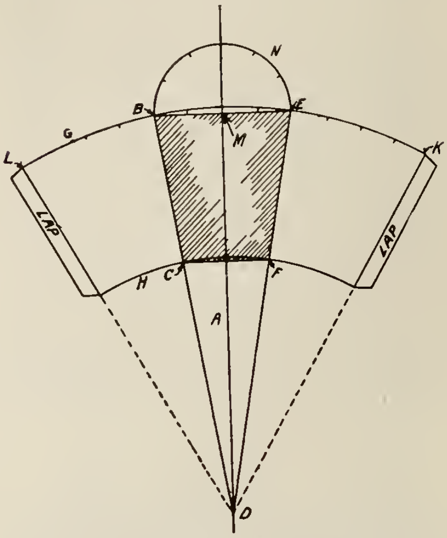
The output desired was 600. At noon the 400 mark was passed, one o'clock showed the spirit neither lacking nor lagging, and at 3 p.m. the work was done. If ever a workman practically volunteered the best that was in him, that fellow did and why? Because the "open and above board," "strictly on the square principle" appeals to human nature and brings out the best that is in it.

The aforementioned constitute the underlying principles on which most foundry piece-work systems are constructed and can be applied to the advantage of all. Fair prices, courteous firmness, just consideration and a sincere desire for mutual advantage will open the way to the system's efficiency.

A FOUNDRY LADLE STORY

By J. R. Tate

A SHORT time ago, I was traveling west, and being held up at a small town junction for a few hours, took a stroll around. Noticing the stack of a cupola, I naturally turned my course that way, so the side door being open, I walked up and stood looking into what seemed to be a blacksmith's shop. Two men were



DEVELOPING SHAPE OF SHEET FOR A FOUNDRY LADLE.

working there, one a blacksmith, and the other evidently a handy man. Taking me for a traveler, they paid little attention to me, outside of pointing to the further end of the shop, when I asked where the foundry was. Before going through, I noticed that the two men were working on a large new ladle and were also having trouble with it.

Offering Assistance

I walked on, and while standing at the foundry door, could hear the conversation of the men at the new ladle. It seemed that the foreman had gone away several days before, and had left instructions for this ladle to be made to certain measurements, and they were both about stuck on the job. The moulding shop did not interest me, so I decided to try and break in carefully on the two men. You know how it goes when a fellow comes into a foundry, all dressed and prettied up, he don't fit somehow, and I felt that I would be better fitted if my dollar shirt, etc., were replaced by my working clothes. However, sauntering back as though going out, I stopped beside the ladle over which the men were having a conference.

"Making a new ladle, boys?" I ventured. "Yes," answered the blacksmith rather shortly. "Rather a difficult thing to make too," I again ventured. "We're the ones as knows it," chirped in the helper.

"Do you know?" said I, "I helped a fellow once to make a ladle and I believe I remember how he did it, yes sir, I believe I do." Pulling out my watch, I said, as though they were old friends of mine, "I have just fifteen minutes to spare boys, now what do you say, if I just turn in and help you two fellows," at the same time reaching for a couple of cigars, which they very naturally connected up to.

"Well," said the blacksmith, "if you can tell us how to lay out a ladle that will measure up to these figures, we will certainly smoke to your health," and he started right in to smoke it, before I had a chance to make good.

Making Good on the Job

The size of the ladle required was as the sketch read 30 inches by 28 inches by 17 inches, being 30 inches deep. We figured out the correct shape as follows. incidentally we drew it out on the concrete floor of the shop. The first line was a straight one as marked A in sketch. We then drew a full-sized sketch of the ladle required, as indicated in shaded portion of cut, and placing a straight edge so that it would touch the points C and B. Next we drew a long line continuing it until it touched the former line A, as at D in cut, repeating the same method at E and F. From the point D all the other measurements were worked out. Taking a piece of string and getting the blacksmith to hold one end of it on point D, I took a piece of chalk and wound the string around it at a point which would permit the chalk to touch points B and E, then we had a large compass with which we struck a line as indicated at G, and shortening up the compass, we also struck line as at H, which line touched points C and F as in cut.

Having this much done, the next problem was to find out how long the strip of metal would have to be to form a ladle 28 inches in diameter at the upper end. Our method was as follows: taking point M as a centre we struck a line as marked N, this line really represents one-half of the upper end of the proposed ladle so, by taking a pair of dividers and stepping the half-circle off into equal parts, we had the distance it was around half of the top of the ladle. It was only necessary now to mark off the same number of spaces on each side of line A, as stepped off in cut, thus if there be six spaces to line N which represents half of the ladle, there will be twelve spaces in line G, which must reach all the way around the ladle. Having ascertained the length of the upper end of strip, a line was drawn from points K and L to the point D, after leaving enough for lap at each end of the strip.

We now had the exact shape to which the sheet must be cut, to form the ladle required. I have described the method in detail, that the laying out of any size ladle may be easily understood. First a cut of the ladle at top end of lineA, then from point D work out the rest, as we did. Your cut of ladle will always control the position of point D. Work out a small one in paper, it is good practice.

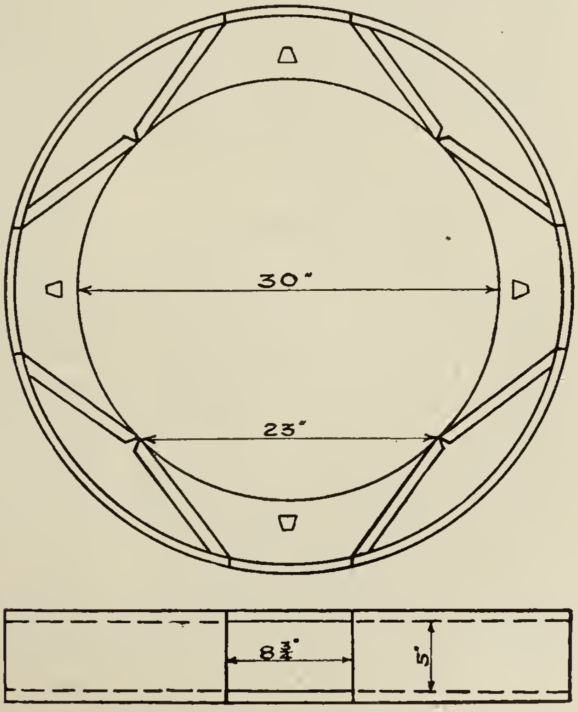
THE BOILER SHELL CUPOLA

By Jas. R. Tate

THE most successful cupola man I have yet worked with, was a man who loved his cupola. I fancy I hear and see him now. Never excited, always patient, and evidently knowing the cause of every little turn the iron took, during the heat. There was not anything peculiar about him, even his talking to the cupola. We all felt that it was the natural thing to hear John saying, "Steady, steady now," when the iron was coming rather quickly for us. Perhaps you have talked to your horse or your dog. What is there to the trooper who does not love and talk to his horse? What is there to the musician who does not love his instrument? It is a most natural condition. It is a true fingerpost to successful service, and one, without which, no man has ever been truly successful.

It is equally true with we foundrymen. We recognize the cupola as the very heart of our foundry, whether it be one with all the latest fads on it, or be just an old, homely-looking boiler shell affair, makes little difference. It is our cupola and, of course, we do not want anybody picking holes in it. Well, I am not going to find fault with yours at all. I know it is a good one, or you would not have it. Why, of course not, but I am supposing that you just think so much of it that you would like to help the old friend a little. Help her to melt iron more easily and with less effort—help her to win more praise for herself as a good melter, etc.

Taking this stand, we will figure it out as to whether or not you have been expecting too much from this old boiler shell cupola. In the first place, how much iron should you really expect to melt per heat? Conditions being right, it is possible for you to melt "properly" about 9 lbs. of iron per hour to every sq. inch there is in the area of your cupola; for instance, if your cupola is 30 in. diameter inside after bricking up, then it is possible to melt 6,354 lbs. of iron per hour, in such a cupola, providing other conditions are correct. The capacity of any cupola can be figured out in the same way as this one has been figured: Diameter of cupola 30 in. 30 $\times$ 30 = 900. 900 $\times$ .7854 = 706. 706 $\times$ 9 = 6,354 lbs. per hour.



THE BOILER SHELL CUPOLA

Correct Amount of Air

Special attention must be given to the fan or blowers required, and tuyers —they are the main requirements and must be correctly proportioned to get the best results out of any cupola. There is more taking for granted, and hit and miss about the air that is required to melt properly, than anything else in a foundry. Giving our wives credit, on the side, I do believe they know more about the drafts in their cook stoves, than some of us know about the drafts in our cupolas—at least taking it turn for turn, good pies, poor pies, good heats, poor heats. It looks that way, only we are too conceited to admit it. But, after spending much money to find out, we have learned that there is a correct amount of air required to melt iron properly. To melt one ton of iron in one hour requires 30,000 cubic feet of air. So if your cupola has a capacity of three tons per hour, it would require 90,000 cubic feet of air to complete the combustion necessary to melt this amount of iron. The 30 in. cupola mentioned would require about 95,000 cubic feet of air per hour. Therefore, without going into further detail, get a catalogue of your fan or blower and see if it is big enough or too big, running too fast or too slow, to supply the air required to give your cupola a fair chance.

The next, and equally as important condition to consider is how to deliver this air. When you want to fill a pail with water from your garden hose, you do not turn the nozzle as you would do to throw the water on the roof. Why don't you? You simply want the water dropped into the pail. You don't want it splashing around in every direction, do you? Well that is just what many of us are doing with our cupolas, only we are paying good and proper for it. We are delivering the air into the cupola under such a high pressure that it is cutting up all kinds of antics with the lining, the iron, the coke and the melting. Then we get ill-tempered and blame everything in sight and bang and hammer around hoping to hit something right somewhere, sometime. The fact is this, to melt successfully, the air must have room to get into the cupola, and all it wants to do is to get in there. It does not require forcing in at such a great rate. There is a rule which has been found to be correct. Taking this 30 in. cupola with an area of 706 square inches, the total amount of tuyer area must be one-quarter of this cupola's area, thus 706 ÷ 4 = 176½, or in other words the total tuyer area should be 176 sq. in. If you are going to have 4 tuyers, then divide the 176 by 4 which gives 44 sq. in. to each tuyer. This would require an opening of about 5 x 8¾ at the small end of each tuyer, or at the end which is next to the shell.

The tuyers should now be widened out enough to make a complete tuyer running around the inside of the cupola. The circumference of a 30 in. cupola will be about 94 in. Dividing this up into four equal parts, will give 23½ in., thus each tuyer iron will be 23 in. wide at the larger end and have an 8¾ opening at the smaller end. The tuyers of other size cupolas can be figured out by this same rule. If 5 tuyers are to be used, it is simply a matter of dividing up the quarter of the total cupola area into 5 parts, as we have here divided it for a 4-tuyer cupola.

Locating Tuyeres Vertically

In cut you will notice there are posts set into tuyers. Their only duty is to stop coke from pushing into the tuyers. Under the mentioned conditions, a cupola will be supplied with oxygen in volume and not under pressure, giving in return perfect combustion and good iron.

As for the height tuyers should be from sand bottom, that is a matter controlled by the nature of your work. Certainly the lower the tuyers are placed, the less coke is used up in building a bed, which must reach the melting zone. For the ordinary jobbing shops, 12 in. from the sand bed to the lower edge of tuyers, I have found to be the most serviceable, but should your work be of a light nature, 9 in. is plenty. It will save you much coke and give you just as good iron as would be given with the tuyers 19 in. from bed.

I do not like the word "blast" in cupola practice, it is misleading. We do not want a blast, we want the air, and what the air contains. Many and varied are the methods of conducting air from fan to cupola, but with this variation I have learned, that to cause friction, by having small pipes, many elbows and sharp turns, is detrimental to the melting qualities of any cupola. In fact the only way to give your fan and cupola a fair chance, is to have the air pipe larger than the opening at the fan. Have it two inches larger in diameter at least, and do away with as many elbows as possible. I use the words air-pipe. I hope you will think of it as such. You don't want air squirted into you under pressure, do you? Well, the cupola is just as human as you are in that respect. It just wants the oxygen in volume, but not to be crammed full like a ballon.

Provide Gates on the Air Pipe

Gates on the air pipes are good things and pay for themselves in a short time. It will naturally take less air to melt the iron at the latter part of the heat, and with a little practice, the use of these gates will become an important part of your cupola practice. It is also essential that these gates should be on the air pipes, for we often hear of an explosion having occurred in some foundry, caused by gas backing up into the air pipes when the fan was stopped. With the gates it is an easy matter to close them, and thus avoid such an accident, at such times as the fan is stopped during a heat.

The height of charging is often governed by the style of building the cupola is placed in. This is, in some cases, apparently justifiable, but if we are to get the very best out of every dollar we spend in our foundry, it will pay us to have this part as near right as some of the other more active portions. Taking this 30 in. cupola again, suppose the charging door is 60 in. from bed plate, our tuyers are 12 in. above bed, causing the melting zone to be about 30 in. above the bed plate. Here we have only 30 in. left for charging. Does it not seem reasonable that the iron last charged in this cupola, will reach the melting zone at a cooler temperature, than a cupola of the same proportions, charged to the door which is 120 in. above the bed plate? The point is, that we are getting more value out of the coke burned in the latter cupola, and are helping the cupola to melt iron more easily and quickly by depositing the iron in the melting zone heated to a higher temperature. Certainly, in the large sized cupolas this is hardly practical, as the height would be too great, but in the smaller sizes, say up to 54 in. cupola, it is well to keep the charging door three or four times as high, from the bed plate as the cupola is in diameter.

HEAT TREATMENT OF COPPER ZINC ALLOYS

By "Melter."

COPPER zinc alloys are generally considered by taking up the theoretical side of the constitution of the alloy which points, when gone into, have little practical value. It is of interest however before going further to note the effect of decreasing the percentage of copper and increasing the percentage of zinc.

Copper content per cent.	Tensile strength tons per sq. in.	Comparative malleability	Comparative hardness	Grain
79.5	15	7	15	Fine
75.0	13	10	14	Fine
66.0	12.5	3	23	Fine
49.5	9.2	12	12	Coarse

If the percentage of zinc is very low it generally will be found that the brass is full of blow holes and therefore unsatisfactory. It is not possible to work brass hot as the tensile strength becomes so low after 400° F. has been reached that the metal tears. In fact brass is so sensitive under shock at higher temperatures, say 1300° F., that if a piece be dropped, it will very likely be found to be defective. The period of annealing does not affect th structure much until 1300° F. has been reached when it has been found to greatly weaken 30-70 brass if held in the oven too long, say longer than 45 minutes.

The most important factor in annealing brass is to anneal at the lowest possible temperature to get the required elongation. Tensile strength increases with annealing temperature up to 550° F. when it falls off with gradual increases in elongation.

Effect of Annealing

If the tensile test pieces are examined when the annealing has been done at a high temperature it will be found that the surface is roughened demonstrating that the grain size is too large and that there are cleavage cracks between the crystals. Microscopic examination shows that at about 750° F. annealing temperature brass begins to have enlarged grains and at 1380° F. the size of grains is about at the maximum allowable if any commercial use is to be expected from the product. A glance at the figures showing strengths and elongations at varied annealing temperatures will confirm the above.

TEST OF 30-70 BRASS

Temperature Degrees Fahr.	Maximum Stress tons per sq. in.	Elongation in 2 in. %
...	25.0	15.5
545	28.5	20
662	26.2	30
932	18.2	54
1166	17.0	58
1256	16.5	58
1382	16.0	63
1475	15.0	59
1560	15.0	59
1650	14.0	53
1690	13.0	25

Quenching brass has been found to give very little difference except in the elongation but the results obtained do not warrant any adoption for commercial practice. Annealing then should be carried out at from 1200° F. to 1300° F. with a period of 30 minutes at that temperature and great care should be taken to heat uniformly and not to subject the brass to shock or strains at that temperature.

ARMSTRONG-WHITWORTH PLANT EXTENSION

THE Armstrong Whitworth of Canada, of which M. J. Butler, C.M.G., is managing director, and Lawrence Russell, secretary-treasurer and sales agent, have given out contracts for the doubling of their already extensive plant at Longueuil by the expenditure of three quarters of a million dollars. Mr. Butler states the present floor space of 50,000 square feet will have been increased to 100,000 square feet on completion of the contracts just given and expects that if all goes well the new unit will be roofed in by the month of September and the machinery installed a few months later.

At present all the available space is being utilized and while 250 men are now employed in the different departments, the number will in all probability be increased to 500 when the new buildings are completed and the machinery in running order. Besides the coming additions a new storehouse and office building will be erected.

The new addition will comprise a plant for the manufacture of steel tires for locomotives and passenger rolling stock as well as for the rolling of steel wheels and the manufacture of forged axles. They will likewise add a rolling mill and provide for the making of special rounds and shapes from electric smelted steel. This is the first time we understand that the manufacture of steel wheels has been undertaken in Canada, and it is being done to meet the now heavy demand for such wheels which are necessary to carry cars of seventy-five tons weight.

The contract for the steel work has been given to the Dominion Bridge Co., and the remaining work to The John Quinlan Co. In fact most of the new extension is to be done by Canadian firms, although a part of the machinery will be manufactured by the Morgan Engineering Co., of Alliance, Ohio, who are experts in all matters pertaining to rolling mills.

Mr. Butler says that the market for the company's goods has gradually expanded hence the decision regarding the further extension.

THE CRUCIBLE SITUATION

THE crucible manufacturers have been put to sore straights for the past eighteen months in the securing of their raw materials. First came the embargo on Ceylon plumbago—(this being lifted after a few months) which left the market in a depleted condition. The natural result was a tremendous advance in price. Next came the exhaustion of the foreign clay, which is used in crucible making, as a binder. The clay used, as far back as crucible history in this country goes, has come from the little principality of Klingenburg in the Black Forest in Bavaria, where, so the story goes, the entire government expenses are paid out of the export duties collected from the clays shipped out. This Klingenburg clay has for years past, been the only clay the crucible makers seemed to think they could satisfactorily use. No shipments of this clay have been made since the beginning of 1915.

Some makers have husbanded the enormous supplies of the foreign clay which they had on hand when hostilities started. This husbanding the stock of the now almost priceless raw material, has been done by partially substituting clays from various parts of the United States, and mixing with the Klingenburg clay.

The tests and trials made by the crucible makers during the past twelve months have been almost endless. When one takes into consideration that it takes from six to ten weeks to prepare a graphite crucible for service in the foundry, some slight idea can be formed of what the crucible maker has to contend with. Added to this delay, and before he can even start in on these goods that will not be marketable for two months to come, the chemists' laboratory tests and trials must be made. These have run into the thousands. Then must come the practical tests in a small way in the foundry; for the crucible maker would stare bankruptcy in the face, if he continued making up hundreds of thousands of dollars worth of goods out of Ceylon plumbago, costing from seventeen and a half to twenty-five cents per pound, only to find at the end of two or three months that they might not be of service to the user.

The bright side, however, to all this, is that in many cases the crucibles made with American clays have gone a surprisingly long time in the fires. In one case there is a report on a No. 300, which ran forty heats on manganese bronze, and dozen of cases as high as thirty-eight and forty heats on No. 100 melting car box metal. The annoyances now seem to be the ununiformity of the products secured. Crucibles made by the same potter, out of similar materials, at the same time, and burnt in the same kiln, when run by one melter on same grade of metals, rise and fall to a variation that is a shock to both user and maker.

All this will in time be rectified. As soon as the manufacturer has become more familiar with the mixing and blending of our native clays, they will no doubt be able to produce in time a crucible as satisfactory as or superior to those manufactured heretofore. The user, however, must use more care in handling the American clay crucibles. It is imperative that these crucibles be thoroughly dry and warm before going into the fire, and that they are heated up very slowly on the initial heat. Some users make a little fire with charcoal inside the crucible, and others put hot ashes in, before placing the pot in the fire, so that the crucible is hot when it goes into the fire for the first heat. There are certain advantages in heating the crucible from the inside first rather than the outside. He must be very careful in the matter of wedging, as American clays have not the same tensile strength when hot, as foreign clay.

The advance in prices of crucibles is due to the unusually high price of Ceylon plumbago in the meantime, just as with zinc, copper, aluminum, lead, etc., but as soon as the war insurances are a thing of the past, then plumbago will be at a normal figure once more, and crucibles will again be marketed at as low or lower prices than they have been for many years past.

ONTARIO BUREAU OF MINES REPORT

THE demand for nickel and copper, due to the war, has been insatiable, and the Sudbury mines have shown a capacity for meeting the requirements which could scarcely have been anticipated. Such is the statement made in the report of the Provincial Bureau of Mines for the first three months of 1916. The output of nickel and copper in the matte was fifty per cent., greater than in the first three months of 1915. If the present rate of production is maintained through the year, 1916 will see about 40,000 tons of nickel and 22,000 tons of copper turned out by the smelters in the Sudbury district, as against 34,000 tons of nickel and 19,600 tons of copper in 1915. The Canadian Copper Co. and the Mond Nickel Co. are the producers; the Alexo Mine turning out a small quantity of ore, which is sold to the Mond Co."

Cobalt oxide and nickel oxide met with a rather better demand, though the quantities exported are still below those of normal times. Metallic cobalt is coming into use principally in steel alloys, and there is now a small quantity of nickel refined in Ontario from the silver cobalt ores of the Cobalt camp. Taking the figures as a whole, there are increases in all products except iron ore.

The total value of the production for the first three months of 1916 was $14,-276,382, as compared with $9,358,210 for the corresponding period of last year. This large increase was due not only to the greater output but to the higher prices now prevailing for most of the metals.

Increase in Gold Yield

The increase in the yield of gold was 31,511 ounces, worth $656,872. Compared with the rate of production for the whole of last year the advance was less marked, but developments now under way are likely to lead to a substantial increase. Porcupine provided the bulk of the 107,818 ounces production, namely, 99,282 ounces. Hollinger led in output, followed by Dome, Acme, McIntyre-Porcupine, Porcupine Crown, Vipond, Schumacher and Dome Lake in descending order. The mines situate elsewhere making up the remainder of the yield are Tough-Oakes and Croesus. Consolidation of the Hollinger, Acme and Millerton interests, says the report, will no doubt lead to a more extensive development and a greater output from these properties.

Silver Yield

A feature of the quarter was an actual increase in the yield of silver as compared with the first three months of 1915, amounting to 67,664 ounces, from 5,230,167 to 5,297,831. In value the increase was proportionately greater, namely $462,673. This was due to the remarkable rise in the price of silver, amounting to about 50 per cent. over the average figure for 1915. A large part of this increase took place in the latter part of the quarter and afterwards, consequently the benefit of the higher prices was only partially realized during the three months

The natural effect of the advance has been to stimulate both mining and prospecting in Cobalt and to enable low-grade ores in the mines or on the dumps to be worked, which at the former low prices of silver were without value. Nipissing continues to lead in quantity of output. Townsite-City, Seneca Superior, Kerr Lake, La Rose, Coniagas, Cobalt Lake, McKinley-Darragh-Savage, Beaver, etc., follow in the order named.

The blast furnaces of the Province produced about 70 per cent. more pig iron than they did in the first quarter of 1915, and the produce was worth almost 100 per cent. more. About 15 per cent. of the iron ore charged into the furnaces was taken from deposits in Ontario, the remainder coming from the United States.

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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Technical Journal devoted to the Foundry and Metal Industries.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

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WORLD-WIDE PROGRESS FOLLOWING THE WAR

OPTIMISTS continue to lay stress on the ultimate expansion of the world's trade and to emphasize the necessity of seizing every opportunity to lay a present foundation for future operations. Some of these critics have referred to the records of historical commentators as authority for the statement that many of the world's advances in arts and industry took place during former periods of strife, the progress of England as a manufacturing nation during the Napoleonic war being one of the outstanding instances of such economic phenomena.

While it is no doubt pleasant to draw comforting analogies between the present and past wars, the wish may be father to the thought to such an extent that accuracy may be overlooked. In many ways the present world condition is entirely unparalleled by any former occurrence. In the instance referred to, England had been enabled, as a result of the unsettled state of affairs in Europe, to obtain a considerable lead in many industries, this being rendered further valuable by her overseas commerce which was then attaining considerable dimensions.

Viewed in the light of the present tumult, however, conditions then were much more favorable to making an advance over industrial competitors than now, one reason being that outside of England there were few aspirants to overseas trade, whereas at the present moment every neutral nation is straining to secure and retain much of what was formerly British business. The strides being made by Scandinavia and Holland in the motor ship industry are one example alone which causes more than passing concern, yet to those who endeavor to see further and deeper than the present trend of events, the possibility of British trade being permanently or even seriously menaced by such developments seems remote.

Latest advices from the scene of hostilities indicate that the industrial resources of the Allies have been utilized to an extent well nigh incredible. While the output of war material in Britain is vast beyond comprehension, the significance of such efforts as omens of future activity should not be lost sight of by those concerned with future happenings in the industrial world, and students of history are not altogether lacking in data wherewith to demonstrate the repetition of the past. The past eighteen months have witnessed developments in every branch of physical science which in ordinary times would have excited the wonder of the world, but at the moment receive only passing comment. Trans-Atlantic telephony, high-speed steel without the use of rare metals, the commercialization of many processes hitherto only possible for the manufacture of products of formerly limited demand, advances in the design, material, and methods of manufacture of airships and submarines, etc., stainless steel, non-ferrous alloys—these, to mention a few only, are some of the more obvious developments whose ultimate influence on industrial conditions will only begin to be felt when ploughshares and pruning hooks resume their natural and inevitable positions of importance in the structure of civilization. In former wars Britain only, advanced, in this war Britain and the world advances.

FACTORS IN OUR MUNITIONS PRODUCTION

FROM observation covering many of our munitions manufacturing plants we have been impressed with the grim earnestness and methodical application which marks each operator's activities. There seems to prevail a keen sense of the necessity for absolute fitness of the product, whether the realization have its inception because of a piecework or bonus system of remuneration in vogue; the strictness of the individual piece inspection; or the desire transcending both of these, that the product may in no respect fail of its great and ultimate purpose. Whatever be the reason, and all three suggestions are likely to be more or less contributory, it would appear that employer and employee are less widely apart in their aims and ideas than pre-war times seemed to indicate.

If there is one thing more than another that munitions production has demonstrated — we speak from what we have seen and experienced in Canadian plants, it is the absolute necessity of having departmental oversight, and that again, of course, in the hands of men, tactful, resourceful and resolute. Such men are rather less plentiful than recruits for our overseas battalions—in any case their sphere does not meantime belong there.

The success of many of our munitions manufacturing plants and the spirit actuating their humblest operator is altogether attributable to headquarters and departmental administration of the nature indicated. Although the language is admittedly figurative, we know of cases where the salary limit of departmental supervisors was given as the "sky," provided the men could be got; and in the particular instances, as is nearly always the case when the position seeks the man, success crowned the enterprise.

The smooth-running, intensified and accelerated munitions output which to-day characterizes our metal-working plants constitute perhaps the most noteworthy achievement that industrial Canada has meantime on record. Of greater importance, however, is the indication that she is out for further achievement both at home and abroad, and means to realize it.

THE FOUNDRYMEN'S CONVENTION AND EXHIBITION

THE American Foundrymen's Convention and Exhibition at Cleveland, Ohio, is little more than two months away, an interesting reminder of the fact being had from the comprehensive detail covering the double function which appears in another section of this issue. The indications are such that no progressive Canadian foundry enterprise can without very good reason fail to have representative attendance, and we think a careful perusal of the detail of good things being provided will bear out our contention.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

AMERICAN ELECTRO-PLATERS' SOCIETY CONVENTION

BELIEVING that the best interests of the American Electro-platers' Society would be served by holding the 1916 convention in the United States instead of in Toronto, the craft in the latter have decided to forego the honor this year. The convention will, therefore, be held in Cleveland, Ohio, on Thursday, Friday and Saturday July 6, 7 and 8 at the Statler Hotel. All platers interested in the progress of the electro deposition of metals, colorings or finishing are invited to attend this convention, whether members of the society or not, and those having something new or novel in the line of plated, or chemically colored metal, are especially invited to exhibit. Manufacturers are particularly requested to attend this convention so as to acquaint themselves with the motives and work of the society, and gather information relative to the improvement and development of their respective interests.

Papers dealing with the art in its various branches will be presented and discussed. The principal factories in Cleveland doing electro-plating will be visited and every hour utilized to the best possible advantage. The society is purely educational, and as such merits the fullest encouragement of its efforts. Walter S. Barrows. 628 Dovercourt Rd., Toronto, is supreme president of the American Electroplaters Society, and he will be glad to furnish further particulars to those having participation in the convention in view.

LEAD PLATING

THE substitution of lead-plated steel for zinc and nickel-plated material and phosphor bronze, copper and brass parts used where metal must be protected from corrosion caused by acid, salts and fumes has, we understand, been made possible by the development of a process for lead plating being used by the U. S. Electro Lead Plating Co., 1265 West Second Street, Cleveland, Ohio. The process was invented by J. E. Schmotzer, vice-president and manager of the company, at the plant of the Willard Storage Battery Co., Cleveland, at which he is in charge of the plating department.

The automobile has created a heavy demand for storage batteries, and the development of the new plating process resulted from efforts to reduce the cost of storage batteries by reducing the cost of plating the parts and at the same time making these parts more lasting. It is stated that the lead-plated parts now used are much cheaper than zinc or copper-plated parts and the phosphor bronze parts formerly used, and that the lead-coated metal is superior to that coated with zinc in that it will not corrode so quickly. It is also claimed that the lead coating does not crack or come off unless it is cut off.

The Willard Storage Battery Co. has equipped a large plating plant, in which the new process is used for plating gray and malleable iron castings, also steel stampings. From 15,000 to 20,000 parts are lead-plated every day, these being used for battery handles, screws, top connections and terminals. The method of electrolytic plating employed is similar to that employed in plating with zinc, nickel or copper. except that pure lead is used for plating purposes and different chemicals are used in forming the plating solution. This part of the process is secret, and a patent on it has been applied for.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.
Officers 1916-1917.
President—Wm. J. Salmon, 104 Lake Front, Kew Beach, Toronto.
Vice-President — John Acheson, 1065 Dundas Street, Toronto.
Sec.-Treasurer—Ernest Coles, P.O. Box 5, Coleman, Ontario.
Librarian — John A. Magill 591 St. Clarens Ave., Toronto.

PLACE AND DATES OF MEETING.
The Occident Hall, corner of Queen and Bathurst Streets. Fourth Thursday of each month, at 8 p.m.

A current of 2,500 amps. is supplied at 6 volts. Large parts are plated in plating tanks and the smaller parts in rotating barrels having a capacity of 100 to 150 lbs. each. The parts are left in the plating solution 20 minutes for weatherproof coating and 3 hours for acid-proof coating. After they are plated they are cleaned, similarly to other plated work, with a solution of caustic potash and acid.

Plating Parts of a Large Blower

The lead-plating work done by the U. S. Lead Plating Co. includes foundry chaplets, clips for batteries to take the place of solid copper, and various other parts. Tests are being made in plating automobile rims, which are now galvanized. An especially large piece of plating work has just been done at this plant—the lead plating of every part of a blower being installed in the pickling room of the Firestone Tire & Rubber Co., Akron, Ohio. This blower has a housing 48 by 120 in. and the blower itself is 72 in. in diameter and 33 in. wide, the blower and housing weighing 3 tons. Before plating, the housing and blower were taken apart, the various parts being afterwards assembled.

TINNED BRASS CASTINGS

BRASS castings for water meters and similar apparatus where freedom from corrosion is necessary are sometimes required to be tinned. This can easily be done unless they contain a large quantity of aluminum. The small quantity such as is often added to yellow brass to aid in running is not, however, detrimental to tinning. The castings are freed from sand by pickling in hydrofluoric acid or by tumbling (preferably the former) and dipped in an acid dip to brighten the surface and remove all oxide. This dip is composed of 1 gallon of oil of vitriol, 1 gallon of aqua-fortis, and 1 oz. of common salt. If the dip does not "bite" well or leave the surface clean and uniform, a little water, say a pint, is added to the 2 gallons of dip. The dip should not work so rapidly as to attack the brass strongly.

The castings are next thoroughly rinsed in cold and then in hot water, and when dried are ready for tinning. A flux, made by dissolving zinc in strong muriatic acid until no more will be taken up by the acid, is used. By this method a strong solution of chloride of zinc is obtained containing no free acid. No water should be used in it. The brass castings are dipped into the flux until completely covered and then immersed in the molten tin and allowed to remain for a short time. When withdrawn, they should be completely covered with tin and no pin holes be present.

To produce a smooth, bright surface. a second tinning is required, and this is done in another kettle of molten tin, on the top of which is a layer of tallow about half or three-quarters of an inch in thickness. The tallow serves to smooth the tin on the second dipping, and produces an even and bright coating.

COMBINATION CLEANING SOLUTIONS

By T. C. Eichstaedt

DURING the past year the plating trade has marked an advance in the matter of a cleaner copper depositing solution. I have had quite some practical experience in handling these formulae, and my results may be instructive to those who are interested. To begin, I started out with something of a prejudice concerning combination solutions. I needed proof to become favorably disposed, but now I believe such formulae are the most economical solutions that can be used in the plating room, saving labor, space and equipment. I recommend them to all. Those who have not the time to make their own experiments will find my conclusions work out in pratice.

The Proctor Combination

Solution No. 1, known as C. H. Proctor's combination copper-electric cleaning solution, is made up as follows:

Water	1 gal.
Caustic soda, 98 per cent.	8 oz.
Soda ash, 50-75 per cent.	8 oz.
Sodium silicate	2 oz.
Copper cyanide (70% copper)	1 oz.
Sodium cyanide, 129 per cent.	1 oz.

I have worked this solution in a tank of 350 gals. capacity, observed its action, and find it very successful, after working it hard day after day continuously. I connected the tank with the positive rod and a work rod with the negative. Having a double-throw jackknife switch, I filled the rod to capacity of one work rod of the regular plating tank, throwing in the switch on the reverse current 10 seconds, then the direct for one minute. I found that the work was cleaned as thoroughly as any electric cleaner could do it; a good, even, bright deposit of copper resulting, and being suitable as a strike or even as protection against rust.

After trying the same solution for a heavy copper deposit, I learned that with 15 minutes deposit I could cut down the work on a 14 in. buff with tripote, and color it equal to an hour's deposit in a regular cyanide hot copper bath. The solution has proved satisfactory in all respects, except in the matter of the fumes. They are very unpleasant. The solution attacks the hands and any exposed flesh parts, so a hood or ventilator should be used, as well as rubber gloves. Its cost is .0642 cents per gallon. I cleaned 450 head and foot ends of beds that had a Vernis Martin finish, taking off the varnish and lacquer and bronze, coating with a good protection coat of copper, all in two minutes to a bed end, and not seeming to hurt the solution for other work.

The Lovering Combination

Solution No. 2 is known as E. D. Lovering's cleaning-coppering combination. I have been in close touch with Mr. Lovering for six months, both of us being in the same establishment, and while I have not used the solution, I believe in all the claims made for it. The cost, however, is high compared with the solutions I have used. It is 20 cents a gallon. The solution is made up as follows:

Lye (Banner brand)	8 oz.
Carbonate of copper	2 oz.
Carb. ammonia	4 oz.
Potassium cyanide	4 oz.
Carb. zinc	2 oz.
Water	1 gal.

It must throw off very bad fumes judged by this formula.

The Walsh Combination

Solution No. 3 is credited to Mr. Walsh, who uses it every day at the Presto-Lite Works with much sucess. I used it during 1914 and found it very good. I gave it up because the class of work (auto parts) needed heavy copper, etc. The fumes of the solution were very strong. It is made up as follows:

Sodium cyanide, 98 per cent.	8 oz.
Caustic soda	2 oz.

No copper carbonate was used, the solution being saturated with copper by hanging anodes on the tank and connecting direct to a work piece of long sheet steel hung on the work rod, and the current turned on until the sheet was copper-coated. This saturated the solution with copper from the anodes. Results good, but cost comparatively high. It is .1028 cents the gallon.

Solution No. 4 is the cheapest to work and is less disagreeable in the matter of fumes, and inconvenience to the person of the operator. It requires little attention and is as successful as any. It is thus made up:

Wyandotte metal cleaner	5 oz.
Copper cyanide, 70 per cent.	1 oz.
Sodium cyanide, 129 per cent.	1 oz.
Water	1 gal.

Used same as solution No. 1. The cost is nominal, being only .0547 cents per gallon.—Am. El.-Chem. Socy.

Adjustable Bench Heights.—Production may be facilitated by having a bench the height of which may be adjusted. In the cleaning room the output of the grinders is increased many per cent. by providing them with stands which can be raised or lowered at will. The lowest level enables the castings to be tipped on and off easily, while the higher levels bring pieces up to a point best suited to the height for working of the individual grinder. Width should be considered from the human angle. Extremely wide benches may furnish large capacity, but they entail laborious reaching; moreover, invite the use of the rear part for the storage of odds and ends.

Questions and Answers

Question.—We wish to inquire if the process of cleaning and coppering steel in one solution by means of the electric current can be, or is being carried on successfully. We have tried to do it in a crock, but do not get results which warrant the adoption of this method on a large scale. Any details regarding the process will be gratefully received by us.

Answer.—The electrolytic cleaning and coppering of metals in one solution is indeed a pronounced success. As you are no doubt aware, the ordinary cyanide copper solution has a very cleansing effect on metallic surface when the solution is operated hot. This characteristic of the cyanide copper bath is intensified by the addition of proper quantities of cleaning compounds. The proportions of chemicals to be used vary with the classes or shapes of work to be treated, but generally speaking, any copper solution which deposits uniformly over the entire surface of irregular shaped pieces and contains sufficient free cyanide to reduce the efficiency of the solution to between 50 per cent. and 60 per cent. will answer for the coppering basis. Use a cleaning compound which is as near 100 per cent soluble as possible, and the copper deposit will be both adherent and of good color. Either a heavy or thin deposit may be obtained, the same entailing much less labor and expense than the old method of separate cleaning and coppering. One of the important points to be considered in the successful operation of this solution is the use of an adequate current density to ensure a copious flow of hydrogen gas from the cathode. Specific directions as to the composition, operation and replenishment of a bath would be difficult or impractical as we have no knowledge of the class of work you intend to treat. We would advise that you continue your experiment with at least 25 gallons of solution and use an iron tank equipped with steam coils, observing usual precaution with reference to insulation of tank, and tight connections on all joints of the electric system. All scum forming on the surface of the solution must be carefully removed, and extra precautions practised regarding cleanliness.

* * *

Question.—We are preparing a "war novelty" for the Canadian market and are having much difficulty obtaining a satisfactory bronze finish. The shade we desire must be of greenish tone and of high class appearance. We would prefer the corrosion method if the cost of same is reasonable. May we ask you to lend us assistance with a reliable formula.

Answer.—The term "war novelty" causes us to doubt the economy of using the corrosion method. Naturally this method is much more expensive and slower than other methods, and for many purposes the quicker, cheaper processes are equally as good, yielding as they do highly decorative and durable results. The best corrosive solution for your purpose of which we are aware is composed of copper sulphate, 10 oz.; ammonium chloride, 8 oz.; sodium chloride, 4 oz.; acetic acid, 2 oz.; zinc chloride, 1 oz.; glycerine, 1 oz.; water 1 gal.

The article to be treated must be previously heavily coppered and the bronze solution used hot. Dip the article in and remove after a few seconds then allow to drain afterwards, dry in moist atmosphere and finally brush to required finish and lacquer or wax. By arranging cabinets of suitable size in which to slowly dry a considerable quantity of the pieces, and by using spraying machine for lacquering, the cost of operation would be materially lessened. We would also call attention to the fact that very beautiful and durable bronze finishes of every possible shade are now being produced by means of colored celluloid lacquers. This method dispenses with the heavy coppering necessary in the corrosion method. Any reliable lacquer house will cheerfully lend you assistance in getting the correct finish, and we firmly believe you will be able to produce results highly satisfactory to your customers. If the metal is non-ferrous, the plating operation could be entirely dispensed with. This in itself is a point well worth your consideration at the present time.

* * *

Question.—I wish to inquire if your correspondent has any knoledge of automatic polishing machines, and what his opinion is regarding these machines for practical purposes?

Answer. — Automatic polishing machines have been made to operate successfully on pieces for which the machine was specially constructed, but as a commercial proposition for a variety of shapes, sizes, etc., the proposition has invariably failed. Nintey nine per cent. of these machines are cumbersome expensive and built on a principle which is not elastic enough to be commercially useful. There are several in the United States which the writer has seen relegated to the "dead house" and one Canadian manufacturer will dispose of his "latest and best type" at a considerable discount. Flat surfaces without sharp edges are sometimes efficiently polished on these machines, but generally speaking we advise you to dismiss the automatic polishing machine idea from your mind.

* * *

Question.—In the process of finishing small steel parts for plating we tumble the steel in a soap solution, using about 4 oz. of scrap chips to a peck of work. The finish obtained is possibly as good as the average but we believe the results would be improved if the solution were slightly more lubrifying, so to speak. The soap solution imparts a sort of stickiness to the steel when finished, and we believe this has a tendency to lessen the lustre. Having tried varying quantities of soap chips per batch of work and failing to obtain results desired, we now submit the problem to you for your consideration.

Answer.—To render your soap solution a better lubricant, add two ounces of soda ash or sodium carbonate to each gallon of water used in the tumbler; this will soften the water sufficiently to give the desired slippery feel to the surface of steel after tumbling, and probably will improve the lustre. A small quantity of ammonia or borax might be better adapted to your particular needs. Avoid possible danger from gas within the tumbler by having suitable vents.

* * *

Question.—How may I determine the presence of iron or manganese in nickel anodes, without a complicated analysis?

Answer.—To determine iron in nickel anodes, obtain fine drillings of the anode, using care to avoid introduction of iron during drilling process. Dissolve a pinch of the anode drillings in strong C.P. nitric acid, add a little water and boil in test tube. Black residue is graphite, which filter off. Make strongly alkaline with ammonia. The bulky brown precipitate is iron. We do not imagine you will find manganese intentionally introduced into nickel anodes at least while present prices prevail, but if you wish to make a test, dissolve a pinch of nickel drillings in nitric acid diluted with 50 per cent. distilled water. Boil off all red fumes and add a pinch of red lead (c.p.). A violet coloration indicates manganese.

* * *

Question. — How is Coslettizing of metals performed?

Answer.—Coslettizing is done by boiling iron or steel in a phosforic acid solution for several hours. The metal is then wiped without rinsing, and oiled with a thin film of boiled linseed oil.

CONCERNING ANTIMONY

ANTIMONY sulphide has long been in use by the Chinese as a coloring matter in the manufacture of pottery and in the ceramic arts. It is also largely used in making anti-friction matches, which contain about 25 per cent. on the match and 55 per cent. in the smear on the box.

Antimony is also extensively used for printing type and for anti-friction metal and bearing metals. English type metal is an alloy of antimony, lead and tin. Britannia metal consists of tin, antimony and zinc. Pewter contains tin, antimony, copper and bismuth, and anti-friction metal is usually composed of copper, antimony and tin. Antimony is employed in the manufacture of paints and colors.

Antimony white has recently come to be employed in the manufacture of enamel for household utensils, bath-tubs, etc. Japan imports large quantities of antimony from China, which is manufactured into numerous artistic articles of daily use, glove and cigarette boxes, the backs of hand-mirrors and hair brushes, cigarette and card cases, statuary, ornaments, etc. Recently the value and need of antimony in the manufacture of explosives has become well known.

BY-PRODUCT COKING OF COAL

THE great development of by-product coking of coal in Germany has assured her an uninterrupted and adequate supply of modern explosives. The value of this development may be measured by the importance of munitions in deciding the outcome of the war.

In the past the whole world has been dependent upon Germany for dye-stuffs and other substances prepared from the derivatives of coal tar. Thus both in peace and war Germany possessed a great industrial advantage over other nations.

British plants are now being established to cope with the demand for picric acid and trinitro-toluene, while the United States is also profiting by the lesson learned from the war. Before the war there was but one company in the United States producing distillation products on a large scale, while the latest statistics show that over 8,000,000 tons of coal were carbonized in by-product ovens last year, yielding over 4,800,000 gallons of benzol and 1,300,000 gallons of toluol. The full annual capacity of the benzol recovery plants now in operation and in course of construction is estimated to exceed 20,000,000 gallons.

Although Canada has the third largest reserves of coal in the world, beehive coke ovens, wasting the by-products, are still used in some sections and not a single additional by-product oven has been installed since the war. The war should teach Canada the obvious lesson that, whether for war or peace, it is criminal folly to neglect the utmost utilization of those resources which are lying latent in her bounteous supplies of bituminous coal.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey Forge, Pittsburg	$18 45
Lake Superior, charcoal, Chicago	19 25
Michigan charcoal iron	28 00
Ferro Nickel pig iron (Soo)	25 00

	Montreal	Toronto
Middlesboro No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1	27 00	24 00
Victoria, No. 2X	27 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL

Per Pound to Large Buyers.	Cents
Iron bars, base	3.25
Steel bars, base	3.25
Steel bars, 2 in. and larger, base	5.25
Small shapes, base	3.75

METALS.

Aluminum	$ .66
Antimony	.25
Cobalt 97% pure	1.50
Copper, lake	30.00
Copper, electrolptic	30.00
Copper, casting	29.50
Lead	.09
Mercury	100.00
Nickel	50.00
Silver, per oz.	.65
Tin	.50
Zinc	.16

Prices Per Lb.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal	Toronto
Copper, light	$16 00	$16 50
Copper, crucible	19 25	19 50
Copper, heavy	19 50	19 75
Copper wire	19 75	20 00
No. 1 machine, compos'n	15 00	15 00
No. 1 compos'n turnings	13 00	13 00
No. 1 wrought iron	11 75	11 75
Heavy melting steel	9 00	9 50
No. 1 machin'y cast iron	14 75	14 50
New brass clippings	14 50	14 50
New brass turnings	11 50	11 50
Heavy lead	5 50	5 50
Tea lead	5 50	5 50
Scrap zinc	11 00	11 00
Aluminum	37 00	36 00

COKE AND COAL.

Solvay foundry coke, on application	
Connellsville foundry coke	$7.02
Yough steam lump coal	....
Pittsburgh steam lump coal	4.30
Best slack	3.87

Net ton f.o.b. Toronto.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	60 00

PROOF COIL CHAIN.

1/4 inch	$9.00
5-16 inch	5.90
3/8 inch	4.95
7-16 inch	4.55
1/2 inch	4.30
9-16 inch	4.20
5/8 inch	4.10
3/4 inch	3.95
7/8 inch	3.80
1 inch	3.70

Above quotations are per 100 lbs.

MISCELLANEOUS.

Solder, guaranteed	0.29½
Babbitt metals	.11 to .60
Putty, 100-lb. drums	3.00
Red dry lead, 100-lb. kegs, p.cwt.	13.87
Glue, French medal, per lb.	0.16
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls.	0.60
Linseed oil, raw, single bbls.	0.70
Linseed oil, boiled, single bbls.	0.73
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7 00
Lead wool, per lb.	0.13
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½
Lard oil, per gal.	1.35

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$4 15	$4 00
Sheets, black, No. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 50	4 50
Canada plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized)	7 00	7 00
Queen's Head, 28, B.W.G.	7 75	7 75
Fleur-de-Lis, 28, B.W.G.	7 35	7 35
Gorbal's best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	7 00	7 00
Premier, 10¾ oz.	7 30	7 30

ELECTRIC WELD COIL CHAIN B.B.

3-16 in.	$11.70
1/4 in.	8.40
5-16 in.	7.40
3/8 in.	6.35
7-16.	6.35
1/2 in.	6.35
5/8 in.	6.35
3/4 in.	6.35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60; headers, 60; flanged unions, 55; malleable bushings, 60; nipples 72½; malleable, lipped union, 60.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy.	.35
Copper, sulphate	.22
Cobalt sulphate	.80
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130 per cent.	.42
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.35 to .38
Tin	.55 to .58
Silver, per oz.	.65 to .67
Zinc	.20 to .22

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt	1.75 to 1.90
Polishing wheels, bullneck	.90
Emery, in kegs, American	.05
Pumice, ground	.05
Emery glue	.18 to .20
Tripoli composition	.04 to .06
Crocus composition	.07 to .08
Emery composition	.09 to .10
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Toronto, Ont., July 4.—The continuance of further orders for munitions to be made in Canada has been assured by the establishing of additional credits for the Imperial Government. The total amount of the new credit will probably be over $50,000,000., the exact amount however, will be determined shortly by the Minister of Finance and a Committee of the Canadian Banker's Association.

A statement recently issued by the Department of Trade and Commerce covering the returns for May, shows a heavy increase in exports of manufactured goods. These exports in May amounted to $27,734,477 as compared with $16,121,149 in the corresponding month last year. The imports also show a substantial increase.

The sheet market is strong but quiet, and quotations are unchanged. Blue annealed sheets are in good demand and prices have an upward tendency. Advancing costs of sheet bars and labor are expected to have a stiffening influence on all grades of sheets. The continued decline in spelter has improved the situation in the galvanizing trade but prices of galvanized sheets are unchanged locally although the market is easier in the States.

Scrap

The market for old materials continues weak and dull. Quotations however are unchanged although declines are looked for in lead, zinc and brass scrap.

Metals

The downward tendency in prices of practically all metals except aluminum is the principal feature of the week, while the demand for most metals continues light there is evidence that prices are gradually working down to a more normal level. Production and consumption are now more evenly balanced and a falling off in demand will thus tend to lower prices. The position of copper is rather different from the other metals owing to the enormous war consumption and it is hardly likely that prices will decline in the same proportion as lead, spelter or antimony. After the war the industrial demand for copper will be so heavy that the possibility of any pronounced decline in prices for many months seems remote.

Copper.—The market is firmer in London but weak and dull in New York. Further price concessions have been made by second hands to attract buyers, but producers continue to hold firm. The visible supply of copper continues to decrease and it is quite possible that the Allies will be in the market for good sized tonnages in the near future. In view of the fact that producers are sold up for three or four months ahead, there appears to be little possibility of any marked decline in prices. Local Quotations are lower and nominal at 30c per pound.

Tin.—The market is weaker and unsettled due to lack of interest on the part of consumers and a big increase in stocks. It is believed in some quarters that tin is cheap when compared with other metals and that the market will recover in due course. Local quotations are lower and nominal at 46c per pound.

Spelter.—Quotations continue to decline and the whole spelter situation is unsatisfactory. Producers are lowering quotations in an effort to interest consumers but little buying has developed. Spelter has declined 1c locally and is now quoted at 15c per pound.

Lead.—The market is steady and unchanged with the "Trust" quoting 7c New York. The situation in the New York market is uncertain and indications point to a decline in prices unless the export demand is renewed. Lead is unchanged locally at 9c per pound.

Antimony.—Sellers are slowly reducing prices to get what little business is offering with the result that the market is weaker with prices lower. The local market is dull and easier at 28c per pound, quotations being entirely nominal.

Aluminum.—The situation is unchanged but the market is stronger and quotations higher at 67c per pound.

Foundry Supplies and Chemicals

The situation in the chemical markets is easier and prices have a lower tendency, yet there are few changes of importance to note. Prices are still very high, and have probably reached the top, but, on account of prevailing conditions, no marked decline is expected for some time. Copper sulphate has declined on account of increase in supplies and general improvement in the situation.

The demand for foundry supplies continues to improve, and prices are keeping firm and steady. American emery is unchanged at 5c per lb., but Turkish is higher at 12c per lb. Shellac has advanced, due to the scarcity and high cost of gums. The British Government recently placed an embargo on shipments of gums from India to prevent supplies reaching enemy countries. High ocean freight rates are also partly responsible for the increase in prices of gums. Pure white shellac is quoted at $2.40, and orange shellac at $2.15 per gallon. Higher prices on leather goods may be looked for owing to the increase in cost of hides and materials used in tanning.

DOMINION STEEL CORPORATION

THE future policy of the Dominion Steel Corporation was outlined by President Mark Workman at the annual meeting of shareholders held in Montreal on June 20. After reviewing the year's operations, Mr. Workman stated that, following a personal investigation, he was of opinion that the company's coal department was equal to any on the continent, but that in order to successfully compete in the world's steel markets, after the close of the war, improvements at the steel plants were necessary.

Remodel Blast Furnaces

Mr. Workman advocated such improvements being made from earnings. In fact, he announced that the first step in the new policy of reducing costs and securing the utmost efficiency from the steel plants had already been taken. This consisted of the remodelling of two of the oldest blast furnaces on the most approved modern lines. As the furnaces had reached the stage where reconstruction was necessary in any event, the work to be carried out would not entail a serious extra expenditure. It was his desire to carry out the same policy throughout the entire steel plant. At the present time more of this work could be started, were it not for the scarcity of labor and the high cost of raw materials. The labor situation at the plants was satisfactory, but all of the company's employees were actively engaged in production, and, therefore, not available for the work of reconstruction. Mr. Workman said that the prospect of satisfactory business throughout the current year justified the belief that the company would be able to undertake the contemplated changes in the near future.

Trade Gossip

H. S. Crowell, manager of New Burrell-Johnson Iron Co., Yarmouth, N.S., has been elected to the executive of the Canadian Manufacturers' Association.

Richard James, Power Building, Montreal, has secured the Quebec agency of E. C. Humphreys Co., Detroit, Mich., for their pig iron, metals, coke, sand, and clay products.

W. R. Gilmore, Manager of the Canadian Steel Foundries, Welland, Ont., has resigned to become vice-president and general manager of a steel Company at Benton Harbor, Mich.

WM. A. RAMBO, President — ROBERT McCOY, Sec'y and Treas.

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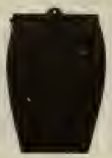
Analysis

Silicic Acid	93.49
Alumina	4.23
Ferric Oxids	0.77
Calcium Oxide	0.57
Magnesium Oxide	Present



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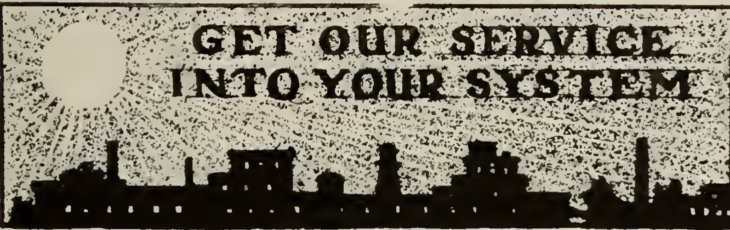

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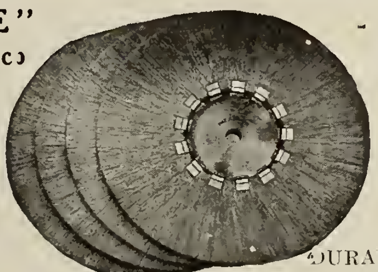

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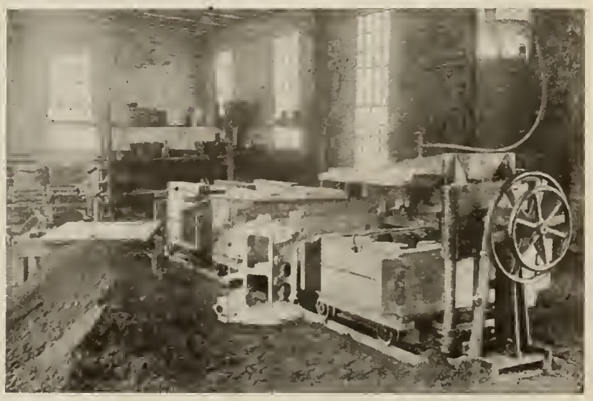

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CANADIAN FOUNDRYMAN

AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields.

Vol. VII. TORONTO, JULY, 1916 No. 7

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VOL. VII. PUBLICATION OFFICE, TORONTO, AUGUST, 1916 No. 8

The L. & A.
ELECTRIC VIBRATOR

For Match Plates, Gated Patterns, Molders' Benches or Tubs, Molding Machines

Costs Three Cents per Day to Operate.

(Figured that energy cost is 5c. kw. and that vibrator works one full minute in four.)

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The weight of the vibrator is small, (aluminum casing).

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The Publisher's Page

Who's Going to Cleveland?

THE FOUNDRYMEN'S CONVENTION will be held this year in Cleveland, September 11th to 16th. Being comparatively close to Ontario and other sections of industrial Canada, there should be a good attendance from this country.

The Program for the Foundryman's Convention will be given in a detailed way in the September issue of CANADIAN FOUNDRYMAN, and intending visitors from Canada will find this issue a valuable guide to the Convention and Exhibition and the Exhibition City.

The issue will be particularly interesting to readers generally. Advertisers will illustrate in a large way the most modern types of Foundry Equipment and Supplies; and next best to a visit to the Convention will be the careful perusal of this issue.

The Convention and Exhibition will provide a pleasant and instructive holiday outing, and we heartily recommend it to Canadian foundrymen.

If you cannot go, then the next best thing is to study our September issue carefully, especially the advertising pages.

The majority of Canadian foundries are very busy, and much equipment, especially of a labor-saving character, is being purchased. We know of no better method of becoming familiar with the very latest foundry equipment and foundry practice than by reading your foundry paper carefully and regularly.

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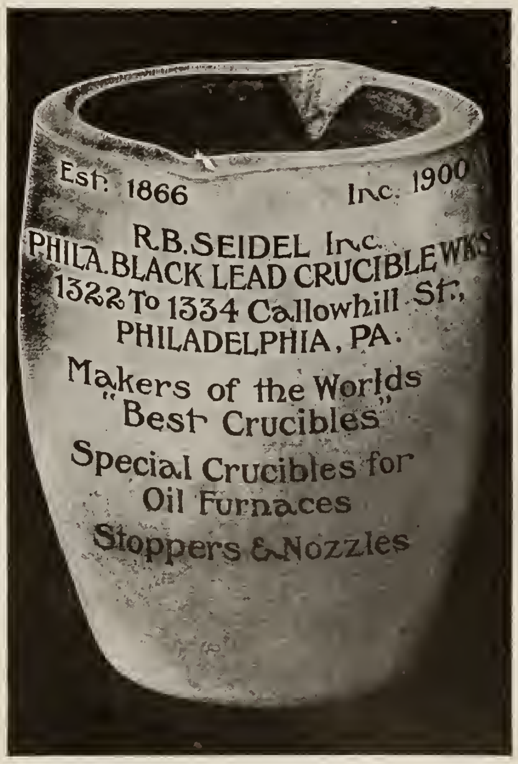

THE STANDARD IN

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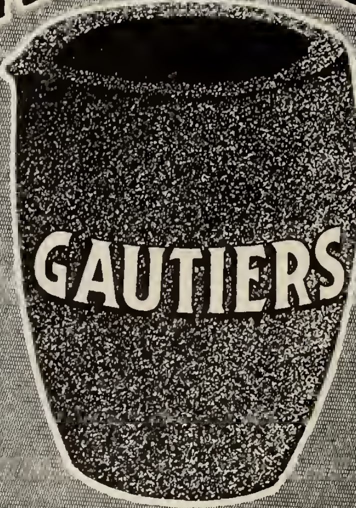

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Our booklet will show you why the "Sly" is the ideal mill for heavy continuous service, and start you on the road to

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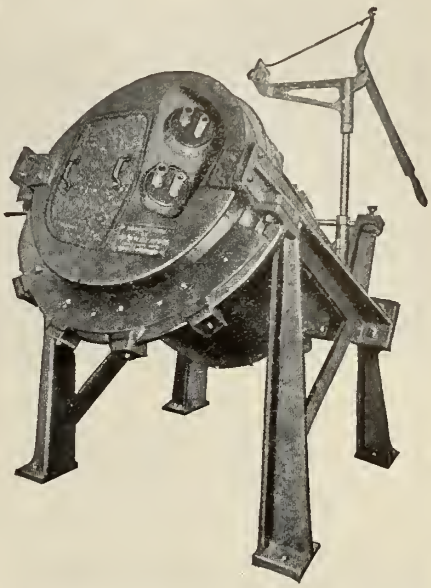

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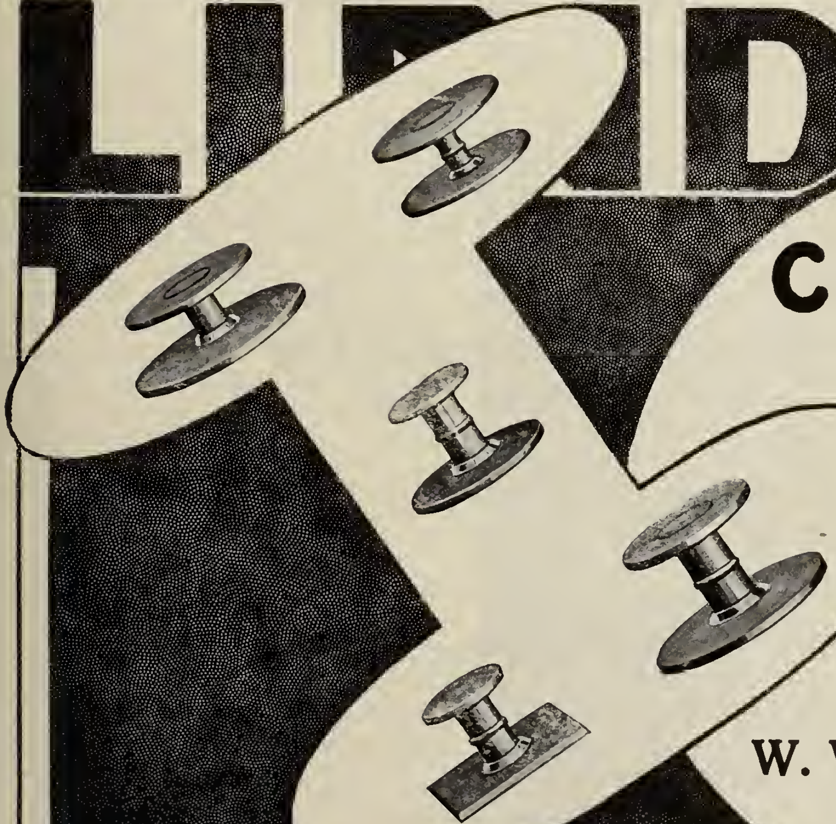

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If any advertisement interests you, tear it out now and place with letters to be answered.

The Nova Scotia Steel & Coal Co.

Wabana Nfld., Sydney Mines and New Glasgow N.S.

By The Editor

The history of "Scotia" from its inception down to the present is a fascinating one, because full of life, energy and optimistic determination. In bringing Canada's coal, iron and steel industries to their present degree of successful achievement, the Nova Scotia Steel & Coal Co., it will be observed, has at no time been lacking in prominence of contributory effort.

ORE, LIMESTONE AND COAL RESOURCES

THE Wabana mine is to all appearances one of the largest deposits of iron ore of proven value at present operated anywhere. It consists of several beds occurring in a rock basin of large area, the greatest part of which extends under Conception Bay, Nfld., but outcrops upon the north shore of Bell Island. The deposit has now been worked continuously for twenty years, the production of ore increasing gradually from year to year until 1913, when the output amounted to over one-and-a-half million tons.

Notwithstanding that all the necessary facilities for efficient mining operations have been developed and utilized, further extensive additions and equipment of the most modern type are being installed to provide not only for the comfortable maintenance of the present output but for its early substantial increase in every direction.

Ore Mined to Date

From the land areas, over 12½ million tons have been mined to date. The submarine areas have been developed by means of slopes driven 7,300 feet out under the waters of Conception Bay, and the ore has been found to be fully maintained both in quality and quantity in this territory. No conditions have so far been met to affect adversely efficient and economical mining operations.

Sufficient ore has been developed in the submarine areas alone, over three-quarters of a million tons of ore having already been extracted, to assure an annual output of one million tons from this section uninterruptedly and for very many years to come.

The situation of the deposit on a comparatively small island in the Atlantic Ocean is ideal and unique, affording as it does the choice of catering to either or both European and American Continental markets. One half million tons of ore per year are sold in the United States and Europe, the remainder of the output being shipped to the company's furnaces at Sydney Mines, N.S.

POURING 3-TON INGOTS, SYDNEY MINES.

A glance at any map of the world will serve to indicate clearly the highly strategic location of the Wabana iron mines relative to all important home and foreign markets. The mines are almost directly on the route of North Atlantic shipping. The "Scotia" Company sells some half million tons of ore each year to Canada, the United States and Europe, the balance of that mined being, as we have already seen shipped to its blast furnaces at Sydney Mines, N.S., for conversion into steel, and as such to its steel plant in New Glasgow, by rail, for conversion into finished and semi-finished steel products, which in due course find their way to practically every corner of the civilized world.

Limestone Quarries

Limestone being an important accessory in blast furnace operation, it was absolutely essential that an adequate supply be both convenient to the steel-making installation and readily available. Nature again has made bountiful provision for successfully prosecuting the manufacture of steel in this respect.

At Point Edward some nine miles distant from Sydney Mines, and connected with the main line of the Intercolonial

Railway by a branch line 2½ miles long, limestine in quantity was discovered, and following the usual survey and investigation, a property of about 250 acres in extent containing carboniferous stone in layers, high grade and uniform in quality was acquired. The product here is got by quarrying, a Lidgerwood overhead cableway with two towers and radius of 800 feet being installed in connection with the latter. The limestone is mined on the open cut system, there being little top soil to remove, and as it is brought direct to the blast furnace from the quarry in railway cars, an abundant supply at a very low cost is readily at hand for smelting purposes at the Sydney Mines plant, or elsewhere.

Coal Areas

The estimated content of the Cape Breton coal properties of the Nova Scotia Steel & Coal Co. run to over 2,500,000 tons, and in addition to ranking high as company assets are among the most important holdings of their kind in Canada. For steam, metallurgical and general purposes, the coal recovered at Sydney Mines is highly regarded, being both comparatively pure and of high calorific value.

Four different coal areas are owned, these being known as the Sydney Mines Land, Sydney Mines Submarine, Boulardarie Land, and the Outer Submarine. The first three run continuously from the north side of Sydney harbor to the south side of the Great Bras d'Or, a distance of some ten miles or thereby.

The Outer Submarine areas extend from Cape Dauphin to Cape Percy, covering the entire Cape Breton coalfield, and, within their contained 21 square miles there is believed to exist every known seam in this already well-proven Sydney Mines district.

OPEN-HEARTH FURNACES AND CHARGING MACHINE, SYDNEY MINES.

A comparatively small portion of these areas has been worked in the ninety years that mining has been carried on, operations having been confined almost entirely to the southern part of the Sydney Mines Land and Submarine Areas. Collieries have been opened in the central portion of that district only within the last four or five years, while as yet not a pound of coal had been taken from the Northern, the Boulardarie or the Outer Submarine fields.

SLAGGING BLAST FURNACE AT SYDNEY MINES.

The thickness of the coal in the various mines runs from five to six and a half feet, the dip being uniformly about eight per cent. The coal is largely mined by the bore and pillar method, but different systems of mining, pumping, haulage and ventilation are practised at the different mines to meet special or local conditions.

Since the Nova Scotia Steel & Coal Co. took over these properties much development has taken place at Sydney Mines Where, in 1900, one colliery was in operation, with an annual output of 240,000 tons, to-day five well equipped mines are producing about 900,000 tons, and during the present year a new colliery will be adding 360,000 tons to the already substantial yearly output.

At Sydney Mines there is also a modern steel plant, described later, with blast furnace and open-hearth steel capacity of about 100,000 tons per year, equipped with all the necessary coke ovens, coal washers and engineering shops. The railway system has been practically rebuilt and greatly extended, while at the shipping port of North Sydney, only three miles from the collieries and steel works, extensive docks. with the most modern facilities for coal shipping and ore receiving, have been constructed. This development has given new life to the sister towns of Sydney Mines and North Sydney, so much so that they have become two most important industrial centres.

Princess No. 1

This colliery was the only one in existence when "Scotia" took over the property from the General Mining Association in 1900. The coal cutting is done by hand. About six hundred men are employed underground, and the mine is equipped to maintain an average daily output of eight hundred tons. The surface plant is the most extensive of any of the collieries, being used as a central plant for many of the operations of Mines No. 2 and 5. Half the boilers at this plant burn waste gases from the nearby coke ovens and the remainder are fired with refuse stock from the coal washing plant, which is referred to later.

Lloyds No. 2

The capacity of this colliery is six hundred tons per day. Cutting is done by machines driven with compressed air, the power for their operation, and that of the haulage engine, etc., being furnished by the big surface plant at the Princess No. 1 Mine already noted.

Florence No. 3

This colliery is located about two miles north of the Princess, and has quite the largest output of any of the existing mines, the amount averaging nine hundred tons daily. Five hundred and fifty men are employed. Six 240 h.p. Stirling boilers supply steam for the different engines, and are equipped with forced draught fans to facilitate the burning of the fuel, which consists principally of waste from the coal washer.

Scotia No. 4

This is considered one of the most interesting mines on the Continent, not because of its size, but because of its being operated underground wholly by electricity. The cutting and handling of coal and the pumping of water is all done electrically. It is claimed to be the only colliery in Canada in which mechanical appliances are utilized to the utmost, although it does not contain a single steam or air pipe. The daily output of nine hundred tons is secured with a minimum of capital outlay and with low overhead charges.

QUEEN PIT AND ENGINE ROUND HOUSE, SYDNEY MINES.

Queen No. 5

This mine was opened up and first operated by the General Mining Association. It was one of the best producers at that time and was more familiarly known as "Queen Pit." The haulage system is now operated by electricity and its equipment is modern in every way. Its capacity is five hundred tons per day the year round.

Jubilee No. 6

This is a new mine being opened up. It will have the largest capacity of the "Scotia" group, as its output will amount to about 1,500 tons per day. The shaft which was started in 1914 is now nearly finished, and other preparations are being made for commencement of operations during the present year.

In the three latest collieries to be operated the underground haulage, or method of conveying the coal from the working places to the main haulage of the mine, is performed by small engines, driven in one colliery by electricity and in the other two collieries by compressed air. Not a single horse is employed underground in either of these three collieries (Nos. 2, 3 and 4), and no horses will be employed in the new Jubilee Colliery. This is an unusual condition of under-coal mining; either horses or ponies being used in nearly every coal mine. The adoption of electricity by "Scotia" on a large scale is the result of the thorough and satisfactory trial which has been given to this motive power. The Jubilee mine is to be operated altogether by it, both on the surface and underground.

All the coal mined from these collieries is screened as it is raised, and, of the output, 75 per cent. of merchantable coal is shipped by rail and water to the various markets, while the remaining 25 per cent. is washed and converted into coke for metallurgical purposes. The refuse from the washing plant is conveyed automatically to the colliery boilers.

GENERAL VIEW FROM OFFICE OF STEEL PLANT AT SYDNEY MINES.

Coal Washing Plant

The construction of this plant was begun in June, 1913, and completed in the autumn of 1914. The washer is of the Baum type, the general arrangement of the plant being designed by Messrs. Simon-Carves, Manchester, England. It has a washing capacity of 1,000 tons of fine coal in ten hours. In general, it consists of a reinforced concrete building elevated about eighteen feet above the yard level and supported by reinforced concrete columns. Ahead of the building and under the tracks is a large pocket into which the raw slack coal is dumped from the railway car, after having first passed over a pair of two hundred ton track scales.

Alongside of the washery building is an elevated settling tank built of reinforced concrete and designed to hold 150,000 gallons of water, the water tank being protected on the outside by a suit-

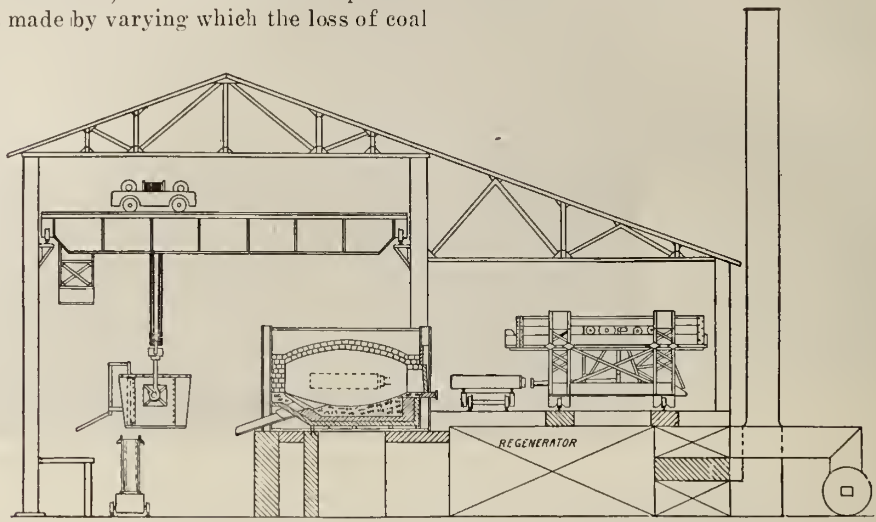
COAL WASHING PLANT AT SYDNEY MINES.

able enclosure which provides sufficient air space to prevent freezing.

In the usual operation of this plant, the raw slack coal is dumped from either of two tracks into the elevator pit, and from there the coal is fed to a bucket elevator which delivers it to the large wash box on the upper floor of the building. Here all the coal is washed, no further treatment being necessary for the larger sizes, although the smaller sizes are re-washed and passed over a system of screens. The larger sizes are delivered by a series of bunker pockets to the crushers, while the smaller sizes are passed along to another washing box and re-washed. In the process of washing, the heavy slate and dirt eventually sink to the bottom of the box and are removed automatically by a spiral convevor and elevator. This dirt is finally collected in a storage bin or is dropped through a cast iron pipe in which flows a stream of water that flushes the refuse material to the sea.

The purpose of the plant is to remove as far as possible all slate and sulphur from the coal. It is also essential to keep coal from being carried away with the refuse material. To reduce the waste to a minimum, a third or middle product is made by varying which the loss of coal becomes very slight and the quality of the washed product considerably improved.

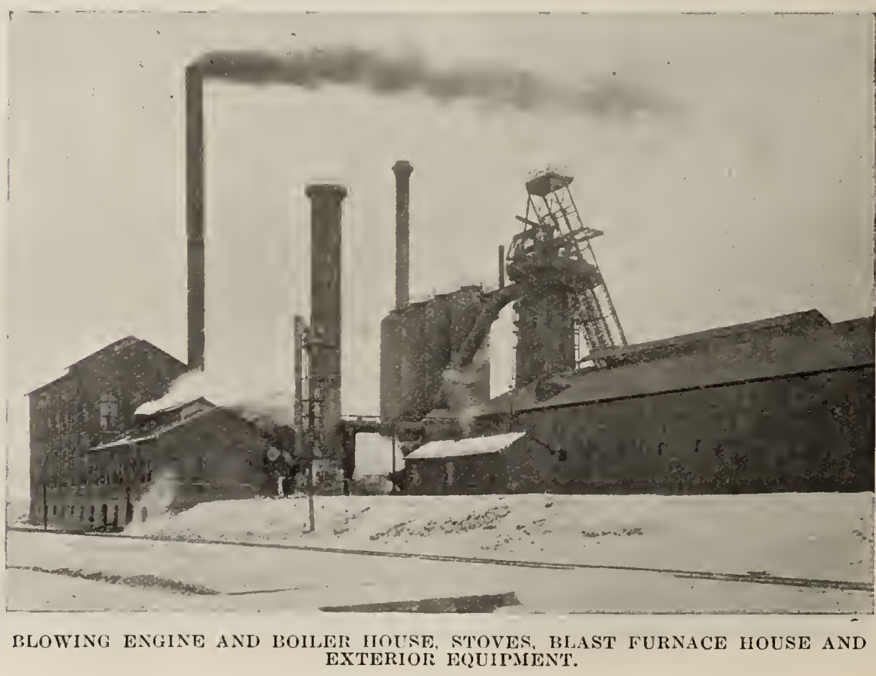
After the coal is washed, the larger sizes are divided into two grades of nut coal and may be shipped separately, or they may be again mixed and passed through a pair of rotary crushers and reduced to sizes sufficiently small for coking purposes. After passing through the crushers the coal is mixed with the fine slack and taken by a twenty-inch conveying belt to the storage tower near the coke ovens. The middle product coal, after being collected in a storage pocket, is transferred to a 16-inch belt conveyor, which carries it to the boiler-house, where it is weighed and distributed to pockets for use as fuel. The water used for washing the coal is collected in a drainage tank where it is clarified and used over again, the settlings being easily removed through a valve at the bottom.



SECTION OF TYPICAL OPEN-HEARTH FURNACE BUILDING.

Coke Ovens

The washed coal is at once conveyed into the neighboring coke ovens. These have been continuously improved and added to, so that at present they consist of 30 Bauer ovens at Princess Colliery, and 120 Bernard ovens, the total capacity of the united batteries being 300 tons of coke per day, all of which is used by the company for smelting purposes. These latter ovens are situated convenient to the blast furnace, where the coke is consumed, so that after the coke is produced there is only one handling of it, and thus much breakage and waste is avoided; an important consideration.



BLOWING ENGINE AND BOILER HOUSE, STOVES, BLAST FURNACE HOUSE AND EXTERIOR EQUIPMENT.

Coal Handling Plants

At North Sydney are situated the coal loading and ore discharging piers. There are two coal piers, high and low level. The former is 60 feet above high water, and is 1,000 feet long, including approaches. It is equipped with bins to hold 5,000 tons. Seven thousand tons have been handled over this pier in six hours.

The low level pier is thirty-four feet above high water, and has a length of 1,300 feet. This is used principally for loading small craft and for bunkering.

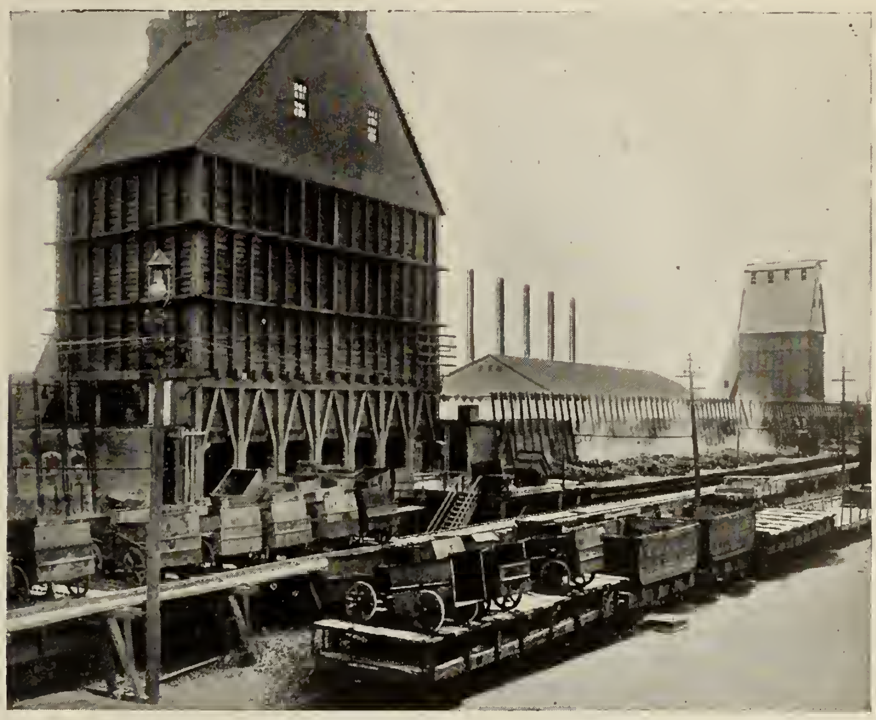
The company also possesses extensive docks at Quebec and Montreal. The Quebec plant consists of three gantry cranes situated on the Louise Basin, which discharge on the stock piles or into cars or lighters without further handling. The plant has a capacity of 3,000 tons per day.

The Montreal plant, located on Bickerdike Pier, on the tracks of the Grand Trunk Railway, consists of two quick-acting Brown hoists with a capacity of 3,000 tons per day. These hoists are particularly adapted for bunkering steamers alongside the plant, and some of the largest liners in the Canadian service have been loaded with despatch.

Traffic and Transportation

With its yearly tonnage of material handled, the transportation problem is one of much importance. In the wide range of its activities, the company has to deal with freight handling of all kinds, from the trucking of a load of logs, to shipping over a million tons of coal and ore annually.

A fleet of fifteen to twenty steamers, mostly built to the company's specifications and secured on long term charters, are engaged in this trade. They have large hatches and are built on the cantilever principle, with holds absolutely clear of all obstructions, such as beams, pillars and stanchions.



COKE OVENS SHOWING A "DRAW" IN FOREGROUND, SYDNEY MINES.

Two other steamers, the Wagama and the Wascana, each with a dead weight capacity of 8,200 tons, are built on the same principle, with large hatches and

POWER HOUSE, BLAST FURNACE, COKE OVENS, ETC., SYDNEY MINES.

clear holds. Like the Themis and Tellus, they are especially suitable for the transportation of ore and coal and for carrying railway cars and heavy machinery. Another boat built for the St. Lawrence coal trade was the Wacousta, a fine type of her class, with a dead weight capacity of 5,700 tons. She was recently torpedoed in French waters.

There is extensive railway equipment in connection with the Sydney Mines plant. The main line is eight miles long, and there are upwards of 12 miles of sidings. Direct connection is made with the Intercolonial Railway at Sydney Mines and North Sydney.

The ore-receiving pier is 42 feet above high water and 1,140 feet long. It is equipped with two Wellman-Seaver-Morgan discharging steam cranes which have an operating capacity of 5,000 tons per day, their working load being 20,000 pounds.

PRODUCING THIN METAL PANS

ACCORDING to the International Moulder's Journal, the extremely thin metal pans made by the Chinese for cooking rice with a minimum amount of fuel are cast in moulds—which are made in two parts—of well-kneaded clay by means of a potter's wheel. When dried the moulds are again placed on the wheel and coated with a very thin layer of moulder's sand, and, after being redried, the two halves are fitted together with the greatest care, since even the slightest relative displacement would spoil the casting. The next step is to bake the moulds, until they are as hard as brick, at red heat in a furnace filled with charcoal and topped by a banded fire-clay cover.

Meanwhile the iron for pouring is melted in a small crucible-like cupola furnace, so that the metal will have attained the requisite fluidity by the time the mould is at a bright red heat, whereupon the cover of the baking furnace is taken off, the metal poured into the mould, and the cover replaced for the casting and mould to cool down together, which takes about two days. The mould is then carefully taken apart, the pan detached, and the casting gate removed with a fine saw. The pan is fitted with wire handles, inserted through drilled holes, and is ready for sale. The moulds can be used for several pourings, being recoated with fine sand every time.

ZINC DEPOSITS NEAR OTTAWA

NEW and valuable deposits of Gatineau zinc have it is reported been discovered by a mining engineer, J. D. McFarlane, and a prospector, Dennis Callahan, formerly of Haileybury, in the vicinity of Burbidge station, which is about 72 miles from Ottawa. The discovery is of special interest in connection with the use of zinc in munitions manufacture.

Callahan made a discovery last fall which attracted much attention, and McFarlane was called to investigate. The deposits looked good and men have been working in the vicinity since. This spring, however, they have made what is claimed to be much more valuable discoveries north of the limestone area in which they were first prospecting. They have trenched across the ore vein at intervals of 1,400 feet, showing ore in places from six to fifteen feet. Mr. McFarlane, states that the deposits are rich, and that the mineral is much better than that found previously.

CONCERNING ALUMINIUM.

IN a recent note to the Faraday Society on the annealing of aluminium, Messrs. Seligman and Williams describe certain interesting anomalies in the behaviour of the metal. Hard-worked aluminium is more readily soluble in nitric acid than the annealed metal. On heating the hard-worked metal to 125 deg. Cent., a definite change in the rate of dissolution is brought about. A sample of the hard-worked metal which lost 56 mgr. per 100 square cm. per 24 hours in 1.42 nitric acid lost 39 mgr. when similarly exposed after being annealing for 10 hours at 125 deg. Cent. showing a decrease in the rate of dissolution of 5.3 per cent.

It was anticipated that if the heating were prolonged the decrease in the rate of dissolution might be augmented. This was not found to be the case, but, on the contrary, as the heating at 125 deg. Cent. was prolonged, the fall in the rate of dissolution diminished until samples heated for 80 hours at 125 deg. Cent. showed the same rate of dissolution as, or even a slightly higher rate of dissolution than samples which had not been heated at all. These facts do not tally completely with the observations of other workers.

BLAST FURNACE WORKING

IT is recognized that regularity and uniformity of charging methods in blast-furnace working are all important. To take a concrete case, a furnace working on phosphoric ores has a diameter of 11 ft., at the stock line; the cold charged ore, flux, and coke are, say 3 in., 1 in., and 10 in. thick, respectively. Now clearly, with mixed ores containing, say, 50 per cent. of lumps averaging 4 in. to 5 in. cubes, and 50 per cent. of fines, with limestone charged in lumps varying from fines to 4 in. cubes, it is not conceivable that the limestone can uniformly distribute itself over the mixed ore. The limestone lumps obviously fail in the gaps between the ore lumps, and when, afterwards in the descent, the limestone calcines, the fine lime is most intimately mixed with the fine portions of the ore, and the large ore lumps are very liable to be left isolated, to catch what lime they can.

As the charge descends and the limestone is calcined, the lime occupies about double its original bulk and tends to somewhat correct the above-mentioned evil, but there can be little doubt that the iron reduction begins first in the fine ore clots, in the path of the reducing gases which carry off some of the fine lime, coke and ore into the downtakes. Before the iron reduction takes place, the ore, lime, and fuel bulk has increased by about 20 per cent. owing to the increased lime bulk and the slight expansion of the ore and fuel. At the point when iron reduction begins there must be a quick contraction and by the time the top of the boshes is reached the bulk of the ore, lime and coke will probably be about 15 per cent. greater than when charged. This shrinkage during the descent through the body of the furnace aids the ascent of the gases, and would be more pronounced but for the fact that carbon deposition during the reduction of the iron helps to slightly swell the mass.

It is probable, however, that as this deposited carbon may be the means of carbonizing the reduced iron, the shrinkage will continue into the neighborhood of the boshes. Where the lumpy ore and large limestone lumps happen to fall together there may be retarded reduction and calcination, and the two may fall into the hearth before being assimilated. Generally speaking, as the lumpy ore is not reduced until lower down the furnace than the fine, the time of travel is not sufficient for complete carbonization and the resulting pig iron will be low in total carbon. Again, such a succession of accidents as are above brought about by the presence of too large lumps of ore and limestone, and the quicker travel and reduction of the fines, must tend towards slipping, causing successive "jams" in the body of the furnace. —J. E. Fletcher, in Foundry Trade Journal.

Blast Furnace for British Columbia.—A movement is on foot to establish a blast-furnace plant in British Columbia. At a recent meeting of representatives of the Vancouver Chamber of Mines and the Intermunicipal Industries Committee, and others, a resolution was passed for the employment of a staff of engineers to report in four months on the supplies of iron ores accessible to the coast, and on the feasibility of establishing a smelter for such ores on the coast. At present there is only one small Bessemer steel casting plant in British Columbia, but there are a number of copper smelters.

EDITORIAL CORRESPONDENCE

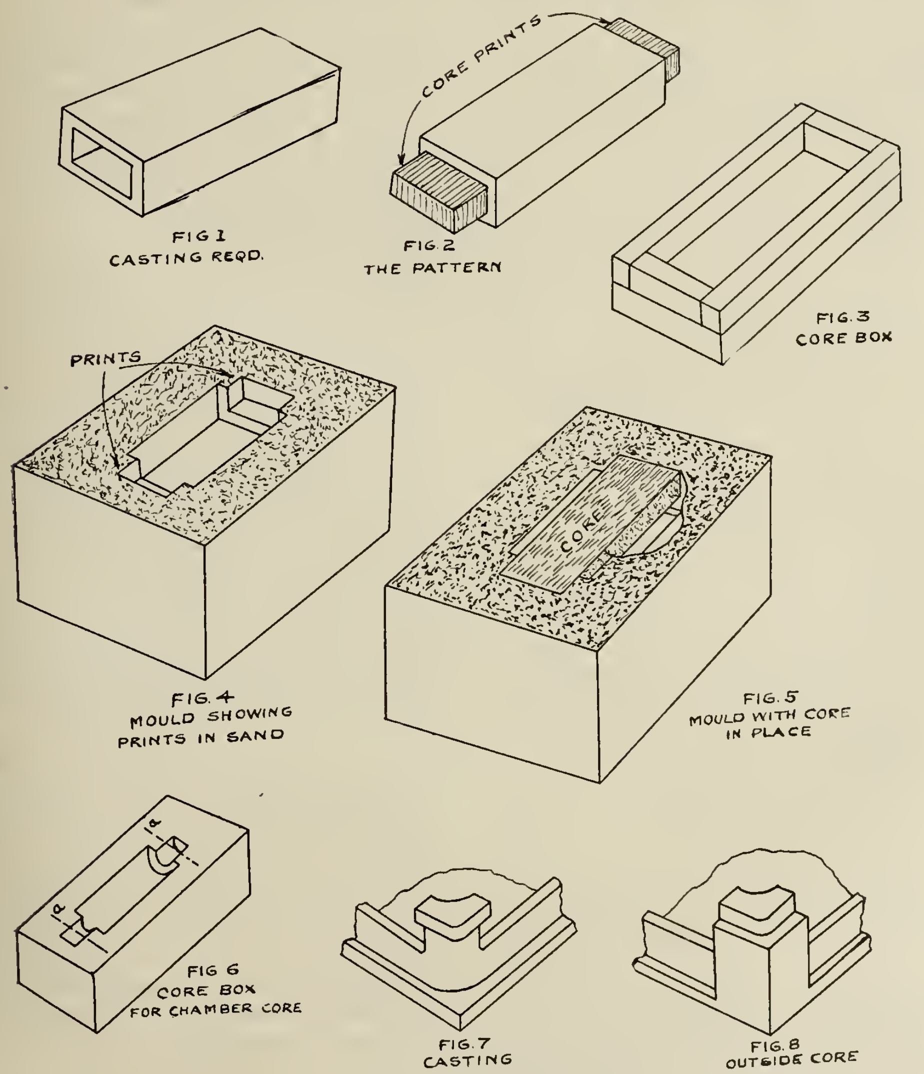
Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

FIRST PRINCIPLES IN THE USE OF CORES.

By D. A. Hampson

TO the person uninstructed in foundry practice, the subject of "cores" is shrouded in mystery—a state of mind intensified by the somewhat gruff way in which one's patterns are turned down by the foundry foreman because of lack of cores and by the reticence in volunteering any information that will enlighten.

Very little work that requires the use of castings, either iron, steel, brass or aluminum, but necessitates the use of cores as well. Fundamental principles of cored work may be acquired by a beginner with a little study; these being all anyone needs unless he is actually engaged in the mechanical trades. If the beginner has mastered the rudiments of pattern work in its relation to the foundry, he will have little trouble in understanding core work. Briefly, a pattern makes a space in the sand mould that is filled with molten metal which, cooled, becomes the casting. This casting will be (except for shrinkage and defects) of the same size and shape as the pattern and will be a solid mass of metal. Now it is evident that if some piece, say a rod, were stuck through the center of the mould before pouring and could be withdrawn after the metal had cooled, a hole would have been formed in the casting. This hole would be a "cored hole" and the rod that formed it would be a "core". All cores are but this same thing in varied and more complicated form.



ILLUSTRATING FIRST PRINCIPLES IN THE USE OF CORES.

Taking a concrete example, consider the casting, Fig. 1, that is required to have a rectangular hole through it. The pattern would be made, as Fig. 2, of the same size and shape as the casting, but solid, and at the ends where the mouth of the hole is to be, a block is added of the same cross section as that of the hole required, and of a length depending on the size of the casting—an average length might be one inch. These blocks, one at each end, are called "core prints" or just "prints".

Their function is to form a print or depression in the sand mould that will locate and support the core itself. Fig. 4 shows the depression in the mould formed by the core prints; likewise the larger space which the pattern proper has left. The other "half" of the mould contains no print, simply a depression left by the pattern beyond the surface of the prints.

Core Constitution

Cores are made of sand, flour, glue, and molasses in various proportions according to the class of work. They are shaped in a mould and baked in an oven until they are hard, after which they are ready to take their place in the sand mould. Cores are formed in a mould called a "core box" usually made of wood, the box having the size and shape of the hole in the casting plus that of the prints on the pattern. (In all that has been and will be said, it is assumed that the reader knows that due allowance has to be made for the shrinkage of metal in cooling.) The core box for the casting, Fig. 1, is shown at Fig. 3. The space formed by the rim around the under board is measured in accordance with the rules just related. It is filled with the plastic core mixture level with the top, and the box is then inverted, dumping the core out. From this latter the shop name of "dump box" is derived. Dump boxes are simple and cheap and answer very well for plain work. The core mixture, though plastic, is sufficiently stiff to retain its shape long enough to get into the oven for baking.

A mould with the core set will be seen at Fig. 5. This view shows a core in place, and incidentally how a pattern may be bulky and solid while the casting produced may be extremely light and anything but solid. The hot metal after pouring disintegrates the materials of the core, and what remains of it on the finished casting is cleared off just as is the adhering moulding sand.

Cores in Half Boxes

Cores which are symmetrical are very often made in half boxes, that is—the face of the box is the center place of the core, and the depression is one half of the core. Two half cores are made in the box and are pasted together before baking. Fig. 6 shows such a half box, and illustrates as well another important point. In this case, the casting is to have a cylindrical core through it but the diameter is to be of two sizes—small at each end and larger inside—forming an interval chamber. Such a core is called a "chamber" core. Its applications are numerous. Generally, when it is desired to have a bearing for a shaft at the two sides of a casting with a clearance space through the center—a chamber core is used. In Fig. 6, the length of the casting is from (a) to (a).

Outside Cores

An outside core is a slight digression from the fundamental idea of a core in that it produces a "hole" on the outside of a casting. The portion of a casting, Fig. 7, shown inverted, is one leg of an iron topped table that has a projecting rim around the top and a foot at the end of the leg. While there are various ways to make this, the inexperienced person would do well to use an outside core making the pattern and its print as in Fig. 8. The construction of the core box will suggest itself if the general idea of those previously described has been comprehended.

Cores are second in importance only to patterns themselves. One of the highest developments of core work may be seen in the block castings for six and eight cylinder motor car engines. Taken throughout, the subject of cores is full of interest.

UNORTHODOX PATTERNS

By J. R. Moorhouse.

IT is admitted there should be no excuse for an unworkable pattern, but there are occasions when conditions positively compel the patternmaker to pass on to the foundry patterns that are scarcely worth the name. These add considerably to the foundry costs, and result in unsatisfactory castings—a very questionable economy. Apart, however, from these, a pattern may be quite practicable and leave much for the moulder to do to complete his mould. Of such nature are the "one-off" variety of patterns; and just where the line should be drawn in regard to what should be done in the pattern-shop and what left for the foundry to do, in view of the entire cost, is of itself a controversial subject. When patterns are required for standard work, too much consideration cannot be given to saving labor in the foundry. Such patterns should be built up in the best possible manner for repetition moulding.

It is here where the patternmaker is often in a difficulty. Though expense may be no consideration, time is vital to the making of a reliable and efficient pattern. As ideas are perfected and laid out in the drawing office, there is a rush to get these going in the pattern-shop, so that some tangible result may be seen in the shops as soon as possible. The daily reminder and inquiry, how soon these are to be sent on to the foundry, is no encouragement to thoroughness, neither is it conducive to the best of relations between the foundry and pattern-shop.

Pattern-Shop and Equipment

Given adequate and up-to-date machinery, arranged to the best of advantage in a well-lighted and ventilated building, the most vital factor in getting out good work and workable patterns cheaply and quickly is ensured. Of a secondary consideration in the make-up of a pattern is the materials used; and although timber will remain the standard for most classes of work, against which no other material can possibly compete, there are occasions when plaster-of-Paris can profitably be used for the quick production of patterns, not for the saving in the price of the material, but rather because it so readily can be worked up into intricate shapes that otherwise would require considerable labor if worked out in timber.

Plaster-of-Paris in Pattern-Making

To the wood pattern-maker this necessitates what, to him, are unorthodox methods of procedure in pattern construction. The use of plaster-of-Paris in the pattern-shop, as is well known, is not new; the writer in his early apprenticeship worked plaster for patterns. It was then used for making accurate forging-tool patterns, one example being a railway carriage draw-bar hook. A model of the hook to be forged is first made in halves in wood. This is then passed by the inspector to check all sections, etc. A frame is next made to conform to the dimensions of the forge block required, and deep enough to leave ½ in. of plaster at the shadow portion covering the hook face; nails are then driven in the inside with the heads protruding well out, to form an anchor for the plaster. One half of the hook, which has previously been varnished and thinly smeared with oil, or preferably vaseline, is secured to a board, on which is placed the frame, over and in correct relation to the hook. Having made this secure, the plaster is run in and strickled flush with the frame edges. In a few moments the board can be inverted and the hook carefully withdrawn, leaving a perfect impression of the hook in the plaster pattern.

It needs no argument to show how much quicker this can be accomplished than working the hook by trial and error into a wood block. To form the top stamping block the process is very much the same, with the exception that the two halves of the hook are placed together as a means of registering the top in true relation to the bottom, so that the stampings will not be overshot, being then put back in the already half-formed plaster pattern, on which is fixed the mating frame for retaining the plaster forming the top half block. This is weighted and then run in with plaster. When set it can be carefully removed, leaving a true impression of the model. The same procedure is often followed in jobbing lines of valves and intricate inlet pipes, etc.

Strickle Work and Plaster-of-Paris

A little experience is necessary, especially on strickle work to manipulate the plaster to the best advantage, as when once it commences to set it cannot be restored without seriously impairing the strength of the pattern. The amount of plaster to use to a given quantity of water varies according to the nature and grade of the material, as also the temperature of the room in which plaster patterns are to be made. A good method is to lightly and quickly sprinkle the plaster over the whole surface of the water, until it begins to settle on the surface. This is then thoroughly mixed, preferably with the hand, until it has a creamy nature, when it can be then run off. For strickle work it may be necessary for the first coat to run it a trifle stiffer, and thinner on the finishing layer. These, however, should follow immediately, if possible, one on the other, to form a bond for the best results. Especially is this necessary on thin strickled sections, where it is found impossible to complete it at one operation.

It should he mentioned that a useful material for working along with plaster-of-Paris, and which widens the field of application for pattern construction, is plasticine, a class of modelling clay. With this material, holes or pockets can be readily formed in plaster moulds, in the same way as cores are used in the sand mould.—From a paper before the Lancashire Branch of the British Foundrymen's Association.

Ottawa, Ont.—The International Nickel Co. has authorized the incorporation of a Canadian subsidiary company, designed to construct and operate a plant for refining nickel in Canada.

Burning Blast Furnace Gas Under Boilers and Stoves*

By A. N. Diehl**

Being a discussion of ways and means whereby greater efficiency will be procurable from the use of the blast furnace gas in hot blast stoves and boilers. It is claimed that a saving of 12.3 cents per ton of iron can be made by increasing the boiler efficiency from 55 to 65 per cent. in burning that portion of the blast furnace gas not utilized in the hot blast stoves.

ABOUT 48 to 50 per cent. of the thermal value of the fuel used in the blast furnace passes from the top in the form of sensible and latent heat in the gas. Of this about 30 per cent. is used in the hot blast stove, 10 per cent. is lost, and 60 per cent. is used in the boilers and engines. The possibility of raising the boiler efficiency from 55 to 65 per cent. in burning the blast furnace gas has, the writer argues, been almost overlooked.

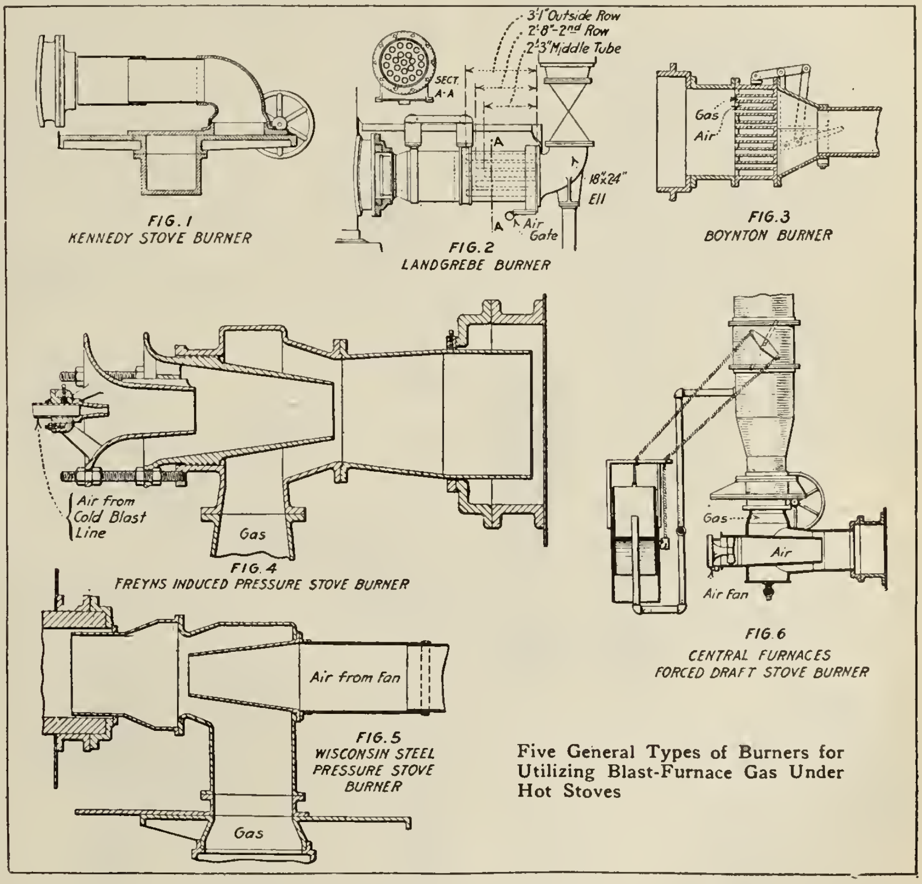
The average blast furnace gas on lake ores has approximately the following analysis by volume: CO_2, 12.5 per cent.; CO, 25.4 per cent.; H. 3.5 per cent.; nitrogen, 58.4 per cent. This gas will have a thermal value at 62 deg. Fah. and 30 in. barometer of 92 B.t.u., and contain from 30 to 35 gr. of water per cubic foot. It also contains considerable dust, which, however, can be removed by washing, the dust content being lowered from 3 gr. to approximately 0.2 gr. a cubic foot, the moisture at the same time being lowered from 30 gr. to 8 to 10 gr. per cubic foot. While washing the gas reduces its temperature 220 deg., this is counterbalanced by the gain due to the cleanliness of the heating surfaces with the washed gas and by the reduction of moisture. Equally high flame temperatures can be obtained from either clean or dirty gas, the temperatures being in the neighborhood of 2,030 deg.

Burner Performance

The performance of a burner may be determined by the observation of flame temperature, and by analysis of the products of combustion. The temperature observation cannot be used as an absolute standard of burner efficiency, and a method based on the analysis of the products of combustion must be used. A burner is put at 100 per cent. efficiency when the analysis of the products of combustion shows only carbon dioxide and nitrogen. It is suggested that the products of combustion be analyzed at a point about 2 ft. from the point of ignition. The 100 per cent. efficient burner is defined as follows: "A gas burner is operated at 100 per cent. combustion efficiency when the analysis of a sample, drawn from a point 2 ft. beyond the point of ignition, shows perfect combustion."

Under this definition the boiler efficiency does not enter into the problem, and burners may be compared with one another. The efficiency of burners varies with the load upon them, and it is desirable to develop a burner that will closely approach perfection at boiler loads of 75 to 200 per cent. of the boiler rated horse-power. The essential condition for this is a maximum flame temperature obtained by a perfect mixture of air and gas in the burner. The burners here discussed cannot be compared, however, on the basis of burner efficiency on account of insufficient data. Blast furnace gas burners may be classified under six general types.

The following points should be observed in using blast furnace gas in burners in connection with stoves: Clean gas should be used when possible. Large heating surfaces should be exposed as an aid in lowering stack temperatures. Equal draft and blast distribution over the entire checker area is essential to good practice. All gas should be consumed in the combustion chamber. The closer the complete combustion is to the burner, the better heating exchange is possible. It is best to add both gas and air at only one point—through the burner, and control them there. Gas and air have channeling tendencies when entered separately. Forced draft will facilitate flame intensity, and it acts in such a manner as to make combustion of more gas possible in the stove than under atmospheric conditions. If the stove is sufficiently large, considerable advantage can be derived by this method. It is advisable to make daily flue gas analyses and have a technical supervision of the combustion.



Five General Types of Burners for Utilizing Blast-Furnace Gas Under Hot Stoves

Types of Burners

(1)—Rectangular or circular nozzle burner with air added around it or by separate doors or both. An example of this type is the Spearman & Kennedy burner, Fig. 1. Air enters the stove through the clearance space aound the burners and through doors in other parts of the stove circumference. Gas and air mix in the combustion chamber.

(2)—Rectangular or circular burner with air conducted into the gas jet by

*From a paper before the American Iron and Steel Institute.
**Asst. Supt. Duquesne Steel Works.

means of pipe or other opening. The Landgrebe burner, Fig. 2, is of this type. Air is admitted at the back of the gas tubes, and at the ends of them meets the gas, at which point mixing takes place. A separate gas valve is placed in the pipe connection to the gas main, and suitable slides, etc., are provided for regulating admission of air into the air chamber of the burner.

(3)—Burners which sub-divide air and gas into a series of streams, but do not mix in the burners. A burner of this type, developed at the Edgar Thompson Works of the Carnegie Steel Co., consists of two concentric passages—the inner one for gas and the outer one for air. The gas and air passages contain helically twisted vanes, the twists in the two helices being in opposite directions. The vanes run the full length of the respective barrels and serve to facilitate the mixture of the gas and air as they emerge from the burner. Another example of this class of burner is the Boynton burner, in use at the Lorain Works of the National Tube Co. It is illustrated in Fig. 3. Air and gas are admitted in horizontal layers, this stratification being produced with the idea of obtaining an intimate mixture of air and gas at the point of admission.

(4)—A burner in which air is aspirated by means of an air jet at high pressure, as in a steam jet blower, the air from both sources mixing with the gas in the burner. The Freyn gas burner is of this type, and is illustrated in Fig. 4. These burners have been used on stoves of the Illinois Steel Co., South Chicago.

(5)—Burner through which all of the required air is forced and completely mixed with the gas before the ignition point. Fig. 5 illustrates a burner of this type in use on the stoves of the Wisconsin Steel Co., South Chicago. Another

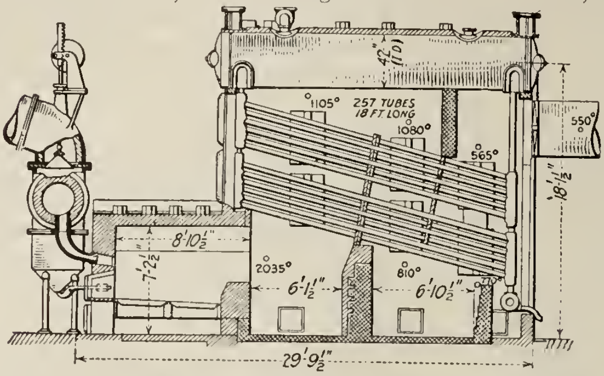
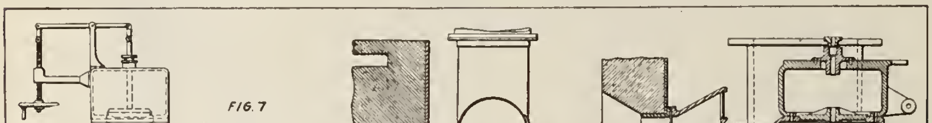


FIG. 15. 500 H.P. B. & W. BOILER AT NATIONAL TUBE CO. PLANT, McKEESPORT, PA., SHOWING 72% EFFICIENCY WITH OLD STYLE BURNER.

form of the same type is used at the American Steel & Wire Co. central furnaces, Cleveland. The burner used at the latter is illustrated in Fig. 6. Air is supplied by a 16-in. turbo-blower, which runs at a constant speed, and, therefore, furnishes the required volume of air at a given rate. A gasometer-controlled damper placed in the gas downtake insures a correspondingly constant gas volume.

(6)—Burners to which air and gas are supplied after being perfectly mixed in a fan, which draws in air on one side and gas on the other, discharging the mixture into a common outlet. This type is at present in process of development.

Boilers in operation at the present time in blast furnace plants range from 250 to 500 horse-power. They are usually equipped with feed-water heaters, but seldom with superheaters or economizers. Settings and baffles as a rule are in bad condition, and the efficiency of the average blast-furnace boiler plant could probably be increased from 5 to 10 per cent. by repair and constant upkeep of settings and baffles. The burner in general use comprises a pipe introduced into the combustion space under the boiler. The gas enters into a solid rectangle or circle, and the air in a thin layer around it. Air and gas are mixed in the combustion chamber and in the boiler flue space generally, the bulk of the work being done in the latter.



Blast-Furnace Gas Burners Applied to Steam Boilers

Controlling Gas Pressure and Quantity

The only method of controlling gas pressure and quantity is a butterfly valve placed in the supply line to the boilers. This method of control is used in order to insure the required pressure at all times at the gas cleaning plant, which is necessary so that the constant quantity of gas required by the stoves and the gas engines shall always be maintained. The variation in quantity and pressure of gas must be taken by the boilers. Pressure regulation at the boilers cannot be considered, and an amount of air proportional to the quantity of gas available must be supplied. This can be done in most equipments by means of damper regulation, in combination with sufficient air openings around the burners. Automatic damper regulation, controlled by pressure in the gas box between the butterfly valve and the burner, will probably give the best results.

Raw Gas Feature

When raw gas is used, the boiler tubes should be blown regularly. Under constant conditions, stack temperatures have shown decreases of from 50 to 100 deg. Fahr. before and after blowing. On account of the loss due to excessive air leakage through the open doors, while the tubes are being blown, the economical period of blowing is every 12 hr. After the 12-hr. interval the deposits accumulate rapidly, causing a correspondingly rapid rise in the stack temperature.

Three general types of burners are in use in connection with boilers as follows: — (1) — Rectangular or circular nozzles, with air added around them or by separate air doors, or by a combination of both. (2)—Rectangular or circular burners with air conducted into the gas jet by means of pipes or other openings, and by means of auxiliary doors through which additional air is admitted around the burner nose. (3)—Rectangular or circular burners with all the air required for combustion conducted into the gas jet by means of pipes or other openings. Type 1 is known as the common burner.

Distribution of Boiler Losses

The maximum average efficiency of a blast furnace boiler plant, using common burners and operating without the aid of technical supervision, is about 50 per cent., frequently being lower. An approximate distribution of the losses is about as follows:

Sensible heat in waste gases. 36 per cent.
CO in waste gases .... 9 per cent.
Radiation .. .. 5 per cent.

The distribution of the loss will, however, vary greatly with the load, the gas

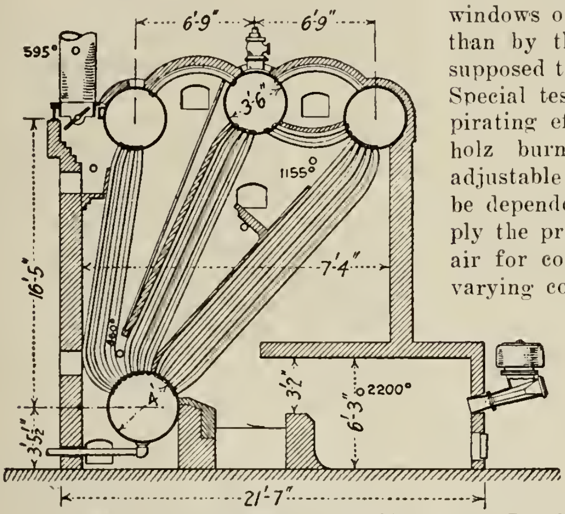


FIG. 16. GAS BURNER INSTALLATION IN 500 H.P. STIRLING BOILER, AT PITTSBURGH STEEL CO. PLANT, MONESSEN, PA.

pressure, and, as is to be expected, with the position of the stack damper.

The maximum efficiency occurs with neither a minimum sensible heat loss nor minimum CO loss, which is generally the case with high efficiency. The efficiency of 59.4 per cent. may be considered about the maximum under present conditions and equipment. It indicates that with attention to details of operation, a continuous operating efficiency of about 58 per cent. is possible at a rate of driving of 175 per cent. of rated boiler horsepower. While this is a low figure, it is probably exceeded by but few blast boiler plants. High efficiencies are possible, however, with old style burners, provided they are used in connection with large boilers, long combustion chambers, excellent conditions of setting and baffles, sufficient air supply and air regulation, together with close attention to performance.

Birkholz-Terbeck Burner

A representative form of a burner of the second class is the Birkholz-Terbeck burner, shown in Fig. 7. In this burner the primary air supply is admitted through openings in the back of the air nozzle, being aspirated by the force of the gas blowing through the burner. The primary air supply is insufficient, and a secondary supply is drawn in by furnace draft through the secondary openings around the nose of the burner.

A series of tests was made by C. J. Bacon on Stirling, Rust and Wheeler boilers to compare Birkholz burner with those of so-called simple construction. The tests were of short duration and the evaporation was measured by steam flow meters instead of by weighing the feed water. The results showed in part that it is extremely difficult to make reliable adjustments of burners when judging solely by the appearance of the flame. The best combustion is accompanied by slightly smoky appearance of the flame, as seen through the glass observation windows of the Birkholz burner, rather than by the bluish-white color usually supposed to indicate perfect combustion. Special tests demonstrated that the aspirating effect of a Birkholz burner with three adjustable air inlets could be depended upon to supply the proper amount of air for combustion under varying conditions of gas supply and regulation of stack draft.

Manual adjustment by experienced attendants is necessary to accomplish lasting improvement. While the mechanical devices of the Birkholz burner facilitate such adjustment, it will not give uniformly good results if unattended. The usual efficiency of boiler plants over long periods does not exceed 55 per cent., while the tests prove that 60 to 65 per cent. efficiency is easily obtainable if close attention is given to the physical upkeep of the boiler plant, even without additional expenditure for special types of burners. As high as 70 per cent. efficiency may be obtained from ordinary types of boilers equipped with the better class of burners, when given expert attention under favorable operating conditions. The degree of improvement in performance accompanying the use of improved burners of the Birkholz type evidently will not be so great with boilers of the Rust and Stirling types as with boilers of the single-pass arrangement such as the Cahall and Wheeler.

Special Burners of Type 2

Fig. 9 shows a burner developed at the Ohio Works of the Carnegie Steel Co. A series of tests on two 400-h.p. Stirling boilers fired with mixed raw and washed blast furnace gas indicated that the efficiency of this type of burner was about equal to that of the Birkholz burner. The McWilliams burner, shown in Fig. 10, is built on about the same principle as the burner shown in Fig. 9. The combustion is no better than in the common type of burner. Experiments showed that the draft, due to aspirating effect, increases with the gas quantity, but not in direct proportion to it. In a series of six 8-hr. tests with this burner on a 250-h.p. Babcock & Wilcox boiler, something like 49.7 per cent. was found to be about the average operating efficiency. Efficiencies ranging from 53.5 per cent. to 55 per cent. were obtained under the test conditions with the doors fastened tightly and all openings in the setting mudded up, additional air being admitted by moving back the screen around the burners.

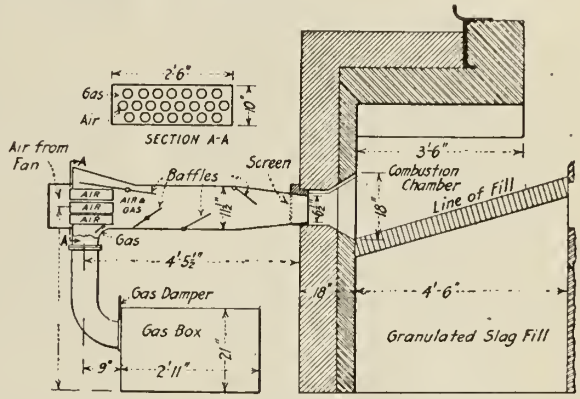


FIG. 17. POSITIVE AIR SUPPLY BURNER AT DUQUESNE WORKS.

Burners of Type 3

An aspirating burner of Type 3, made at Duquesne for experimental purposes, is shown in Fig. 11. It consists of a series of air vanes at the top and bottom of the burner, the gas jet being contracted at each vane, but each contracted area being made larger than the preceding one. When operated at the rated capacity of the boiler, 250 h.p., a burner efficiency of 92 per cent. was obtained, but, on increasing the capacity, the efficiency dropped rapidly, due to unconsumed CO. In tests with this burner on a 250-h.p. Babcock & Wilcox boiler, a boiler efficiency of 63.7 per cent. was obtained. Tests made at the same time on an adjoining boiler using the common type of burner showed a boiler efficiency in the neighborhood of 56 per cent.

The Bradshaw burner shown in Fig. 12 is supposed to follow the principle of the Venturi meter. It consists of a rectangular casting through which the gas passes, air being admitted through narrow openings top and bottom for the full width of the burner. The casting is contracted at this point, and the reduction in pressure due to the increase in velocity provides the medium for air aspiration. The casting then flares out to permit expansion from the throat of the burner into the furnace. In tests on a 500-h.p. Stirling boiler (Fig. 16) at the works of the Pittsburgh Steel Co., Monessen, Pa., the boiler efficiency over the usual working range of gas pressure averaged 65.1 per cent. The test results showed, with an increase of gas above the amount for which the original adjustments of the burner were made, a loss of 8.2 per cent. due to unconsumed CO gases, proving that air in proportion was not induced through the burner.

Two modifications of the Bradshaw burner have been made, known as Fraser burners No. 1 and No. 2. The principal difference between these modifications and the Bradshaw burner lies in taking air to the contracted portion of the gas jet inside instead of outside. In burner No. 1 the side gas passages past the air box were made too small, resulting in only a small amount of gas passing under the air box. Burner No. 2 was designed to provide ample passage for gas on the sides of the air box, which resulted in more nearly equal gas pressures at the top and bottom of the burners. The test of Frazer burner No. 2 showed an average efficiency of 65.4 per cent.

Another burner of the general type of Class 3 is the Kling-Weidlein burner, developed at the Ohio works of the Carnegie Steel Company and illustrated in Fig. 14. The gas leaves the primary nozzle at high speed and in two streams, drawing the primary air in between the gas streams. The air mixes with the inside layers of the gas streams on their way to the ignition chamber, but before the latter is reached the secondary air is brought in in two streams and mixes with the outside layers of the gas stream. The results of tests with this burner showed that within small limits of pressure variations, a burner will aspirate practically, though not exactly, the correct quantities of air. For large pressure differences, however, regulation of gas pressure or air supply would be necessary to the maintenance of maximum efficiency.

Burners With Positive Air Supply

A burner of the type in which all the air is forced into the burner and completely mixed with the gas before the ignition point is shown in Fig. 17. All the air required for combustion is supplied by a motor-driven fan. Air enters the rectangular box at the back of the burner, and after passing through the short pipes, mixes with the gas. Gas and air are thoroughly intermingled before reaching the point of ignition at the end of the burner. By careful regulation a burner efficiency of 96 per cent. was obtained. In a working arrangement of forced draft, the speed of the motor or engine driving the fan should be controlled by the gas pressure. Results of a representative test for this burner on a 250-h.p. Babcock & Wilcox boiler showed 21.9 per cent. of CO_2 in the stack gases, and 3.1 per cent. O_2, while CO was zero. The boiler efficiency in this test was 65.6 per cent.

Conclusions Regarding Boiler Practice

The most noticeable feature in the comparison of boiler tests with relation to the burners is that in the same plant nearly all of the burners compared showed very little difference in efficiency, although there may be considerable difference between particular tests in the same plant. The plant must, therefore, be considered a constant, and we must conclude that the equipment and supervision is superior in the plant showing the best results. The following general conclusions were drawn as a result of all the tests of burners in connection with boilers:

(1)—Under test conditions all types of burners appear to approximate equal results with the same equipment and management, although engineering features in some types render manipulation and control easier.

(2)—High efficiencies will prevail when the equipment is properly designed and in first-class condition.

(3)—Combustion chambers should be sufficiently large to accomplish full combustion of the gas before it passes the first row of boiler tubes. Combustion chambers should be proportioned to suit the burner conditions. In general, the size of combustion chambers should be inversely proportional to the degree of mixing in the burner.

(4)—Balanced draft control in the combustion chamber and necessary damper regulation with consequent exclusion of infiltrated air is a decided advantage.

(5)—Although a burner can be designed to aspirate the proper quantity of air at one pressure, none has yet been designed to aspirate over any very considerable range of varying gas pressures Over small ranges a number of the recently developed burners approach within practical limits the condition of sufficient air supply.

(6)—Gas pressures constantly varying within relatively wide limits render impossible the attainment of good combustion without constant regulation of the air supply.

(7)—Unless preheaters, superheaters or economizers are used, claims of boiler efficiencies of over 70 per cent. should be accepted with caution.

(8)—Constant gas analysis coupled with intelligent supervision is one of the principal factors in obtaining continuous high efficiency and control without much change in equipment.

(9)—A properly designed burner with easy means of controlling air and gas mixtures is far preferable to slip-shod methods which prevail in many plants.—Data courtesy The Iron Age.

CONTRACTION CAVITIES IN SPUR WHEEL BLANKS

THE following query appearing in a British contemporary is of more or less interest to readers of our journal, some of whom may have been up against a like trouble; on the other hand, there may be those who are prepared to suggest a solution.

I am having trouble with certain Government work which is really very simple from a moulding point of view, namely, spur-wheel blanks. The teeth of these are cut, of course, after they are turned and I find in many of them liquid contraction or gas holes at the rim where the arms join. (These are mostly of H section.) To get rid of contraction I introduced "chills," at the corners of the arms, and found that for a while I quite got over the trouble at that point, although it seemed then to move midway between the arms.

The larger wheels (some exceed 1 ton) are moulded in the floor and the arms are cored out in the usual way. The mould is made of dry sand and is dried in the floor; the smaller ones are taken to the oven and dried, cast from the hub, with four risers on the rims. The wheels generally have six arms. A feeding rod is placed in the hub, and also in the risers. The metal we use taps out at:—Carbon, 3.40; silicon, 1.9 to 2.5; sulphur, 0.6; manganese, 0.6 to 0.8; phosphorus, 0.80 to 1.2.

I have tried green sand also, but the percentage of wasters is about the same. I would be pleased to have a suggestion for a solution of the difficulty.

Protection of Iron by Enamelling.—A method of enamelling iron, consists of the following:—The metal is first pickled in hydrochloric acid to free it from foundry scale, then washed thoroughly and dried. The first coating applied is composed of 34 parts silica, 2 parts soda, and 15 parts borax, mixed in water. The metal thus coated is exposed for 10 to 15 min. in a dull red-hot retort. A second coating is then applied, consisting of 34 parts feldspar, 19 silica, 24 borax, 16 oxide of tin, 4 fluorspar, 9 soda, and 3 saltpetre. This mixture is first melted in a crucible, then ground to a fine paste in a little water and applied with a brush. The coated piece is then again subjected to white heat in a muffle. It is claimed that the enamel unites with the iron and that pipes thus enamelled have been in use for many years without deterioration.

SPELTER, ITS GRADES AND USES

By G. C. Stone.

SPELTER, like all commercial metals contains impurities, but, unlike most other metals, none of these impurities are advantageous for any of the purposes for which it is used. The effects of these impurities on different products made from it vary greatly, hence the necessity for several grades differing in purity. Spelter is used for the following purposes, in quantities in the order mentioned:—Galvanizing, alloys, rolling, ornamental castings and miscellaneous uses.

For ordinary galvanizing, the effect of the common impurities is not very great. Iron is objectionable as causing a loss in dross and in making the coating more brittle and liable to crack and peel off. Lead, up to the limit found in commercial spelter, has no serious effect, but is objectionable when present in large quantity, as it liquidates in the bath and does not enter the coating and is, therefore, wasted. Lead is usually worth less than zinc and the purchaser does not wish to pay for it at zinc prices. The four higher grades of spelter are chiefly used for alloys and the specifications are principally made for the alloy makers and do not, in all cases, call for metal suitable for some of the other purposes for which it is used.

Aluminum

In alloys, aluminum is frequently very injurious, 0.01 per cent. in many cases making brass useless for the purposes for which it is intended. In the few instances where its presence is desired, it is more satisfactory to add it directly than as a contituent of the spelter. The specifications (as proposed for the American Society for Testing Materials in 1915), therefore, require that the four higher grades of spelter shall be entirely free from aluminum.

Iron

Iron is always present in spelter, but is very undesirable in brass and similar alloys, making them harder and greatly increasing the hardness due to cold working. The increased hardness is very objectionable, causing a greater consumption of power and endangering the rolling mills and drawing presses.

Lead

Lead is very objectionable in some alloys and essential in others, and the main variation in the different grades of spelter is in the allowable amount of lead. High-grade spelter, which is used for alloys that are to be subjected to the most severe spinning and drawing operations, can be rejected if it contains over 0.07 per cent. of lead, as lead reduces the ductility of brass. Intermediate spelter, with a lead limit of 0.20 per cent. is used for alloys that do not have to undergo as severe treatment, and also very largely for alloys like manganese bronze that are used both cast and wrought.

Brass special has a lead limit of 0.60 per cent., and is mainly used for brasses where the maximum ductility is not required. The lead and iron are limited to 0.69 per cent. and 0.03 per cent. respectively, because brass made from such spelter is used for ordinary drawing, spinning and forming work where the requirements are not especially severe.

Selected spelter, carrying the maximum 0.80 per cent. of lead, and 0.04 per cent. iron, is used by brass manufacturers for making alloys to which lead is added in order to secure free cutting qualities. Material of this kind is usually made into rods and heavy sheets for the manufacturing of small articles by turning, milling and drilling operations. Such brass must contain sufficient lead to reduce the strength of the material and cause the chips to break easily.

Owing to the fact that brass is usually made in crucibles in small quantities, uniformity in the spelter is of the greatest importance. As lead segregates badly, and more markedly the higher the proportion, the lead limit of the average sample is made low enough to allow for this tendency without injurious effect on the product. Even when the brass manufacturer adds lead, he does so in known amounts and thus obtains a uniform alloy from the different pots, which would not be possible if all the lead needed were contained in the spelter.

Cadmium

There is very little doubt that cadmium in zinc is very injurious for some of the purposes for which it is used, as it renders it harder and much more brittle. There is, however, considerable difference of opinion as to how far these undesirable properties persist in alloys made from zinc containing cadmium. The majority of brass-makers are of opinion that the higher temperature of the brass pots causes so much of the cadmium to volatilize that the residual amount has very little deleterious effect.

There is no doubt that large amounts of cadmium, say 1 or 2 per cent., make brass hard and brittle. We have no reliable information at present showing the effect of small amounts of cadmium on the alloys, and the evidence on this point is extremely conflicting. Cadmium, together with lead, seems to intensify the effect of the latter and also causes the brass to become more sensitive to the effect of overheating in the various annealing operations to which the wrought material is subjected.

Very little spelter is made containing as much cadmium as is alloyed for intermediate and brass special, and the specifications, therefore, put practically no limit on cadmium except for high grade. Whatever the facts may be for alloys, it is certain that the amounts of cadmium allowed by the specifications are much greater than are permissible for other purposes for which zinc is used. The question of cadmium in the better grade is complicated by the fact that until the last year and a half practically all the high-grade and most of the intermediate spelter was made by one company from ores that are free from cadmium. The alloy makers have, therefore, had no extended experience with the effect of cadmium in the better grades of spelter, and during the last eighteen months conditions have been so abnormal that it is difficult to draw conclusions.

High Grade Spelter Uses

High-grade spelter is very extensively used for galvanizing telegraph and telephone wires which are required to stand sharp bending when making the "lineman's splice;" as it has been found that if impure spelter is used, the coating cracks and peels off the joint. The only high-grade spelter that has been used for this purpose is entirely free from cadmium. Cadmium being the element most likely to cause this trouble, it is very doubtful whether metal containing as much as is allowed by the specifications (0.05 per cent.) would be suitable for this purpose.

For rolling, cadmium causes such severe cracking that metal containing much of it is not economical; but as practically all the zinc rolling mills produce their own spelter, this matter is within their own control and the specifications do not affect them.

For ornamental castings no spelter described by the specifications would be satisfactory. The high-grade is all right as far as lead and iron are concerned, but with the maximum cadmium allowed, it would be impossible to make castings of many of the common shapes.

The foregoing was submitted as an addendum to the report of the Committee on Non-Ferrous Metals and Alloys at the meeting of the American Society for Testing Materials, Atlantic City, N.J. The author is metallurgist to the New Jersey Tire Co.

Major T. C. Irving, D. S. O., of the Moffat-Irving Steelworks, Toronto, now serving at the front with the Canadian Engineers, was married in Kent, England, recently, to Jessie, daughter of Angus Murray, of Toronto.

Beauceville, Que. — Marcoux & Porier's foundry, which was recently destroyed by fire with a loss of $12,000, will be rebuilt and new machinery installed.

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CANADIAN NICKEL AND THE "DEUTSCHLAND"

THE arrival of a German merchant submarine in an American Atlantic port has re-opened the controversy as to the export of nickel of Canadian origin. Nero fiddled while Rome burned, at least so we are told, and as if one such horrible example weren't enough even in nineteen hundred odd years of the same Christian era, we are asked to sit up and take notice of this latest and equally stupid performance. Digressing just a little more, and perhaps not so, it looks as if German vanity was badly punctured by a recent submarine ocean voyage achievement in which Canada figured to an appreciable extent.

What the Deutschland brought to the United States, and what she or her sisters may be permitted to take back from there, cut very little figure in this day of achievement and enterprise. It was only natural to expect, however, that Canada's little accomplishment in the direction already indicated would be subject for attack and that, if possible where the thrust would be most keenly felt. It was deemed only necessary to advertise the fact that nickel would constitute the major portion of the Deutschland's return voyage cargo, in order to strike us hard. It was well-known in Germany that we were not lacking in advocates of Canadian nickel being refined as well as mined within our borders, and that our nickel resources are easily the greatest in the world. Whether then the Deutschland takes back a cargo of refined nickel of Canadian origin or otherwise, the exploit has succeeded in opening the controversy concerning our nickel export.

On the subject of Canadian nickel export, we have had the most specific public assurances from British as well as Canadian Government officers, and the general disposition has been to accept such statements; their effect being that no nickel of Canadian territorial extraction does reach our meantime enemies. On the other hand, we have just as explicit assurances that our nickel is reaching the enemy, and while the leaning as to conviction may be altogether to the first named, nevertheless a horrible nightmare of uncertainty supervenes. Aside entirely from the holdful of nickel whose origin is open to question that the Deutschland will essay to land in Germany, isn't it rather a reflection on our public life that any question should arise as to the destination of Canadian mined nickel.

As we see it, the ultimate destination is somewhat hard to determine, particularly as the refining is done in a foreign country. On the other hand, were refining as well as mining purely Canadian, would we be able to control the ultimate destination? Not unless the entire sales were direct to Great Britain or her Allies. Without a doubt, Canadian nickel caters to the needs of the American domestic market, and may do more, in any case the purchase ramifications may reach as far as the hold of the Deutschland. It seems to us that unless the refined product of our nickel mines becomes a meantime monopoly purchase of Great Britain and her Allies, the openings to our enemy are many.

On the nickel refining and export questions, as on a myriad others that are ripe for action and settlement in this Dominion of Canada to-day, we have too much politics, too many politicians, and too few, if any statesmen. Until politics and politicians are displaced by statesmanship and statesmen, neither the nickel refining and export questions, nor the thousand and one other equally pressing problems, the solution of which halts Canada's progress, can be approached for settlement.

THE 1916 CANADIAN NATIONAL EXHIBITION

THE forthcoming Canadian National Exhibition gives promise of recognizing to a greater extent than has any of its predecessors the place and part that our metal-working industries fill in our national progress, and in turn reflect on our international status.

In arranging to recognize in a special manner what our metal-working plant executives and operators have, during these twenty months or more, accomplished on behalf of our Empire, the Exhibition management are to be congratulated. It goes to show that, although the machinery side of the Exhibition scheme of things has in the past been somewhat secondary in importance, if steps be taken—and the time never was more opportune, to erect a Machinery Hall commensurate with the scope of the metal-working industries and with the reputation of the Exhibition as an educative and nation-building enterprise, the myriad industries concerned—large and small, will be found ready and willing to annually tax such a building to its fullest capacity with worthy examples of craftsmanship.

The European War has opened up to us new fields of commercial endeavor, but back of commerce we must have industry, and the latter must needs have inspiration to keep it progressive. The Canadian National Exhibition as an annual institution may well provide the inspiration for our industries.

OUR FAVORABLE TRADE BALANCE

THE piling up of bank deposits in Canada continues unabated, and, as a phase of national strength, may be said to augur well for our bearing somewhat comfortably the war-imposed burdens already effective and those yet to be enacted. It must be admitted, however, that our financial strength arises largely from the widespread production of munitions by our manufacturing plants to order of Great Britain and her Allies.

Fortunately, in the most desirable sense of the term, this munitions business is only temporary; but are we acting as if it were so. We have talked of new opportunities for export trade and the capturing of former German trade which is both domestic and export, yet seem to have accomplished little in either direction. Our imports are increasing by leaps and bounds, aside from raw material requirements for munitions, and just where we will ultimately land unless we call a halt and proceed to manufacture, instead of continuing to buy "ready for service," the "gods" alone can supply the answer.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

AMERICAN ELECTRO - PLATERS' SOCIETY CONVENTION

THE fourth annual convention of the American Electro-Platers' Society was held in the Hotel Statler, Cleveland, Ohio, on July 6, 7, 8, and, as expected, proved a complete success from every viewpoint. Although the weather was almost uncomfortably warm, the attendance at each business session was excellent, the discussions following the various papers read being pointed and often brilliant. The papers presented were as a whole possibly the best which have been read before the society in convention. The paper by Fred Liscomb, on "Anodes," is especially worthy of mention, it having created much interest. Mr. Liscomb being a careful, thorough and practical electro-plater and a close observer of scientific improvements, caught the confidence of his hearers, and each experiment which he related assisted many of those present to more clearly understand the perplexing problem of efficient anode selection.

Dr. Holler, of the United States Bureau of Standards, gave a very interesting address, his presence encouraging members of the society to press on in their efforts toward more perfect plating conditions both electrically and chemically. Several large plating plants were visited, while an automobile trip through the extensive parks system of Cleveland, was much enjoyed. At the banquet which marked the closing of the convention, several non-technical papers were read, the wits present dispensing many really meritorious and original puns.

The exhibit of plating supplies and plated goods, was above the ordinary. St. Louis members displaying two large cases of beautifully finished stove legs. The specimens of coloring and silver plating were a revelation to most of those present. The officers elected for the ensuing year are as follows:

President—H. H. Williams, St. Louis, Mo.

1st Vice-President—W. G. Stratton, Bridgeport, Conn.

2nd Vice-President — Oscar Service, Chicago, Ill.

Sec'y-Theas.—Walter Fraine, Dayton, Ohio.

Editor—H. J. Richards, St. Louis, Mo.

After a rather spirited contest, the convention city for 1917 was declared to be St. Louis, Mo., and it goes without saying that the society will receive a genuine Western welcome when it meets there for its fifth annual function.

Papers Presented

Anodes—Fred Liscomb.

My Ideas for the Growth and Expansion of the A.E.S., Locally and Nationally—E. W. Woodmansee.

A Practical Cyanide Zinc Solution — C. H. Proctor.

Problems of the Job Shop—Francis A. Shepherd.

Acid Copper Baths—Dr. H. D. Holler, Bureau of Standards.

Some Conditions in Plating Rooms and How They Can be Avoided—D. Allen Metz.

The Laws Which Govern the Choice of An Electrolyte for the Deposition of Nickel—By the Philadelphia Branch.

Something About Lacquers—George I. Eddy.

How to Make the Branch Society Meetings of Greater Value and Interest to Members—Walter Fraine.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.
Officers 1916-1917.

President—Wm. J. Salmon, 104 Lake Front, Kew Beach, Toronto.
Vice-President — John Acheson, 1065 Dundas Street, Toronto.
Sec.-Treasurer—Ernest Coles, P.O. Box 5, Coleman, Ontario.
Librarian — John A. Magill 591 St. Clarens Ave., Toronto.

PLACE AND DATES OF MEETING.

The Occident Hall, corner of Queen and Bathurst Streets. Fourth Thursday of each month, at 8 p.m.

The Trade Paper and the Plater—Dr. F. C. Stanley.

Bright Nickel Plating — H. J. Ter Doest.

Reaction of Conducting Salts in Nickel Solutions—Edwin W. Heil.

Soap and Caustic Soda as Cleansing Agents—A. L. Reeves.

Cleaning Brush Brass Work by Electro-Cleaning—E. T. Holman.

Plater: Practical Man and Scientist —H. E. Willmore.

At the banquet on Saturday evening in the Statler Hotel, the following addresses were read:

Improving the Efficiency of the Plating Room—H. E. Willmore, Jr.

How Can the Distant Members be Benefited—Geo. B. Hogaboom.

Then and Now—E. S. Thompson.

The papers as a rule were not too technical for general appreciation.

Canadian Representation

Walter S. Barrows, 628 Dovercourt Road, Toronto, Ont.

Frank Powers, Sarnia, Ont.

W. J. Salmon, Toronto, Ont.

E. Coles, Toronto, Ont.

H. W. Cresswell, Jr., Toronto, Ont.

John Achman, Toronto, Ont.

C. E. Rehder, Bowmanville, Ont.

A. A. Densom, Bowmanville, Ont.

Exhibitors

Walter Fraine, Dayton, Ohio.

General Supply Co., Cleveland, Ohio

E. J. Woodison Co., Detroit, Mich.

Taylor Instrument Co., Rochester, New York.

Cleveland Tool & Supply Co., Cleveland, Ohio.

Stanley Manufacturing Co., Dayton Ohio.

Ohio Carbon Co., Cleveland, Ohio.

Niagara Emery Mills, Inc.

Apothecaries Hall Co., Bridgeport, Conn.

Crown Rheostat & Supply Co., Chicago, Ill.

Celluloid Zapon Co., New York City

W. R. Parsons, Chicago.

E. Reed Burns Supply Co., Brooklyn, New York.

Northern Blower Co., Cleveland, Ohio.

DeVilkiss Mfg. Co., Toledo, Ohio.

H. J. Ter Doest, Cleveland Branch, A. C. S.

Indianapolis Branch, A. E. S., which included exhibits from Wheeler & Schebler, Leedy Mfg. Co., Keyless Lock Co., and the Indianapolis Plating Co., of Indianapolis, Ind.

A. N. Theriault, Bridgeport Branch, A. E. S.

Lewis H. O'Donnell, Newark Branch, A. E. S.

St. Louis Branch, A. E. S.

W. T. Wicks, Cleveland Branch, A. E. S.

C. O. Werft, Cleveland Branch, A. E. S.

W. D. Scott, plater with Scott-Ullman Co., Cleveland, Ohio.

Representation Without Exhibits

Munning-Loeb Co., Matawan, N. J.

J. H. Rhodes & Co., Chicago and New York.

Manufacturers' Brush Co., Cleveland, Ohio.

Cupror Metal Products Co., Cleveland, Ohio.

R. J. Watters Co., Buffalo, N.Y.

REVIEW OF ELECTRO-PLATING IMPROVEMENTS

By "Abe Winters."

DURING the past three years the electro-plating field has been continually beset by first one scientific discovery and then another. Improvements in plating baths have been loudly heralded, while new addition agents such as conducting salts, retarding agents or brighteners have attracted widespread attention. Rapid nickeling with both cold and hot solutions has been advised, and tried by hundreds of interested platers. The electro-cleaning copper solution has found many ready and willing to adopt this labor-saving method. Electro-cleaning previous to copper-plating has been improved, and the general trend of opinion regarding the practical utility of this latter solution has been greatly altered. Cobalt plating held the attention of progressive men for about eighteen months. It now has an assured success in several establishments where the tests were persistently pursued.

The various addition agents which were to correct the faults of the old-time-tried solutions, made from formulae carefully compiled by trained minds, have found but comparatively few advocates among modern platers. Each new idea has its value and may be employed to good advantage in some particular branch of the art, but we know of no recent change in general plating procedure which has proved to be universally popular after thorough trial. Almost invariably the plater discards some feature of the improvement and returns to the method previously employed, his experiments having possibly enabled him to either modify or alter the process in some manner so that he considers the present methods adopted as really an advancement.

Nickeling Iron and Steel

When rapid nickeling began to attract attention, the average plater was positive that iron or steel should be quickly covered when placed in the nickel bath. Experience with various dense nickel solutions, however, caused the plater to slightly alter his opinion respecting this quick film formation, often his attempts to obtain adherent deposits by this method proved so futile that he actually condemned the solution. As he proceeded with his tests he became convinced that iron or steel, especially when hardened, would become more durably coated with a nickel film when treated with a low current density, whether the bath be ordinary double salt solution or the more recently developed dense single salt solution. The plater has also learned that extra highly tempered steel will receive a more adherent deposit of nickel at low current density and at a tension of possibly one and one-half or two volts, in a nickel-ammonium plating bath than is possible at high current density at any voltage in a nickel sulphate nickel bath containing a high percentage of boric acid and with possibly a chloride as a conducting salt.

In the use of concentrated nickel baths the plater usually finds that he has not obtained full efficiency from the solution during the early portion of his experience with such baths, simply because he has not become acquainted with the quick action. He has not acquired confidence sufficient to take a chance. For years, possibly he has run his work for one and one-half or two hours and a deposit of nickel which will prove adequate for protection purposes obtained in less than the above time is to his mind an impossibility; yet, once convinced of his error and out of the rut in which he labored for years he becomes an ardent advocate of dense plating baths. Common sense tells us he is quite right in his newly adopted method, but prejudice causes many to religiously adhere to the slow plating baths.

Rapid Nickel Solutions.

There are several points to be taken into consideration before adopting a rapid nickel solution for any commercial plating. To one, these solutions may prove of inestimable value, to another they may be a source of endless trouble and expensive waste, for the more we study the actual chemical reactions in a nickel bath, the more fully do we realize the impracticability of advising any one formula for all purposes and under all conditions. If John Smith finds that a certain strength nickel bath, operated at two volts gives him satisfactory results on stove work, it does not prove that William Black cannot produce a highly satisfactory deposit from a nickel solution of different composition, operated at three volts.

Before proclaiming either solution the better one, we must look to maintenance costs, power required to operate, waste of materials, efficiency of bath and the comparative output in a given time, plus labor required to produce this output. The plater operating dense solutions for the first time should bear in mind that these so-called rapid baths do not deposit any more metal per ampere than the old style bath. One ampere of current will deposit a given amount of metal regardless of the density of the bath; a dense solution will, however allow a greater number of amperes per square foot to flow from the positive to the negative poles and thus greatly increase the rate of deposition. This increase in the flow of ions is usually manifested by a change in the character of the deposit, and upon this point often hangs the determining feature of the solution.

In any of the various modern improvements in electro-plating, cleaning or coloring, there are factors to be given serious consideration before any idea or method is adopted for a specific line of work. Possibly the waste of materials may at first seem enormous, yet the results obtained may be such as to warrant the extra expense for the one item. At this time when labor is scarce and wages high, a greater percentage of waste can be allowed on labor-saving methods. With the above points before us we may safely regard the modern rapid nickel plating bath as an economic proposition.

Electro-Cleaning Copper Solution

Now, let us consider the use of the electro-cleaning copper solution, by this we mean a solution which cleans and copper-plates iron or steel in one operation. Twenty years ago such a procedure would have been ridiculed by any practical plater. Where the idea originated we do not know, but, nevertheless, the practical utility of this method is now well founded and several of our most successful platers are daily preparing iron and steel for the nickel bath by the combination of two well-known operations. We do not claim this process to equal the old scouring method of cleaning metallic surfaces which have become heavily coated with emery paste during polishing operations, with the paste allowed to dry on the article. For such work the separate electric cleaner is preferable owing to the rapid contamination of the plating bath if cleaned in the electro-copper bath. Iron and steel which reach the plater with a coating of saponifiable oil, or oil free from the solids which characterize average pastes may be cleaned and coppered perfectly in this combination bath.

A bath which is giving excellent satisfaction is composed of—caustic potash or caustic soda—one pound, soda ash—3 oz., added to each gallon of an ordinary hot copper solution; to this is added one ounce of cyanide per gallon. This bath produces a thin film of copper which, though not sufficient to form a protective coating acts as an indicator, and aids in effecting an adherent coating of nickel upon the surface when transfered to the nickel bath. If a spot upon the surface is left uncovered by the copper, the operator may at once detect the defect and correct the irregularity of the bath or increase the supply of current. Possibly the metal has been unusually dirty, and it may be necessary to use a preliminary soaking bath previous to the combination copper bath.

We cannot cover the details of this bath here, yet would say that the process requires intelligent application. It has its limitations and will not produce economical results unless operated with due regard to cleanliness and the proper balance of its component parts. From 3½ to 5 volts may be employed, and the current density should be adjusted by means of a rheostat. A few trials will suffice to show the most suitable current density. This should be systematically noted, and the same current used for similar loads. The tank may be connected to the electric circuit and act as anode. No copper anodes are used in this bath, but suitable hoods must be installed over the cleaning tank, and an efficient suction of air maintained throughout the entire operation of the bath, as the fumes which are liberated are extremely poisonous. Keep the solution at boiling point for uniform results. If allowed to fall below boiling point, the temperature is less easily regulated and the results are sure to vary, owing to the fact that the temperature of the solution is of vital importance when treating some of the oils used in machining metals. When the oils collect on the surface of the solution, they must be removed to avoid contaminating the pieces removed from the bath.

The current is used direct, but some platers find it an advantage to use the reverse current for a few seconds, and then finish with the direct. No absolute ruling can be made on this point, as it depends greatly upon the nature of the work, and the condition of the surface to be cleaned. As this bath is constructed for its cleansing qualities and not for a regular coppering solution, the management of the solution must be in accordance with usual rules for electric cleaners rather than with those followed for coppering baths.

Other modern improvements such as dynamos, plating apparatus, rheostats and general mechanical equipment are all worthy of attention, and will be mentioned in future articles.

Questions and Answers

Question.—I wish to obtain a formula for producing a dark background on relief work. I now use a black nickel solution but the black deposit is very difficult to relieve properly owing to its hardness. A soft black which will cut from high light leaving the deep position intact will satisfy us nicely.

Answer.—Make a solution of sodium carbonate and water to register 5° Beaume. Add nickel carbonate and ammonia until the solution yields a grey deposit when electrolyzed with a weak curent and using a nickel anode. Add copper carbonate dissolved in ammonia until a smut deposit is obtained. If the deposit becomes too hard after working for some time add copper carbonate in ammonia. If too soft add nickel carbonate. Relieve on soft wheel with uniform pressure.

* * *

Question.—I am operating some plating barrels with celluloid sides, and having noted that these sides wear well and receive no deposit, I conceived the idea of coating the exposed portions of plating racks with celluloid in order to prevent a deposit forming on the holders. I have however, been unable to get the substance in a molten condition.

Answer.—Your idea would be practicable but expensive if the material could be made plastic. Celluloid cannot be melted. It is a very inflammable and explosive compound. Celluloid is shaped as a soft bulky mass by hydraulic pressure, similarly to papier mache, therefore your idea is about as valuable as the hole in a doughnut.

* * *

Question.—The firm with whom I am employed, operate a large refrigerating system in a separate plant. Recently when repairing the system they sent a quantity of anhydrous ammonia to me to be used in the plating department. They claim I should be able to utilize this material, but as I have never had any experience with it I prefer to get some information on the subject.

Answer. — The better thing to do would be to send the anhydrous ammonia to a manufacturer for redistillation. In all ordinary plating processes the water ammonia is preferred and as the quantity sent you is no doubt considerable you would find it an expensive and troublesome task to do justice to your employers request.

* * *

Question.—I desire to obtain a formula for a nickel plating solution which will produce a uniform, white durable deposit in less time than the ordinary nickel solution which I have. I have heard it intimated that single nickel salts can now be used in place of the double nickel salts commonly employed for nickel plating and that the plating is also superior. If this be true, will you please furnish me with a dependable formula for single nickel salt plating solution?

Answer.—Single nickel salts in your plating solutions will prove economical whether used as addition to double sulphate baths or as the sole metallic salt for the construction of a bath. When used however, as the base for nickel baths, the single salt will reduce the maintenance expense fully 50 per cent. Single nickel salt contains about 21 per cent. metal while the double salt contains but 14 per cent. metal. Not more than 12 oz. of double salt per gallon, can be successfully employed in the nickel bath, thus giving a metallic content of only about 1.67 oz. of metal per gallon. This low metallic content allows but a comparatively low amperage to be employed, and a slow deposit. Burned edges and dark surfaces result if attempts are made to hasten the deposition. With single salts, a metallic content approaching four and one half ounces of metal per gallon may be easily employed. Again the amperage may be increased from two or three times the amperage used for double salt solutions thereby decreasing time in procuring equal deposit to one half or one third. You may safely adopt the single nickel salt idea as it is no longer an experiment. For a two hundred gallon bath, use 200 pounds of best single nickel salts, 37½ pounds of boracic acid and 25 pounds of magnesium sulphate. Dissolve nickel salt in warm water, then add magnesium sulphate; mix well, then dissolve boracic acid in boiling water, add to solution and stir for at least five minutes. When cool, the solution is ready to use, operate with increased amperage to get quick results.

Trade Gossip

J. A. Kilpatrick, president and manager of the Dominion Wheel & Foundry Co., of Toronto, and formerly of St. Thomas, has been appointed by the Imperial Munitions Board at Ottawa to take charge of the production of forgings.

Thomas J. Drummond, a prominent business man of Montreal, and a member of the Drummond, McCall Co., died at his summer residence at Castine, Me., on August 6. Mr. Drummond was born at Tawley, County Leitrim, Ireland, on September 26, 1860.

St. Thomas, Ont. — The American Brake Shoe & Foundry Co., whose head office is in New York, will establish a foundry here for making brake shoes and miscellaneous castings. The foundry will be 225 ft. by 50 ft., and will be located near the Canada Iron Corporation's plant.

C. Stendol has been appointed manager of the steel department of the Canada Cement Co., Montreal, in succession to C. H. McMillan, who has resigned. Mr. Stendol was formerly with the Dominion Steel Corporation, and previously held an important managerial position with the Algoma Steel Co., Sault Ste. Marie, Ont.

Haileybury, Ont. — The School of Mines on which work has been started by the contractors Secord & Sons, of Brantford, Ont., will contain assay and balance rooms, mill room, forge, carpenter, and machine shops, stamp mill and crushing room. The school will be equipped with modern appliances and will be in charge of A. E. Flynn.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey Forge, Pittsburg	$18 45	
Lake Superior, charcoal, Chicago	19 25	
Michigan charcoal iron	28 00	
Ferro Nickel pig iron (Soo)	25 00	
	Montreal	Toronto
Middlesboro No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1	27 00	24 00
Victoria, No. 2X	27 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL

Per Pound to Large Buyers.	Cents
Iron bars, base	3.25
Steel bars, base	3.25
Steel bars, 2 in. and larger, base	5.25
Small shapes, base	3.75

METALS.

Aluminum	$ 68
Antimony	.19
Cobalt 97% pure	1.50
Copper, lake	29.00
Copper, electrolytic	29.00
Copper, casting	28.50
Lead	.08½
Mercury	100.00
Nickel	50.00
Silver, per oz.	.71
Tin	.44
Zinc	.13½

Prices Per Lb.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal	Toronto
Copper, light	$15 00	$15 00
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine, compos'n	14 00	14 00
No. 1 compos'n turnings	12 00	12 00
No. 1 wrought iron	11 00	11 00
Heavy melting steel	9 00	9 00
No. 1 machin'y cast iron	14 75	14 50
New brass clippings	13 50	13 50
New brass turnings	11 50	11 50
Heavy lead	5 00	5 00
Tea lead	5 00	5 00
Scrap zinc	8 50	8 00
Aluminum	34 00	35 00

COKE AND COAL.

Solvay foundry coke, on application	
Connellsville foundry coke	$7.02
Yough steam lump coal	....
Pittsburgh steam lump coal	4.30
Best slack	3.87

Net ton f.o.b. Toronto.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$42 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	55 00

PROOF COIL CHAIN.

¼ inch	$9.45
5-16 inch	9.10
⅜ inch	8.35
7-16 inch	7.15
½ inch	6.95
9-16 inch	6.95
⅝ inch	6.80
¾ inch	6.70
⅝ inch	6.55
1 inch	6.40

Above quotations are per 100 lbs.

MISCELLANEOUS.

Solder, guaranteed	0.28½
Babbitt metals	.11 to .60
Putty, 100-lb. drums	3.00
Red dry lead, 100-lb. kegs, p.cwt.	13.87
Glue, French medal, per lb.	0.20
Motor gasoline, single bbls., gal.	0.32
Benzine, single bbls., per gal.	0.31½
Pure turpentine, single bbls.	0.69
Linseed oil, raw, single bbls.	0.90
Linseed oil, boiled, single bbls.	0.93
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7 00
Lead wool, per lb.	0.13
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½
Lard oil, per gal.	1.35

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$4 15	$4 00
Sheets, black, ..o. 10	4 60	4 50
Canada plates, dull, 52 sheets	4 50	4 50
Canada plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized)	6 75	6 75
Queen's Head, 28, B.W.G.	7 75	7 75
Fleur-de-Lis, 28, B.W.G.	7 35	7 35
Gorbal's best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	6 45	6 45
Premier, 10¾ oz.	6 75	6 75

ELECTRIC WELD COIL CHAIN B.B.

3-16 in.	$15.50
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60; headers, 60; flanged unions, 55; malleable bushings, 60; nipples 72½; malleable, lipped union, 60.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper carbonate, anhy.	.35
Copper, sulphate	.22
Cobalt sulphate	.14
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide	.29
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.35 to .38
Tin	.49 to .52
Silver, per oz.	.75 to .77
Zinc	.16 to .18

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt	2.00
Polishing wheels, bullneck	1.10
Emery, in kegs, American	.05
Pumice, ground	.05
Emery glue	.18 to .20
Tripoli composition	.04 to .06
Crocus composition	.07 to .08
Emery composition	.09 to .10
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Toronto, Ont., Aug. 8.—The continued warm weather while being decidedly beneficial to the crops is affecting the steel trade by causing a reduction in output. Incidentally the crop prospects are very favorable and as a result an optimistic feeling prevails in business circles regarding the industrial situation. While great progress has been made in the manufacture of munitions, the daily deliveries being valued at nearly $1,000,000, production is considerably less than was hoped for or expected. Lack of co-operation is responsible for this unfortunate state of affairs, which has resulted in a shortage of some parts thus delaying the completion of the finished shells. Orders for shells placed by the British Government in Canada now total nearly $500,000,000 of which amount $200,000,000 have already been delivered. It will thus be seen that there is no lack of orders and that there is enough business in sight to keep the shell plants fully occupied for many months. After a long period of quiet the Allies are again placing large contracts for munitions with manufacturers in the United States. Three things have marked the new buying movement; the size of shells, the rapidity with which orders are being closed and the extension of delivery periods until May 1917. This indicates the enormous demand for munitions and also that further large orders are assured for Canadian manufacturers if deliveries can be maintained at the desired amount.

Steel

Conditions in the steel trade continue very active although the output of the mills has been somewhat curtailed owing to the hot weather. The domestic demand is light as is usually the case at this time of the year, but export business continues heavy with no indication of falling off. The demand for munitions being as insistent as ever, the steel companies are making a big effort to supply the necessary steel, consequently the production of rails has been affected. On this account rails are being imported from the States by Canadian railways. The C.P.R. has placed at Chicago a contract for 14,000 tons against its rail enquiry for 25,000 tons. A considerable quantity of barb wire has also been imported into Canada from mills in the States. As was expected, galvanized pipe has declined due to cheaper spelter, but black pipe is unchanged.

Galvanized sheets are firmer but the situation is unchanged and the market is steady. Spelter has not declined any further and black sheets continue firm. Prices on galvanized sheets are a little firmer in the U.S. market but unchanged locally. Black sheets are in rather light demand at present, but the mills are well filled on old contracts on which they have a good accumulation of specifications, enough to run them three months or more, on an average. Blue annealed sheets are quite firm with a good tonnage demand for both nearby and far off deliveries. Prices on sheets continue to be rather irregular in the primary market but local quotations are unchanged.

Pig Iron

The hot weather is having the effect of reducing the production of pig iron but otherwise the situation is unchanged. The market continues quiet and prices show little movement.

Supplies

The demand for machine shop supplies continues brisk and prices continue very firm. The market is very steady and there are very few price changes to note. A sharp advance has been made in linseed oil which is now quoted at 90c for raw and 93c for boiled oil. Turpentine has declined 1c and is quoted at 69c one gallon. A break in the price of Pennsylvania crude oil has unsettled the market as it will probably affect the refined situation. No change however has been made in gasoline in the meantime although later on in the year prices may be easier.

Metals

The general situation in the metal market is unchanged and prices have been maintained at last month's levels with the exception of lead which has declined. A good demand for metals for munitions continues but ordinary business is quieter on account of the usual summer dullness. Copper quotations are still nominal but conditions in the market are improving because of the gradual absorption of metal in second hands. The tin market is dull and easy, at unchanged quotations. Spelter is dull with comparatively little interest being shown by consumers. The Trust has reduced its price on lead to the same level as the independents. Antimony continues weak and quotations nominal, while Aluminum is also unchanged.

Copper.—The buying movement which has been so long expected in the copper market has not developed yet but prices are unchanged and nominal. Comparatively little copper has been available recently as many refiners sold nearly all their production some time ago. If consumers can hold out until the end of September without heavy buying, prices may decline, but if they are obliged to buy heavily soon, an advance in prices is expected. Quotations are unchanged at 29c per pound.

Tin.—The market is quiet and dull at unchanged quotations. The demand for tin is light as consumers are not taking much interest in the market for either spot or futures. Tin is quoted locally at 44c per pound.

Spelter.—The demand for spelter continues light particularly from the brass mills although galvanizers are buying more metal. The market is steadier but quiet and unchanged at 13½c per pound.

Lead.—The Trust have reduced their price ½c per pound to the basis of 6.00c New York, bringing the price to the same level as the outside market. The independents however are cutting prices which indicates continued weakness in the market. Buyers who have been holding back in anticipation of this reduction are expected to come into the market now, but the buying movement has not started yet. Lead had declined locally and is now being quoted at 8¼c per pound.

Antimony. — The market continues weak with prices nominal and unchanged at 19c per pound.

Aluminum.—There is nothing of particular interest to note in the market and quotations are unchanged at 68c per pound.

Foundry Supplies and Chemicals

The volume of business in foundry supplies continues to improve, and is very fair. considering the conditions which prevail in the foundry trade. The market is steady with prices firm, and in some lines advances have been made. Prices of most kinds of polishing wheels are higher owing to the continued high prices of raw materials, particularly leather, felt and rags. Felt wheels are now quoted at $2 and "bullneck" at $1.10. Turkish emery is still very scarce, being practically off the market, but sufficient supplies of American emery are available at unchanged prices. Supplies composed of brass are still high in price, but easier.

Indications point to chemicals having advanced about as far as they are likely to go, but prices generally are being well maintained, and no material decline may be looked for except in a very few cases. One of these is copper sulphate, which is lower, due to the demand having fallen off. Tin chloride has also declined and caustic soda is dull and easier. Chloride of lime is weak and prices have an easier

tendency. There is continued activity in the demand for soda ash, and prices are hardening.

Trade Gossip

Beauceville, Que.—The foundry owned by Marcoux & Poirer was destroyed by fire recently, the loss being estimated at $12,000.

Niagara Falls, Ont.—The new plant of the Canada Nickel Smelting & Refining Co. at Chippawa is practically finished, and will likely be in operation within a few weeks. It will be the first nickel refining plant to use Niagara power.

Metal Spray Ltd., has been incorporated at Ottawa with a capital of $10,000 to manufacture metals, metal powders, chemicals, etc. Head office at Montreal. Incorporators, Louis B. Schwary, George H. Spencer and Constantine A. O. Gorman all of Montreal.

The Manitoba Steel Foundries, Ltd., has been incorporated at Ottawa with a capital of $300,000 to carry on the business of steel and iron founders, mechanical engineers, etc., at Winnipeg, Man. Incorporators are Peter J. Smith, Arthur M. Tirbutt all of Winnipeg.

The Armstrong-Whitworth Co. of Canada, at Longueuil, Que., will instal two 6-ton "Heroult" electric furnaces for making forged tires, wheels and axles from cold scrap. These are in addition to the one 3-ton furnace used for making tool steel.

The Metals Coating Co. of Canada has been incorporated at Ottawa, with a capital of $200,000, to acquire the rights of "The Schoop Process of Metallic Deposition" and to manufacture mechanical specialties of all kinds. Head office at Montreal. Incorporators are: A. A. W. Plimsoll, Reigner Brodeur and Adolphe Chouinard, all of Montreal.

The Canada Stove & Foundry Co., has been incorporated at Ottawa with a capital of $1,500,000 to carry on the business of iron masters, steel makers, Head office to be situated at Montreal, Que. Incorporators, E. R. Parkins, R. E. Allan and F. W Tofield all of Montreal

The Foundation Company, Montreal, has received two contracts from the Algoma Steel Corporation, Sault Ste. Marie, Ont. One is for the revision of the yard, including the engineering and constructing of three plate-girder bridges, and the other is for the construction of the foundations of two open-hearth furnaces and a gas producer.

The Algoma Construction & Engineering Co. has been incorporated at Toronto, with a capital of $100,000, to manufacture steel, nickel and any other ore products, charcoal, coke and by-products, etc., at Sault Ste. Marie, Ont. The provisional directors are: Alexander Taylor, R. E. Nicholson and J. G. Gibson, all of Toronto.

Montreal.—Announcement is made that the new sulphuric acid plant of the Consolidated Mining & Smelting Co., Trail, B.C., has been completed, and will be started up very shortly. It will manufacture the acid as a by-product of the smelter fumes. The company's other extension includes the new zinc plant recently started up and a copper refining plant.

Blast Furnace for British Columbia.—A movement is on foot to establish a blast-furnace plant in British Columbia. At a recent meeting of representatives of the Vancouver Chamber of Mines and the Intermunicipal Industries Committee, and others, a resolution was passed for the employment of a staff of engineers to report in four months on the supplies of iron ores accessible to the coast, and on the feasibility of establishing a smelter for such ores on the coast. At present there is only one small Bessemer steel casting plant in British Columbia, but there are a number of copper smelters.

Ottawa, Ont. — That erection would start immediately of the big steel plant which the United States Steel Corporation plans to erect at Ojibway, near Windsor, Ont., was the statement made by Wallace Nesbitt, K.C., recently. Mr. Nesbitt was in the city arranging certain departmental matters in connection with the going ahead of the work. The company over two years ago secured a large tract of land at Ojibway, but little has been done up to the present.

CANADIAN FOUNDRYMAN BUYERS' DIRECTORY

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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BUFFS AND

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CARS, CORE OVEN
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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CHEMISTS—SEE METALLURGISTS

CHEMICALS
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
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CINDER MILLS
Sly, W. W., Mfg. Co., The, Cleveland, O.

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McCulloch-Dalzell Crucible Co., Pittsburg, Pa.
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Robeson Process Co., New York City.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Northern Crane Works, Ltd., Walkerville, Ont.
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Lindsay, W. W., & Co., Philadelphia, Pa.
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Northern Crane Works, Ltd., Walkerville, Ont.
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

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Monarch Eng. & Mfg. Co., Baltimore.
Woodison, E. J., Co., Toronto, Ont.

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Northern Crane Works, Walkerville.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphit, Pa.
Sly, W. W., Mfg. Co., The, Cleveland, O.
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Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

SAND BLAST SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
E. J. Woodison Co., Toronto.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
New Haven Sand Blast Co., New Haven, Conn.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Standard Sand & Mach. Co., Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

SAND MOLDING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
J. W. Paxson, Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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J. W. Paxson Co., Philadelphia, Pa.
Standard Sand & Mach. Co., Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

SIEVES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

SILICA WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

SILICA ROCK, GROUND AND PULVERIZED
Can. Hanson & Van Winkle Co., Toronto, Ont.
Wm. Penn Silica Works, Wm. Penn Po., Pa.
Woodison, E. J., Co., Toronto, Ont.

SKIMMERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

SMALL ANGLES
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Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

SOAPSTONE
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Hamilton Facing Mill Co., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

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Joseph Dixon Crucible Co., Jersey City, Pa.
Woodison, E. J., Co., Toronto, Ont.

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J. W. Paxson Co., Philadelphia, Pa.
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E. H. Mumford Co., Elizabeth, N.J.
Tabor Mfg. Co., Philadelphia.
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Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

STEEL GRIT
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Wm. McGregor, Scottish Steel Grit Works, Airdire, Scotland.
Woodison, E. J., Co., Toronto, Ont.

STEEL RAILS
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Woodison, E. J., Co., Toronto, Ont.

STEEL BARS, ALL KINDS
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Dom. Iron & Stel Co., Sydney, N.S.
Northern Crane Works, Walkerville.
J. W. Paxson Co., Philadelphia, Pa.
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Can. Hart Wheels, Hamilton, Ont.

TALC
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Hamilton Facing Mill Co., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
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WHEELS, POLISHING, ABRASIVE
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Woodison, E. J., Co., Toronto, Ont.

CANADIAN FOUNDRYMAN

AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields

Vol. VII. TORONTO, AUGUST, 1916 No. 8

EDITORIAL CONTENTS

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PRE-CONVENTION NUMBER

CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

VOL. VII. PUBLICATION OFFICE, TORONTO, SEPTEMBER, 1916 No. 9

The L. & A. ELECTRIC VIBRATOR

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Works faster and in this way will increase production.

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In ordering please say cycleage and voltage of your current.

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is a moderately fast cutter, used where it is necessary to reduce cost by cutting and coloring at one operation. This Tripoli composition is a little higher in price than the ordinary, does away with using a coloring composition, and also with the labor required for coloring, as with the one operation both results are obtained. This cannot be used on all work, but on jobs which are "particular" it has met with success.

Samples for the asking.

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Made in Three Grades:

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"C" Dry—For brass valves and special work.

As its name implies, this composition will give to the pure nickel deposit on the work a rich, high and clear lustre. The use of the proper grade, "A," "B" or "C," for the work it is made for, insures you the very best results as regards—time required for work, quantity of material used, ease with which it may be washed out of deep background, and, most important, the lustre which you and your trade must have on the work.

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Montreal **TORONTO, ONT.** **Windsor**

Foundry Facings, Fire Brick, Woodseed Liquid Core Compound, Polishers' and Platers' Supplies, Compounds and Equipment, Cupola Blocks, Foundry Supplies and Equipment.

The Publisher's Page

TORONTO September, 1916

Canada's Era of Expansion

CANADA is entering the arena of world-trade, to supply the markets of Europe, Asia, Africa, Australia and South America. Necessity and opportunity have combined to force her into this larger energy.

* * *

Time was, and that until yesterday, when the manufacturers of Canada as a class were largely indifferent to foreign trade — this for the perhaps sufficient reason that the home demand was taxing them to the limits of production. In a sense this same condition continues to obtain, for the burden on the Canadian manufacturer to meet home demand is made the heavier in view of the cutting off of supplies from other lands—from Great Britain and the Continent in particular.

* * *

But a clamorous demand from abroad joined to alluringly attractive prices, is multiplying the energies of Canadian producers, and a new vision and a new purpose have impelled them to greater efforts than ever before.

All this to meet the immediate situation. Beyond this is the larger future — the opening markets of the East and South, into which Canada, as one of the Allies, will have a ready access and a hearty welcome. Great Britain, France, Italy, Russia will depend heavily on Canada for her distinctive products; and Canada's economic advantages, due to her possession of essential raw materials in unreckoned measure, will, in the economic adjustments of trade following peace, be utilized to the full.

* * *

It is to be remembered that Canada has three ocean coasts —the Atlantic, the Pacific and the Arctic—this latter of very real value when the ports on Hudson's and James Bays are opened up, and trade routes via these waters established.

* * *

Also, for half of her Continental width, Canada possesses a magnificent waterway — the way of the five great inland seas and their outlet, the St. Lawrence River.

Add to all this her three transcontinental railway lines to carry East and West the yield of forests, fields, mines and seas; and her manufactured products: and it must be apparent that Canada, strategically and by the arts and labors of man, is able in a marvelous way to enter the business of supplying the world's needs.

* * *

The fruitage of the present era of expansion will have a sure result; it will multiply Canada's production. If her own people and industries are insufficient in point of numbers to meet the demands of the new conditions, then it is inevitable that the population of tillers of the soil and workers in the factory; and other toilers will come in from without, attracted by the magnet of prosperity long continued.

* * *

Canadian Foundryman
and Metal Industry News

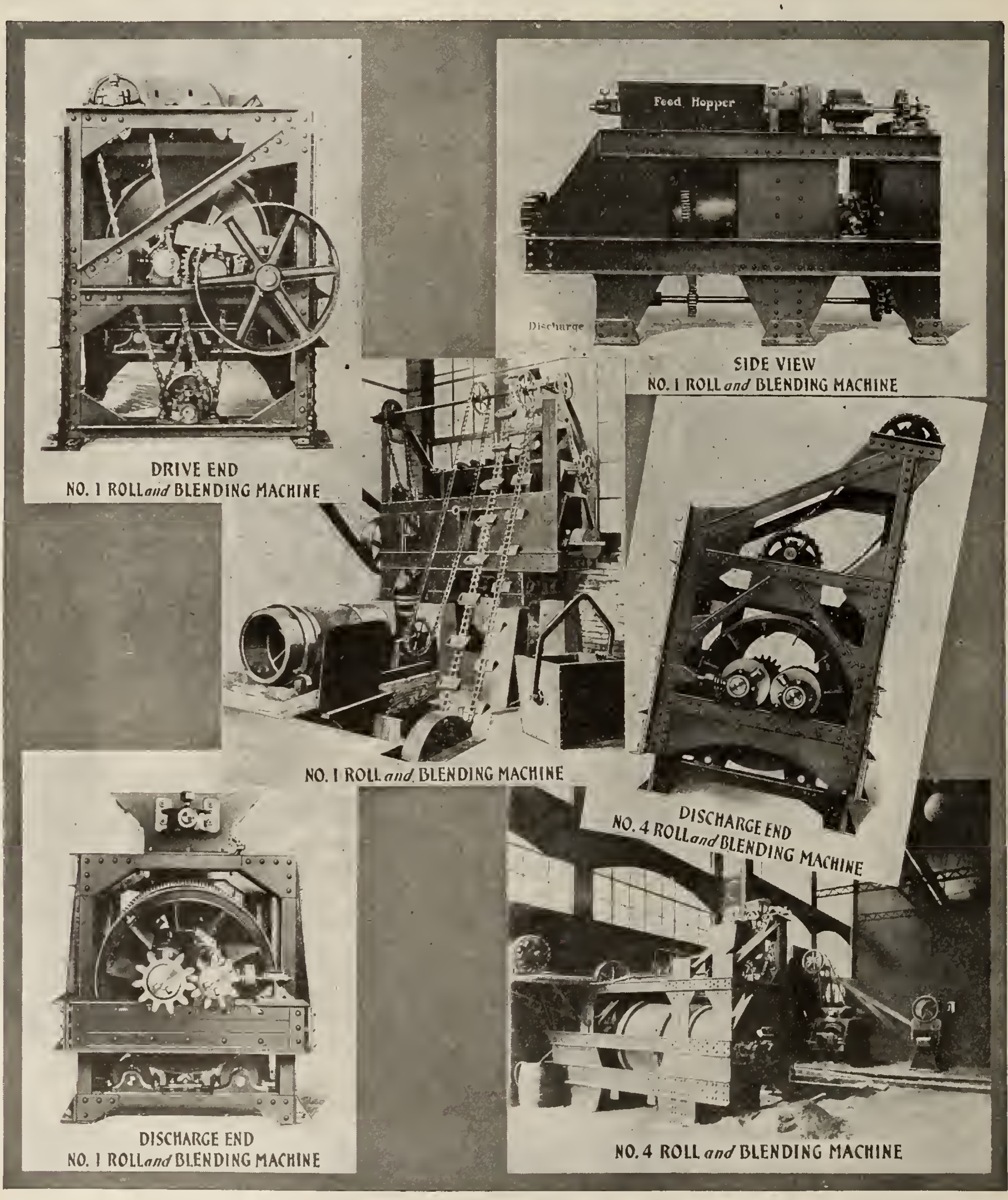
143-153 University Avenue
Toronto

also at Montreal, Winnipeg, New York, Chicago, Boston and London.

STANDARD

SAND MIXING and CONVEYING MACHINERY

Is being widely copied, which proves its established record of fifteen years in the foundries.



Don't worry about the scarcity of labor to handle your raw and finished material. DO IT MECHANICALLY. Our Engineering Department will gladly show you how.

The E. J. WOODISON CO., Canadian Agents

The Standard Sand & Machine Co., Cleveland, Ohio

TABOR

Power Squeezing Molding Machines

10" POWER SQUEEZER

We have had 92 of these machines operating in one shop for over nine years and the total cost of repair parts ordered has been less than $10.00—a striking tribute to TABOR QUALITY.

There Is No Faster Machine Made

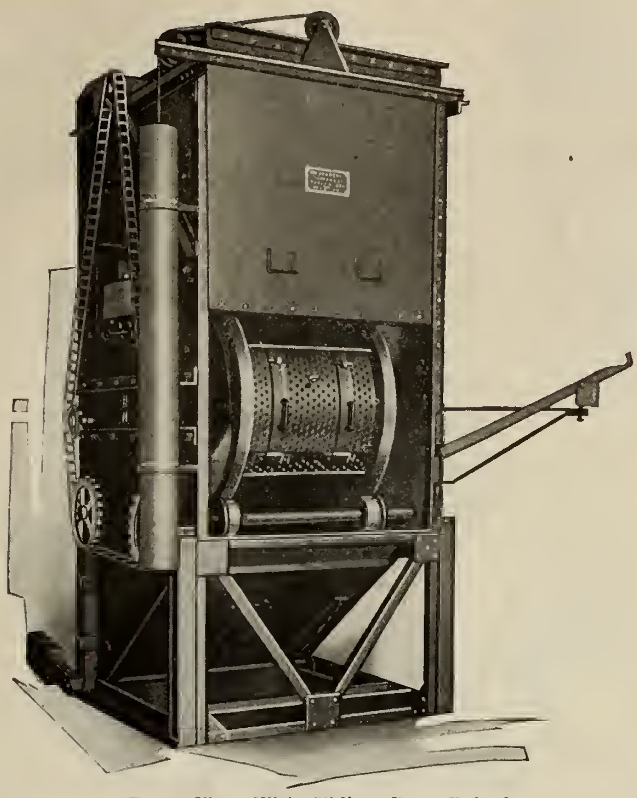
The only mechanical operation of any plain squeezer is bringing up the head and squeezing the mold which requires but .06 minute on the Tabor—take your stop watch and verify this.

The choice of Squeezers is a matter of quality and workmanship and both are of the highest in the Tabor.

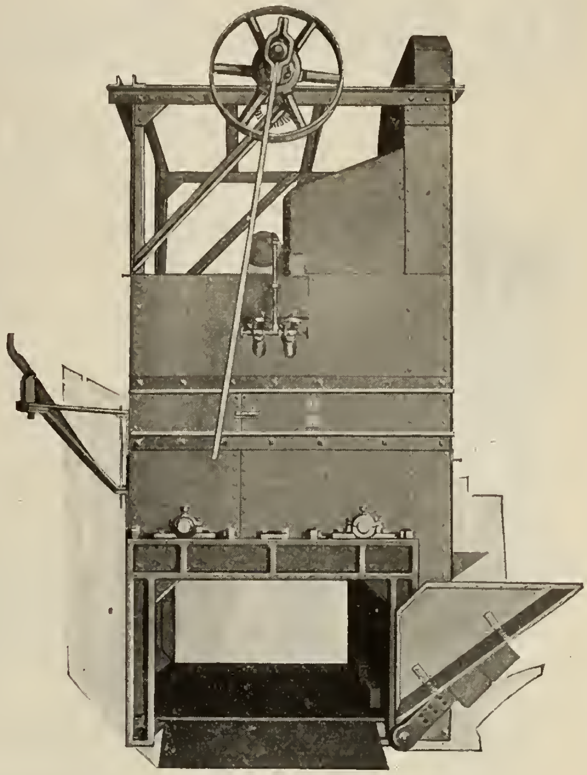
SEND FOR BULLETIN M-R.

THE TABOR MANUFACTURING CO.

PHILADELPHIA, PA., U.S.A.

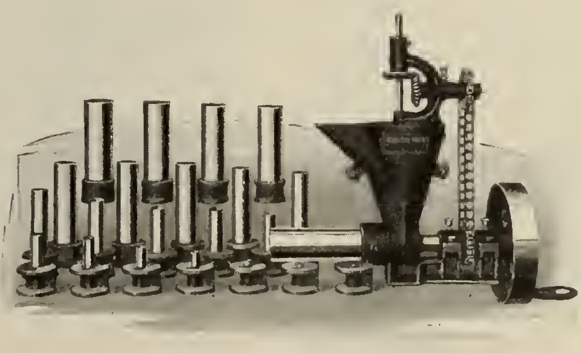


Front View With Sliding Door Raised.

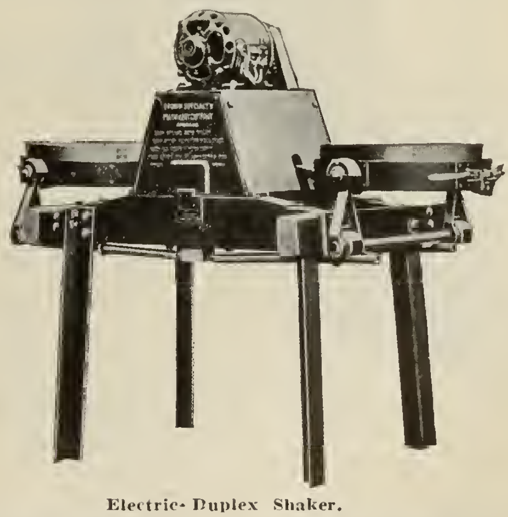


Side View. Truck is Run Underneath Barrel.

OUR number 3 Revolving Barrel Sand Blast Machine is the last word in the barrel type of machine for cleaning large loads. Its capacity is 15 to 20 tons of Malleable Iron or 7 to 10 tons steel castings per day. Meet us at the convention. Let us explain the exclusive features of this machine.



Style A. Hammer Core Machine.



Electric Duplex Shaker.

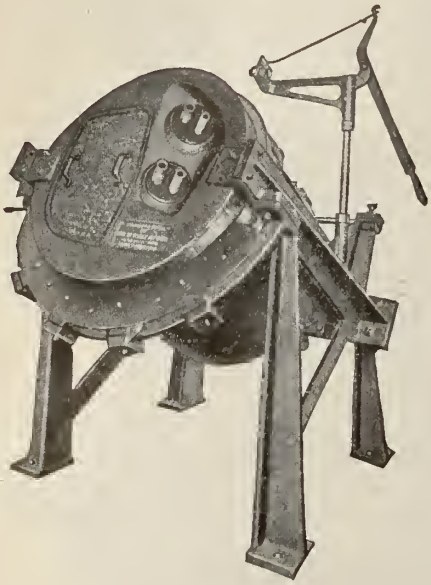
If you come to Cleveland for the convention call at our booth 110, and see the above machines. Their superior features are responsible for the universal success of our equipment. They are labor and money savers.

Brown Specialty Machinery Company

2424 West 22nd Street, Chicago

The No-Wear Nozzle--

An exclusive "Sly" feature holds the air consumption down to a minimum and keeps the supply constant at all times.



As there is practically no wear to this nozzle its life is prolonged indefinitely—there is no constant expense for new nozzles; nor the annoyance of replacing them.

3 H.P. will run the "Sly" nicely and turn out a bunch of work—*good work.* The mill is thoroughly balanced, with adjusting rollers to compensate for any wear.

The ideal mill for heavy, continuous service. Let us tell you all about it. Getting full particulars is the first step to "Sly and Satisfaction."

WE MANUFACTURE—

- CLEANING MILLS
- CINDER MILLS
- DUST ARRESTERS
- ROSIN MILLS
- SAND BLAST MILLS
- CUPOLAS
- SAND BLAST MACHINES
- SAND BLAST ROTARY TABLES
- SAND BLAST ROOMS
- LADLES
- CORE OVENS
- CRANES

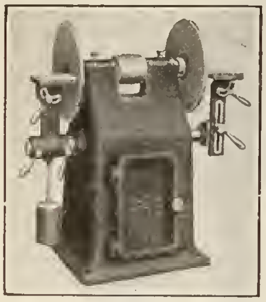
THE W. W. SLY MANUFACTURING COMPANY

CLEVELAND, OHIO

Complete Sand Blast Rooms and Equipment a Specialty

SIMPLICITY DESIGN DURABILITY WORKMANSHIP **The Ford-Smith Machine Company** SIMPLICITY DESIGN DURABILITY WORKMANSHIP

Ford-Smith Grinders



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For anything relating to Grinders write us. We are specialists in **Foundry Service,** and general grinder practice.

Our Catalogue is well worth a place on your desk, and it may be had for the asking. Suppose you write us NOW.

THE FORD-SMITH MACHINE CO., LTD.

HAMILTON - - CANADA

WATER TOOL GRINDERS

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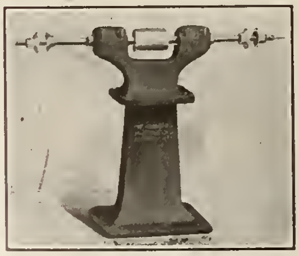
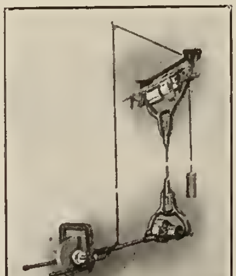


POLISHERS



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ANGULAR GRIT

The Ideal Metallic Sand Blasting Abrasive

In bringing ANGULAR GRIT to your attention, we wish to impress upon you its superiority over sand and shot as a sand blast abrasive.

ANGULAR GRIT is a scientific metallic abrasive, being angular and irregular in shape with many cutting points. Shot is globular in form and requires great pressure to accomplish a small portion of the work ANGULAR GRIT will do. ANGULAR GRIT can only be destroyed by wear and it makes no dust. Sand quickly pulverizes and breaks down to dust. ONE TON of ANGULAR GRIT will do as much work as one to four carloads of sand.

When using ANGULAR GRIT, you eliminate sand bins, sand dryers and much labor—your room that you now use for sand storage can be put to more valuable use.

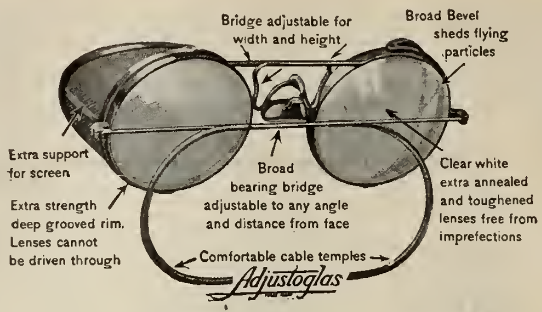
Use ANGULAR GRIT and reduce sand blasting cost 20 to 80%.

Write us

Pittsburgh Crushed Steel Co.
(SOLE MANUFACTURERS)
PITTSBURGH, PA., U.S.A.
Established 1888

Eastern Canadian Representatives
Williams & Wilson, Limited, Montreal, Canada

Meet us at the Foundrymen's Exhibit at Booth 125



Perfect Eye Protection

is assured every user of the "Adjustoglas," the only eye protector that is completely adjustable to perfectly fit any human face. A slight pressure of the fingers adjusts it comfortably—no tools required.

Most practical protector ever made for men who do grinding, chipping, welding and similar work. Frames are non-rustable metal, easily sterilized and sanitary. Note the diagram; it tells the story. The trade-marked name is stamped in the rim; look for it.

Samples and Prices on request.

If you visit the foundry and machine exhibit at Cleveland Sept. 11-16 look for us at Booth 116.

The Strong, Kennard & Nutt Co.
581 Schofield Building - Cleveland, Ohio

Have You a Globe Barrel In Your Plant?

You should have—if you clean or smoothen or brighten small metal parts.

For the Globe Tilter will do the work far more quickly than any other device, and at least as well.

You can fill, inspect and empty the Globe Tilter **while it is in motion**—no wrestling with covers and belts.

Let us send you booklet CF. It's about this and other types of Globe Tumbling Barrels.

THE GLOBE MACHINE & STAMPING CO.,
CLEVELAND, OHIO.

If any advertisement interests you, tear it out now and place with letters to be answered.

The Nova Scotia Steel & Coal Co.

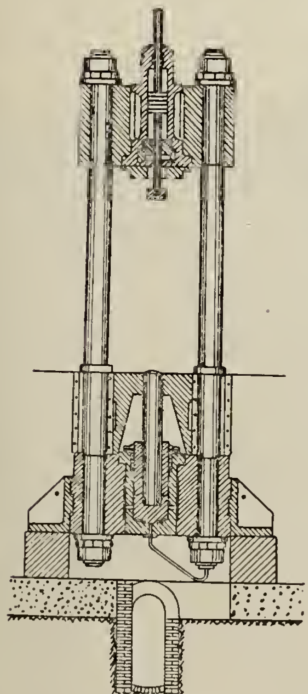
Wabana Nfld., Sydney Mines and New Glasgow N.S.

By The Editor

The history of "Scotia" from its inception down to the present is a fascinating one, because full of life, energy and optimistic determination. In bringing Canada's coal, iron and steel industries to their present degree of successful achievement, the Nova Scotia Steel & Coal Co., it will be observed, has at no time been lacking in prominence of contributory effort.

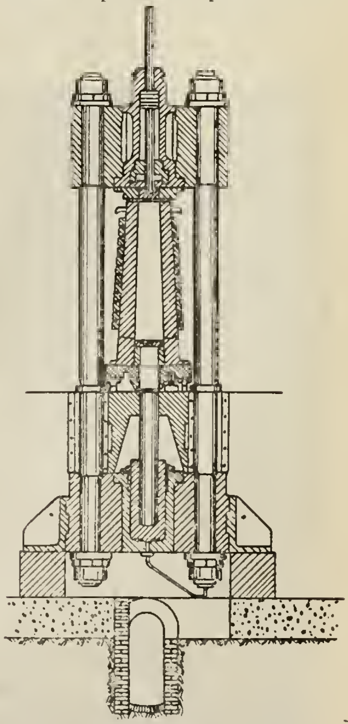
STEEL PRODUCTION AT SYDNEY MINES

ALL the raw material for manufacture at the steel mills, forges, constituting the headquarters plant at New Glasgow, N.S., is produced at Sydney Mines, where, as already briefly indicated, an efficient and thoroughly up-to-date installation of blast and open-hearth furnaces, coke ovens, fluid compressed steel plant, foundry, etc., together with their contributory accessory equipment has been completed and in operation, at least in part, since 1905. It has replaced the original metallurgical works in Pictou County, and its construction was started in 1902, being finished as far as then projected in 1905. We may remark here, however, that in the interval up to the present writing, enlargement, extension, and improved equipment have figured largely, indicating at once not only the increased product de-



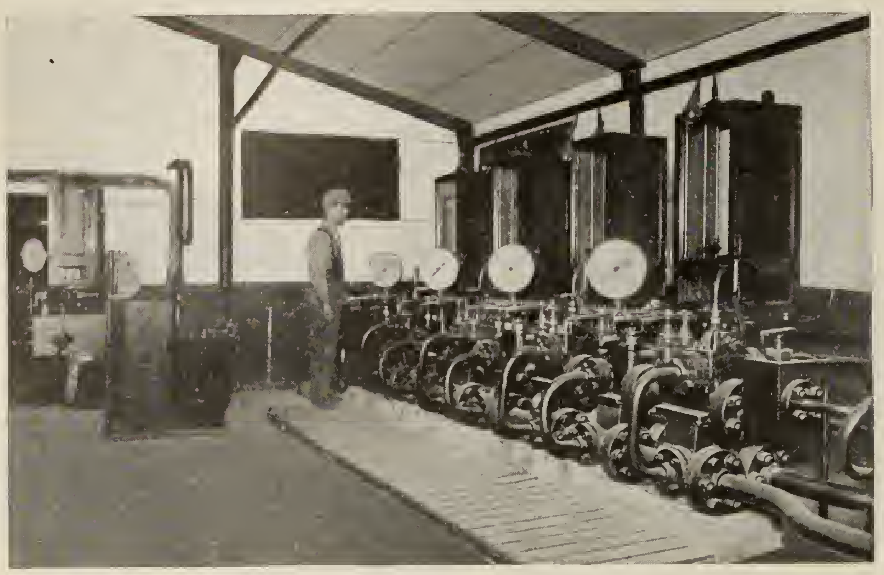
HARMET PRESS. MOLD NOT IN POSITION.

POURING 6-TON INGOTS, SYDNEY MINES.



HARMET PRESS, MOLD IN POSITION.

mand, but the progressive spirit of the management in keeping pace with invention and discovery relative to quality, quantity and variety output.



INTERIOR OF "FLUID STEEL COMPRESSION" OPERATING AND REGULATING ROOM.

The blast furnace at present installed, and in which the iron ore is reduced, has a daily capacity of 300 tons. It was originally designed by Frank C. Roberts & Co., has nine tuyeres, is 80 ft. high, 12 ft. 6 ins. in diameter at stock level, 18 ft. 10 ins. in diameter at bosh, and 13 ft. in diameter at hearth. The equipment includes, pig casting machine and breakers, four Cowper furnace, gas fired, air heating stoves, each 85 feet high and 12 feet in diameter, two Southwark compound blowing engines with air cylinders 72 inches in diameter and of 60-inch stroke, the steam for driving same being supplied by a battery of Stirling water-tube boilers, furnace gas fired. A skip hoist with a double bell filling aparatus feeds the blast furnace and is supplied with coke, ore and limestone from a system of modern storage bins. Four batteries of retort ovens, 150 in all, supply the coke required. Thirty of these ovens of the Bauer type are at the Princess Colliery; the remainder, of the Bernard type, being located in the vicinity of the furnace.

In spite of the fact that fuel in the shape of coal might be said to be plentiful and convenient of use because of the proximity of the steel making plant and the Company's collieries to each other,

POURING A 30-TON INGOT, SYDNEY MINES.

and further because of the calorific value and comparative purity of the coal, every effort has been and is still being bent to keep coal consumption for manufacturing purposes to the irreducible minimum. This of course is accomplished by utilizing the waste gases arising from the blast furnace and coke oven operations, etc., for the purpose of generating steam in the various boiler batteries of return tubular, and water tube types, for power, heating, and general purpose requirements throughout the plant.

The present blast furnace was blown-in some eleven years ago, and, with the exception of the necessary periodic lay-off for repairs, has been in continuous operation ever since. To cope with the growing demand for "Scotia" manufactured products—finished and semi-finished a second blast furnace of like capacity to that described is now in course of erection.

The Wabana ore smelted in making the pig iron from which steel is later produced is of the following approximate analysis:

Metallic Iron	52.86%.
Silica	10.40%
Phosphorous	0.78%.
Sulphur	0.26%.
Aluminium	2.10%
Lime	2.10%
Manganese	0.46%.
Mognesia	0.46%.

The ore is remarkable for its uniformity both physical and chemical, but is not, we understand of Bessemer quality by reason of its high phosphorous content.

The coal from which the coke is produce is of the soft bituminous class, and is characterized by its high proportion of combustible matter, low ash and relatively high sulphur. An approximate analysis is as follows:

Volatile and Combustible matter	36.8%
Fixed carbon	56.7%
Ash	6.5%
Sulphur	2.5%
Moisture	3.5%

Sulphur in the organic form is present to the extent of slightly less than one-half of the total of the sulphur-content. The coal for washing treatment yields a purified product of the following approximate analysis:

Volatile and Combustible matter	34.94%
Fixed carbon	60.71%
Ash	4.33%
Sulphur	1.45%

This washed coal when coked shows a yield of from 65 to 75 per cent. and is of about the following composition:

Volatile and combustible matter	2.30%
Fixed carbon	90.55%
Ash	7.15%
Sulphur	1.30%

The limestone flux has a silica content varying from $2\frac{1}{2}$ to $4\frac{1}{2}$ per cent., and totals from 95 to $97\frac{1}{2}$ per cent. in combined lime and magnesia carbonates.

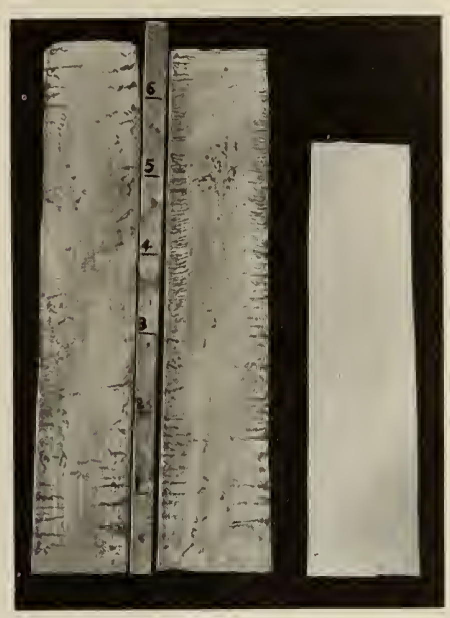
The blast furnace practice is determined by the burden and is not marked by any unusual features. The molten pig is cast into truck ladles and conveyed to the hot metal mixer located adjacent to the open hearth furnaces. This method has the advantage of ensuring to a latter a more uniform product, besides resulting in a saving of heat. From time to time, as required, hot metal is drawn from the mixer and added to the O. H. furnaces. Pig iron manufactured for the production of steel contains approximately:

Silica	1.00 to 1.50%
Phosphorous	1.45 to 1.80%
Sulphur	0.015 to 0.03%

Open Hearth Furnaces

The product of the blast furnace is conveyed as molten metal in huge truck ladles, to the open hearth furnaces, situated a few hundred yards from the other. The open hearth department consists of two 50 to 60 ton and three 40 to 50 ton basic furnaces of modern Wellman-Seaver-Morgan design and one tilting hot metal mixer, with capacity of 200 tons, also of Wellman-Seaver-Morgan design. Into these the molten metal is poured, and from them emerges ultimately as molten steel. The open hearth furnaces are housed in a steel fabricated building equipped with two 75 ton Shaw electric cranes and one Wellman-Seaver-Morgan charging machine, and are heated by gas manufactured in a battery of 16 Duff type gas producers from coal from the company's mines.

Since being put in actual service in 1905, the open hearth steel plant has made continuous shipments of ordinary ingots, flask ingots, and, later, fluid compressed ingots for forging purposes, to the steel mill and forging plant at New Glasgow for final conversion into finished and semi-finished products to both home and foreign order



A B C

SAWN INGOTS, A AND B, AS ORDINARILY CAST, AND C, MANUFACTURED BY HARMET PROCESS.

Note surface and other blow holes in A and B, also tendency to pipe in the latter, and absence of both in C.

Fluid Compressed Steel Plant

The chief additions made to the steel making plant at Sydney Mines since its initial service installation in 1905 may rightfully be stated as those connected with the installation of a complete equipment for the production of "fluid compressed" steel on the Harmet process. The open hearth furnace capacity with its contributary requirements has however also been increased.

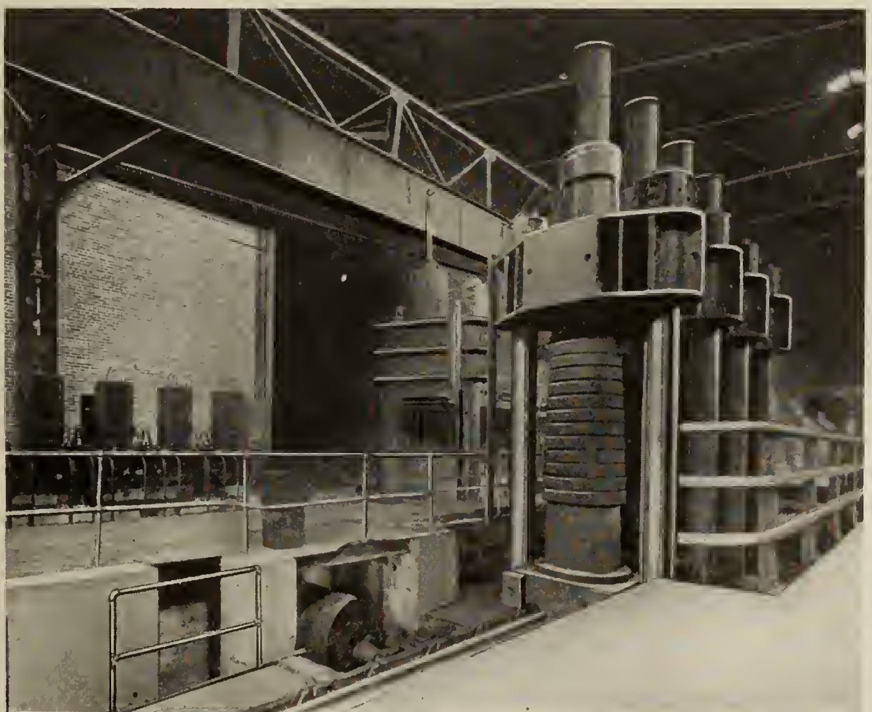
By way of introduction, it may be stated that what is known as the Harmet process of making "fluid compressed" steel consists in submitting the ingot immediately after pouring, and while the metal is still plastic to intensive yet carefully calculated compression from all sides in a conical mold during the cooling period, the aim being to prevent the formation of pipe, blow holes, undue localized segregation or internal strains; in short to make the metal throughout the entire ingot homogeneous.

O. H. Ingot Defects

For many years much time has been given and research work undertaken relative to basic open-hearth steel, and many forms of treatment have been devised as a result, whereby its quality may be improved by eliminating defects inherent to and arising from its manufacture during different stages of the latter. Of the defects referred to, unsoundness of the cast ingot to a lesser or greater extent is easily the most serious. Varying degrees of success have been achieved by different methods of treatment, and not the least effective in the direction indicated has been that of the Harmet Fluid Compressed Steel Process.

The Nova Scotia Steel & Coal Co., realizing the importance of "fluid compression," as a valuable aid in manufacturing reliable and high class steel products, procured by purchase the Canadian license from M. Harmet, of St. Etienne, France, whereby they own the sole rights in this country to use his process. This they considered to be strictly in accordance with their policy of taking advantage of every important metallurgical development, thus advancing with modern progress; and particularly that their already well-known reputation as manufacturers of first quality marine, railway and general machinery forgings should be both maintained and enhanced.

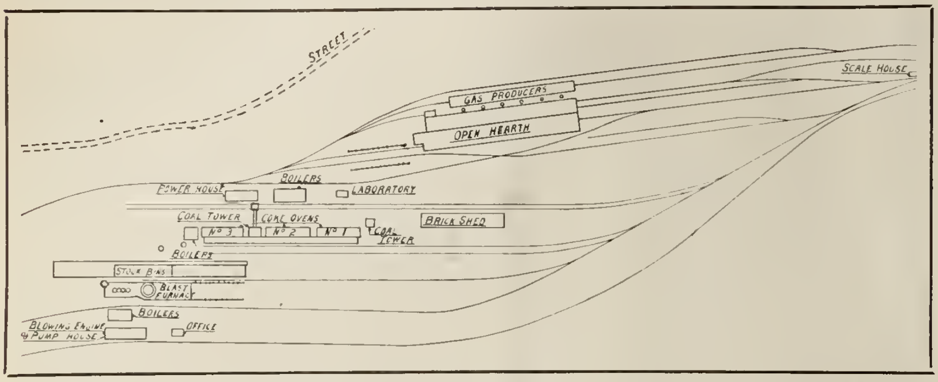
The installation of the Harmet Fluid Compressed Steel Plant at Sydney Mines was made during 1912, and it may be well to point out a few facts concerning the ideals aimed at and being consummated by this and other somewhat similar processes. A generally held opinion and one too often carelessly expressed refers to steel as such being liable to unaccountable failures. For most purposes as against iron, even in spite of occasional and unaccountable



"FLUID STEEL COMPRESSION" PLANT, OPEN-HEARTH BUILDING, SYDNEY MINES.

failures, it has easily shown its superiority, and where it has fallen down there has simply been given additional impetus to research and improved methods of production.

To not all steel manufacturers, however, does the latter statement apply, be-



LAYOUT OF BLAST FURNACE AND OPEN-HEARTH STEEL PLANT AT SYDNEY MINES.

cause for ordinary purposes, the usual merchant brands of steel are satisfactory and the cost of extra treatment would be prohibitive. Those who are placing on the market high grade steel for heavy forging purposes are however, applying the method known as the Fluid Compression Process, by which the metal is subjected to high pressure while passing from the molten to the solid state. The product of this process is used in the manufacture of first quality forgings, such as locomotive axles, crank shafts, marine forgings, artillery tubes and armor plate of the highest grade.

Ordinary Ingot Steel Defects

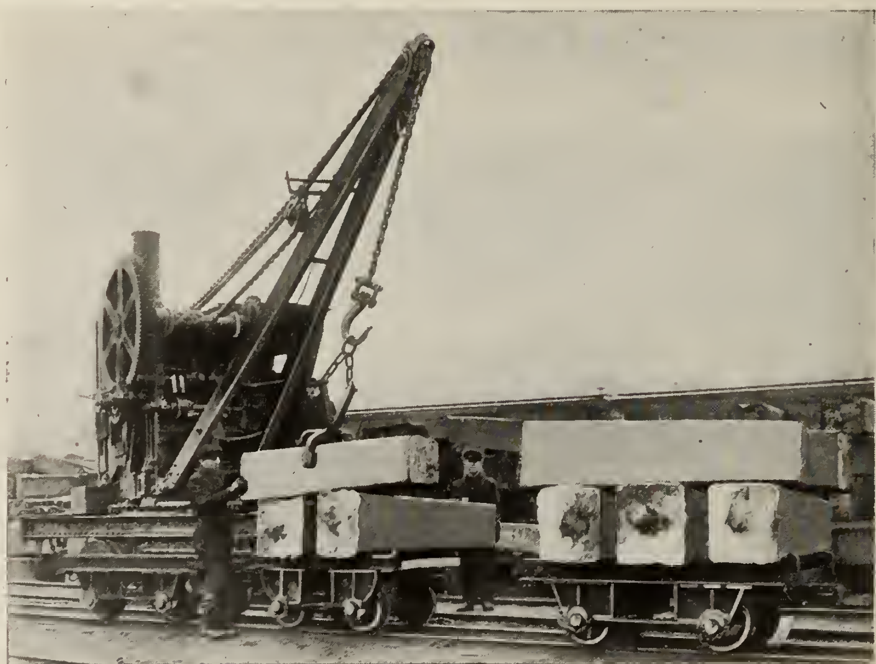
The defects most common in steel cast in ingot molds are:—Blowholes, pipes, porosities, cracks, internal stresses, segregation, and excessive crystallization. Blowholes are caused by the presence of occluded gases in the liquid metal. Iron, like water, has a higher solvent power for gases, such as carbon, monoxide, nitrogen and hydrogen, when liquid than when solid. Thus, during the solidification of the steel, the excess gas dissolved when the metal was liquid is expelled, and, becoming entangled in the hardening mass, causes bubbles or blowholes. These may either be deep-seated or located close to the surface. While both are highly undesirable, the latter are particularly so.

Blowholes

Ordinarily, deep-seated blowholes close up upon rolling or forging, and probably do little harm if sufficient work is done upon the metal, but in the case of large sections the necessary amount of work to effect this is seldom given. The blowholes which occur close to the surface are liable, while the ingot is being rolled or forged, to burst, thus causing a break, through which atmospheric oxygen and slag may enter the cavity. Should oxygen do so, it reacts with the iron of the interior wall of the blowhole, forming iron oxide, the presence of which effectually prevents welding and leaves a permanent flaw. To surface blowholes are due, therefore, most of the surface cracks frequently found on turning up steel pieces.

"Pipe" or Central Cavity

The "pipe" or central cavity is due to shrinkage, and is distinguished by an opening or void, usually found most highly developed near the top and toward the centre of the ingot. The same cause—shrinkage—produces a continuation of this defect downward along the longitudinal axis, the visible pipe gradually tapering away until its presence is only marked by the spongy or porous structure of the affected metal. If the ingot is allowed to cool undisturbed in the mold, this pipe, including the lower



LOADING 3½-TON INGOTS FOR COGGING MILL.

porous section, cannot well be avoided.

In cooling a freshly poured ingot, the outer crust of the steel first becomes rigid, and thus determines its outer dimensions. The greater part of the contraction has already taken place in the metal forming this shell, but there still remains the interior liquid, the volume of which is greatly modified by shrinkage during cooling. Little by little this molten metal becomes plastic, and, attaching itself progressively to the solid shell, adds to its thickness, and tends to leave a hollow portion or cavity equal in volume to that of the shrinkage of the metal. Simultaneously there is a tendency for the more fluid metal from the hotter portion of the ingot to flow in and fill up this area. The visible "pipe" is, therefore, caused by the gradual descent of the still liquid metal to fill up the void due to shrinkage.

Again, the shrinkage continues after solidification, and, as the metal of the outer shell of the ingot is colder and more solid than that toward the centre, therefore, the inevitable contraction accompanying cooling is made possible only by the growth of minute voids, thus causing a porous structure along the lower part of the central axis. Internal stresses are also set up in a similar fashion, due to the contraction of the metal, and these rend the metal with small fissures or cracks.

Segregation of Impurities

Segregation, or the unequal distribution of impurities throughout the ingot, is chiefly due to the melting points of these constituents being lower than that of iron. The cooling of the outer portions of the ingot causes a flow of these impurities to the more molten metal of the interior. The central and upper portions, being the last to solidify, thus show the greatest degree of segregation.

The effects of the presence of these different imperfections are important, and demand great care and attention in order to prevent serious defects in the finished product. If the ingot is allowed to cool freely, the formation of either the visible pipe or blowhole may be somewhat controlled, but both cannot be avoided, while the invisible effects accompanying the pipe, described as sponginess, segregation, and internal stresses, cannot well be prevented unless by some such process as is the subject of this description.

INGOT STRIPPING YARD, SYDNEY MINES

The Discard

In producing steel for all ordinary purposes, the manufacturer cuts off the upper part of the ingot and discards it, thus avoiding the portions of the ingot most affected by the defects described. Where utmost reliability is essential, further efforts are made to minimize the injurious influence of defects by increasing the proportion of discard and by hollow-boring the ingot.

The discard, being of inferior quality, is utilized in the manufacture of low grade material, or is scrapped, a large percentage being fit only for the latter purpose. It will be noticed that by cropping and similar methods, no improvement in the quality of the material is attempted, but only a selection made of the most uniform portions of the ingot. It is apparent that this method of obtaining uniformity, besides being ineffective and uncertain, is also very expensive. Thus there is a strong incentive to crop as little of the top of the ingot as possible; hence much unsound steel. All the above irregularities in composition and in structure of steel are ultimately due to three forces, namely: crystallization, shrinkage and segregation, and the trouble developes during that period in which the liquid metal passes into the stable solid state, or, in short, while it cools.

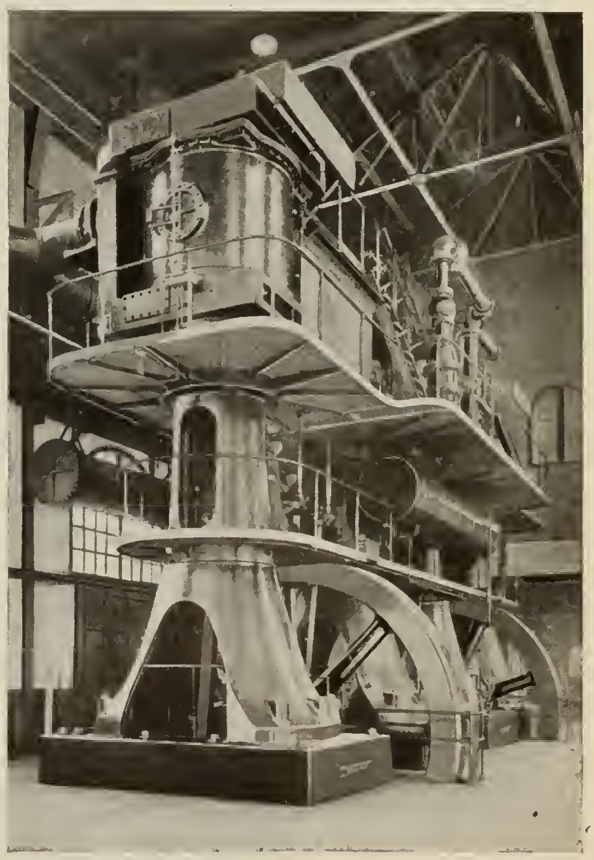
Whitworth System

Owing to the natural difficulties in the way, such as high temperature and weight of the mass to be handled, and the troublesome forces to be controlled, little was done to solve the problem of preventing the formation of defects accompanying solidification, until about 1865, when Sir Joseph Whitworth undertook the task. The solution which suggested itself to him was to submit solidifying steel to great pressure. This would force some, if not all, of the occluded gases to exude, reduce the blowholes to insignificant dimensions, and also would prevent the formation of pipes. Further, by equalizing the pressure throughout the mass, a more homogeneous steel both physically and chemically, would be obtained. The Whitworth process consisted, in brief, of subjecting the fluid steel, which had been poured into a side-strengthened cylindrical mold, to a pressure of above two tons per square inch, and preferably six tons or more, and continuing same throughout the cooling period of the metal. It was found when this pressure was applied that large volumes of gas were driven off, and the ingot shortened—rapidly at first, but later on more slowly; the entire shortening amounting to about eight to ten per cent. more than when cooled in the ordinary manner.

The objection to this process is its initial and operating cost and its inefficiency, the latter due to the fact that the pressure is applied only at the top of the ingot. The effect is that the great force of the pressure is applied only in the walls of the ingot, which, in cooling rapidly, forms a crust with the rigidity of a column, thus arresting the force applied, and protecting the molten central portion from pressure. Thus, to accomplish compression, the maximum amount of energy appears necessary of application. There would also seem to be a tendency of the pressure in the Whitworth process to make ingots open up in a manner similar to the staves of a barrel, and to force the rich, segregated liquid from the interior into the cavities thus made. The improvement in the quality of steel subjected to this treatment is marked nevertheless.

The Harmet Process

The Harmet process main objective is not so much to remedy the already-mentioned and other metal defects as to forestall their development. The process can be described briefly by saying that the ingot, immediately after pouring, and while still fluid, is lifted from below and pressed into a mold of diminished cross-sectional areas. The pressing is stopped only after the steel is chilled. The slightly conical form of the



"SOUTHWARK" BLAST FURNACE BLOWING ENGINES, SYDNEY MINES.

mold causes the pressure on the base to produce lateral compression, and with great effectiveness, due to the wedge-like action. The ingot is thus put under intense compression, transversely and longitudinally, with a relatively small expenditure of power. The advantages claimed from the Harmet treatment, and substantiated in practice, are:

1.—Prevention of cracks due to shrinkage; prevention of internal stresses and resulting cracks or fissures.

2.—Early cessation in the crystallization of the metal, as pressure hastens the transition from the liquid to the solid state; the production of fine crystallization without cleavage planes.

3.—Lessening of segregation, i.e.: reduction of tendency of carbon and other impurities to concentrate in the central and upper parts of the ingot. The gradual movement of the ingot upward into the cooler portion of the mold adds to this tendency.

4.—Prevention of "pipes" or interior cavities, due to the lateral pressure, and thus preservation of absolute solidity in the finished ingot.

5.—Improvement in physical properties, due to the mechanical effect of the operation being similar to forging.

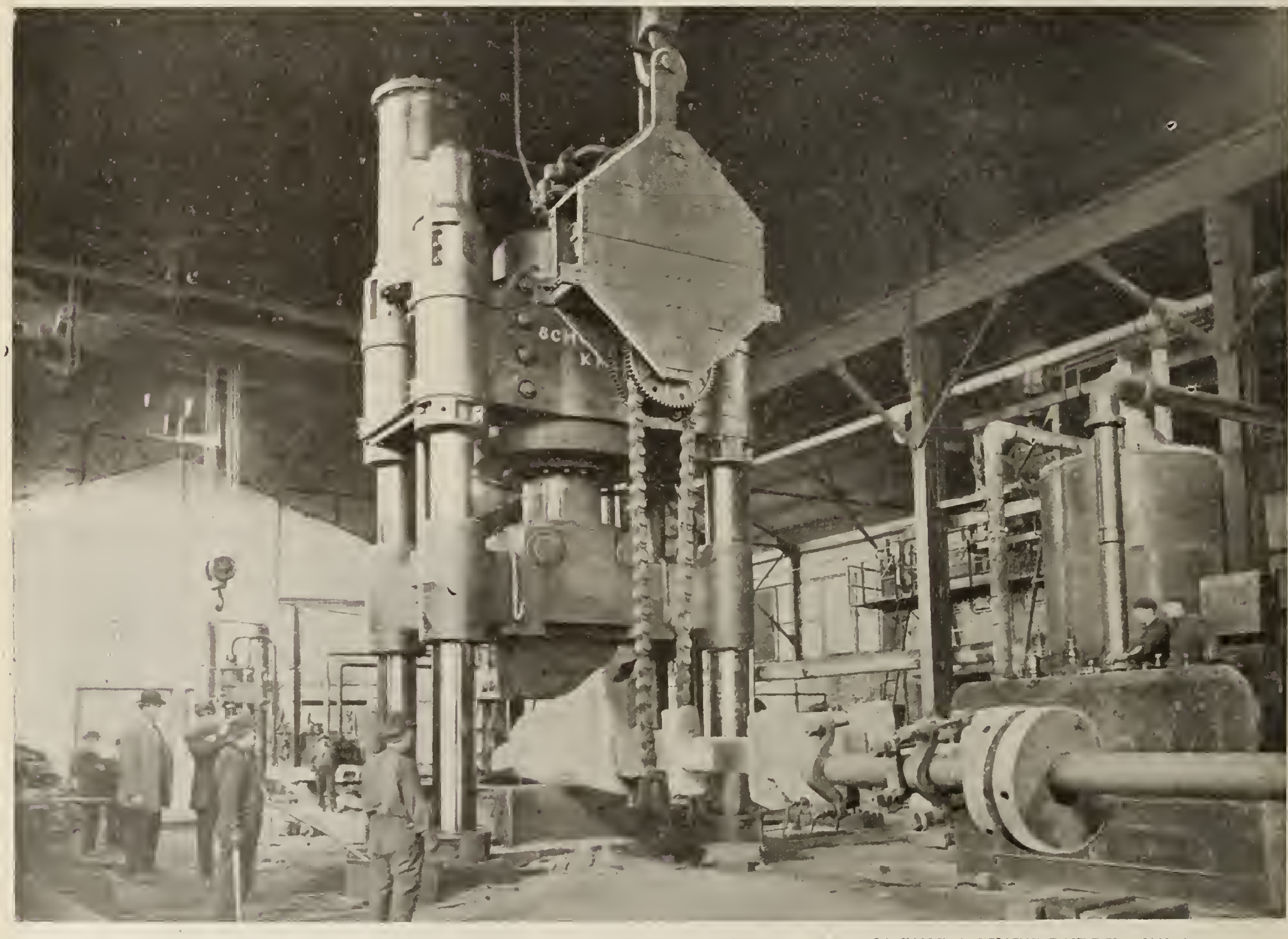
6.—Reduction in the waste of ingot, practically no cropping being necessary, as the uniformity of composition and absence of cavities is maintained throughout the whole of the ingot.

Fluid Steel Compression Plant Detail

The fluid compression plant installed at Sydney Mines consists of one group of Harmet presses each of 1,250 tons for handling four ingots of from $2\frac{1}{2}$ to 5 tons weight at one time, and a 4,000 ton Harmet press for handling ingots of 12, 20 and 30 tons. The presses with their equipment of pumps, accumulators, operating valves, etc., are erected in an extension to the open-hearth buildings, situated close to the furnaces there, and arranged so that the pouring ladle containing the metal to be compressed has, as it comes directly from the furnaces, only a short distance to go to the pouring platform. The press proper consists of two hydraulic cylinders with actuating pistons, having at their ends rams which fit loosely the inside of the top and bottom of the ingot-mold respectively. The cylinders are held a certain fixed distance apart to allow the ingot mold to be introduced between them, when the rams are withdrawn. This is effected by heavy tie-rods, which are fastened to lugs upon the cylinders.

The ingot-molds are of cast iron, tapered, and strongly reinforced with steel bands to resist great pressure. They stand upon heavy movable cast steel buggies, through the floor of which a short shaft transmits the pressure as received from the lower ram piston, imparting it to the bottom of the ingot. The upper ram is brought directly in contact with the metal at the top of the ingot, and merely acts as a buffer to the bottom ram which supplies the power for the actual compressing. The upper ram is slightly withdrawn from time to time as the ingot is pushed further into the mold. The mold buggies are movable and run on a horizontal track which extends sufficiently far on either side of the presses proper to give plenty of standage room.

In the case of the group press there is standage room for a train of four moulds quite clear of the presses. The buggies are hauled along the track by means of a hydraulic-operated conveyor until the correct position under the press is reached. Here it is securely held by



4,000-TON STEAM HYDRAULIC PRESS AT THE NEW GLASGOW PLANT FORGING A SHIP'S RUDDER HEAD.

means of similarly actuated stops which come up through the floor. The pouring platform, upon which the ladle and stopper men stand when pouring the heat, is situated at the side of this track, slightly removed from the presses.

The empty mold is placed on its movable buggy, and when the metal is ready to be poured, is moved to a position immediately next the pouring platform. As soon as the mold is filled with metal it is propelled into position under the press. Each of the group molds is poured successively and the process proper commenced on each as soon as it is in position under the press.

Once this position is attained, a water spray is turned on to cool the top of the ingot in order that the metal may not adhere to the ram. The top ram is then let fall to come in contact with the metal. The bottom ram is next brought into service, a pressure gradually increasing up to over three tons per square inch of ingot bottom area being employed. The total pressure upon the ingot, in the case of 3-ton size amounts to 1,250 tons. The length of time before a full pressure is reached depends upon the size of the ingot, and may be taken as fifteen minutes for each ton of metal, or, say, forty-five minutes for a three-ton ingot. This maximum pressure is maintained for another fifteen minutes per ton of metal, thus bringing the total time under press for these conditions to one hour and a half.

Connected with each of the press rams is a system of cords leading to and operating a pencil moving over the surface of a constantly rotated cylindrical drum. The vertical movements of the pencil are proportional to those of the ram and show the longitudinal shrinkage of the ingot. Thus a continuous time-displacement curve is obtained for the compression period. The pressure upon the cylinders may be read directly from pressure gauges situated with the hydraulic controlling valves in front of the above-mentioned drums, upon the press operator's platform.

It has been found that in order to obtain the best quality of steel from ingots of certain size, form and composition, a definite curve must be followed, and once such a curve is obtained it is only necessary to cause the pencil or pointer to follow it in order to reproduce the same condition.

When the compression is finished, the bottom ram is withdrawn, and the top ram brought into play, thus stripping the ingot. The mold is then removed in the ordinary way and the ingot taken to the ingot yard. Ingots of 5 tons and upwards treated by the above plant are used solely for making heavy forgings at the company's steam-hydraulic forging plant at New Glasgow. From tests conducted on uncompressed and fluid compressed steel at the Sydney Mines plant, the results were such as to amply justify the claims already made for the Harmet process of manufacture as being superior in every feature where forging ingots of homogeneous structure and maximum reliability are called for.

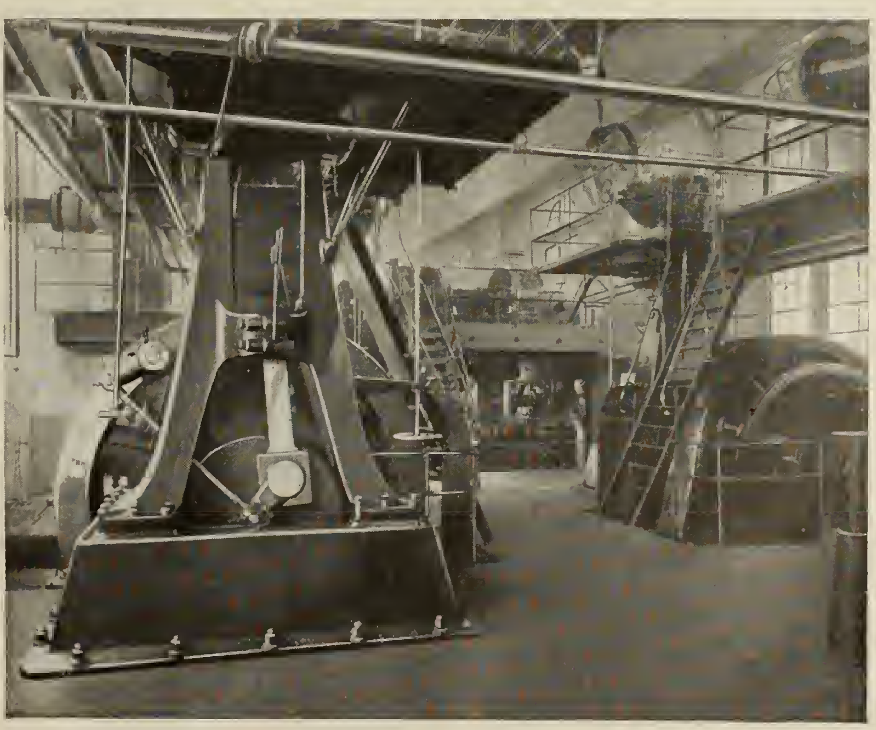
MAJOR C. L. CANTLEY,
Ordnance Advisor and Assistant to the President.

Miscellaneous Equipment Data

Coal Washer—The washed coal from the Washer Plant is delivered on a Robins conveyor belt to the coke ovens storage tank, and the "middles" or boiler coal is delivered on a similar belt to the colliery boilers. The outstanding features of this plant are as follows:—The washed product before leaving the Washer is dried by natural drainage in the draining band down to eight per cent. moisture. There is also an ingenious device for the recovery of the fine floatings which are ordinarily lost. The last operation is the pulverizing of the coal, insuring thorough mixture; and the fact that all metallic substances are removed in the first washing box avoids the possibility of damage to the mechanism, which is incidental to the washing machinery in plants where the crushing is the first operation.

Coke Ovens—One battery of coke ovens in the vicinity of the Coal Washer Plant, of the Bauer retort type, is 38 ft. long, 7 ft. high, and 20-22 inches wide. The waste gases from these ovens are used to generate steam at Princess Colliery. The ovens are charged from the top, and the coke pushed by a steam-driven ram-type pusher. There are also three batteries of 40 ovens each—120 altogether—of Bernard retort type, their dimensions being 32 ft. long, 5 ft. 8 in. high, and 21-23 inches wide. The waste gases are used to generate steam for the electric power plant. Ovens are charged from the top, and coke is pushed by electrically-operated pushers.

Central Power Plant—The power plant is operated by three Stirling water-tube boilers, of 310 h.p. each, working at 200 lbs. pressure, with 100 degrees of superheat, together with nine fire-tube boilers, by Mathieson, New Glasgow, fired with waste heat from the ovens, working at 150 lbs. pressure, and developing approximately 100 h.p. each. The engine-room equipment consists of two 400 k.w. Canadian General Electric 250-volt, direct current generators, connected to two 18-in. and 36-in. diameter cylinders by 24-in. stroke vertical cross compound con-



POWER PLANT INTERIOR, SHOWING STEAM ENGINE AND STEAM TURBINE DRIVEN ELECTRIC GENERATORS, SYDNEY MINES.

densing Robb engines, running at 150 r.p.m. At present these engines are run non-condensing; the exhaust going to a mixed pressure 750 k.w. turbine of the Rateau multicellular type. There is also a 200 k.w. Canadian Westinghouse 220-volt, 3-phase, 60-cycle, motor-driven alternator. The 750 k.w. mixed pressure turbine is driven from three above-mentioned Stirling water-tube boilers, fired with the waste gases from coke ovens. A 2,000 k.w. steam turbine, to be connected to a 2,000 k.w., 3-phase, 60-cycle, 2,200-volt alternator, with surface condensing equipment, is now in course of construction.

Blast Furnace—The power equipment for the blast furnace consists of a compound disconnecting blowing engine, with 72-inch blowing tubes, made by the Southward Foundry & Machine Co., Philadelphia, Pa. The engine is running condensing, with Worthington barometric condenser. The pumping equipment consists of three outside packed Epping-Carpenter circulating pumps, with a capacity of 36,000,000 gallons in twenty-four hours; and one Belliss & Morcom engine, direct connected to a Rees-Roturbo pump, which has a capacity of 4,000 gallons per minute. The power equipment is operated from six 300 h.p. Stirling water-tube boilers.

Open-Hearth—The open-hearth furnaces are fired by groups of four standard hand-fired Duff producers, except in one instance, where two mechanically-fired Chapman producers are used. The Basic Siemens-Martin process is used. The plant is equipped with two 75-ton ladle cranes, built by the Shaw Electric Crane Co., of Muskegon, Ohio. The ingots are stripped and handled with a combination electric yard and stripper crane, built by the Alliance Crane Co., of Alliance, Ohio. The furnaces are charged with a standard Wellman-Seaver electrically-driven charging machine, are of the latest open-hearth design, and are equipped with Blair water-cooled port ends and hoods. The plant has an approximate capacity of 14,000 tons per month.

Welfare Work—Sydney Mines

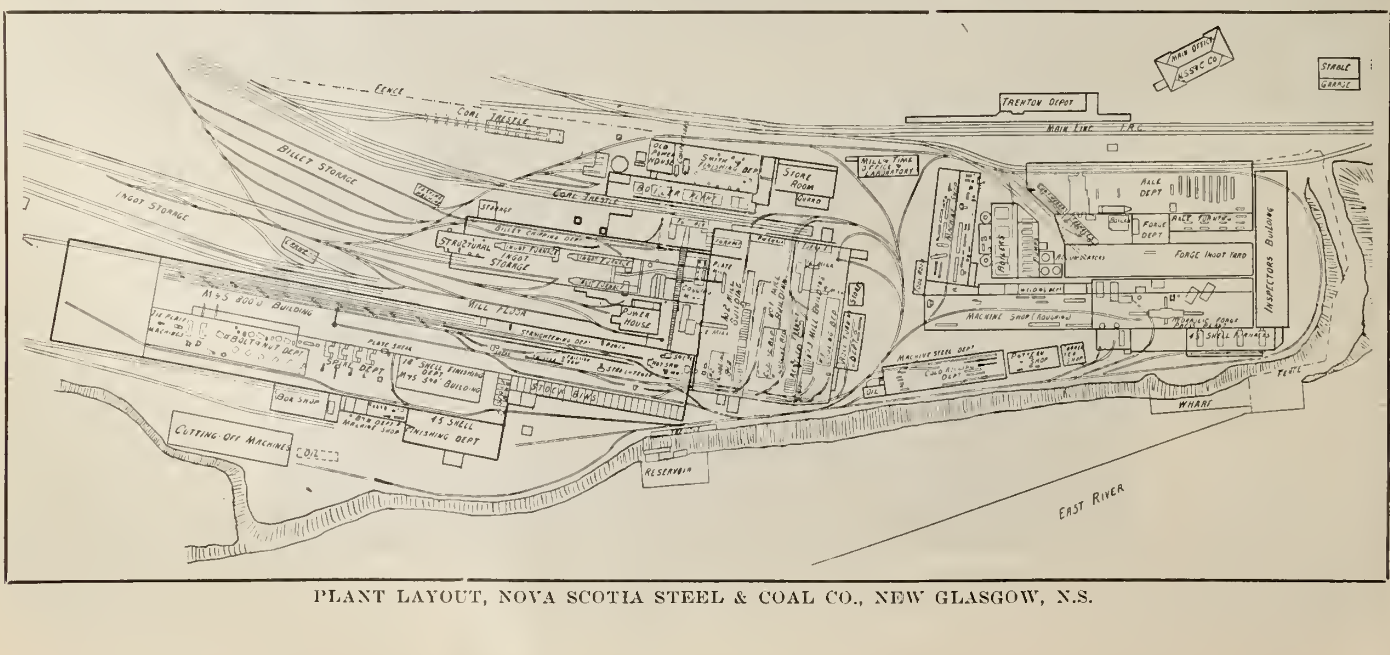
At the various Sydney Mines plants, about 3,600 workmen are employed. The town of Sydney Mines is literally the creation of the "Scotia" Company, and is a model in every respect, comparing more than favorably with similar places either here or abroad.

When the property was acquired from the General Mining Association, the policy was adopted of dividing up the larger holdings into building lots in size of about 70 feet frontage and of 130 to 140 feet in depth. These lots were offered for sale to the general public at reasonable rates and to the workmen at a considerably lower figure. To further aid the workmen in their desire to become owners of comfortable homes, the Company agreed to build houses on the purchased lots on the instalment plan, each workman deciding on the plan of house most suitable for his requirements and repaying the advance at so much per month, with interest on the money. The whole amount being paid, the workman receives a clear title to his house and land. The result has been the building of a clean modern town with attractive, comfortable, and substantial homes.

HEAD OFFICE, NOVA SCOTIA STEEL & COAL CO., NEW GLASGOW, N.S.

A large brick hospital costing in the vicinity of $65,000 has been erected, and is maintained by monthly subscriptions from every workman, by annual contribution from the company, the Town of Sydney Mines, County of Cape Breton, and Province of Nova Scotia. An efficient staff of physicians and nurses is always in attendance.

Well constructed ambulances constitute part of the equipment provided by



PLANT LAYOUT, NOVA SCOTIA STEEL & COAL CO., NEW GLASGOW, N.S.

the Scotia Company for the conveyance of the sick and injured. A "rescue car", furnished with all modern apparatus for fire fighting and rescue work in mines, and provided with all the necessities of a travelling hospital, stands on the railroad tracks in front of the general offices ready to be rushed to the point where needed. It is also worthy of mention that every officer of the Nova Scotia Steel & Coal Co., employed at the works, holds a certificate from the St. John's Ambulance Association, and is capable of rendering first aid to the injured.

First aid boxes are placed at the collieries and at the different surface plants, and two officers are employed, one on the surface and one underground, whose sole duties are to investigate conditions about the plant or mines, and take steps to insure protection for the men at their work. Further, by means of literature and notices, the "safety first" movement is encouraged and promoted among the employees with beneficial results. Change houses are also provided at all collieries where the workmen may wash and change their clothes on completion of their shift.

One other feature showing the friendly relations existing between Company and workmen is the provision made by the Company for the free transportation of the men every morning and evening from their homes to the different works. The trains are comfortable, well lighted and heated, are a great convenience to the employees, and their institution has been decidedly advantageous to the Company and the town of Sydney Mines generally. As a result, the building of houses is concentrated in the town and there are no struggling untidy villages surrounding the various collieries.

PATTERNS BROUGHT FROM STORAGE.

EVEN when castings are wanted without alteration from a pattern which it is certain has never been altered, it is seldom that the latter can be taken from the stores and sent into the foundry without requiring something done to it in the pattern-shop. A pattern in regular use can be relied on, but one which has been out of use for a long time cannot. Wood is liable to shrink and warp, especially in a new pattern which has had time for this to occur, and has not received attention since being made. Shrinkage may affect important dimensions, but more frequently it causes overlapping joints which tear up sand in being drawn from the mold. The pattern must be examined for this and tested for truth on surfaces liable to warp, besides being measured and examined for breakage or possible missing details.

A warped surface may be planed true if sufficient material can be removed without reducing too much the thickness of metal or over-all measurements. Sometimes battens are screwed on to pull the surface true, and are stopped off in the mold. In other cases a concave surface can be straightened by wetting the central part and causing it to swell, and so regain its original form. A part originally circular may become elliptical through shrinkage, and this has to be rectified, often by inserting a piece.

Shrinkage in some places can be made good by putting pieces on. Sometimes the shrinkage may be in a place where it does not matter, or it may be so small in amount that it can be ignored. Damaged corners or other parts may have to be made good by letting pieces in. Fillets are often broken or missing and require replacement. Varnish wears off when a pattern has been molded from a good many times, and more varnish must be put on, preceded by thorough glass-papering and scraping where necessary to remove roughness. Work of this kind has to be done on old patterns before they go into the foundry even when the castings required are similar to previous ones.

OUR 1916 IRON AND STEEL OUTPUT

OFFICIAL figures compiled by the American Iron & Steel Institute show that the production of pig iron in Canada in the first half of the current year was 40 per cent. ahead of production in the corresponding period of 1915, and 11 per cent. ahead of production in the last half of that year. At the rate of production in the first half of this year it is possible, if not likely, that the output for the full twelve months will exceed the high record established in 1913.

The total production of pig iron up to June 30 of this year was 507,750 tons and compares with 366,825 tons in the first half of 1915, 458,595 tons in the second half, and 1,015,118 tons for the full twelve months of the record breaking year of 1913.

Production of steel ingots and castings in Canada, according to the Institute, promises to break all records in 1916. Last year, production was very near the high record of 1,042,503 tons in 1913. The output in 1915 was 912,755 tons, compared with only 743,352 tons in 1914, an increase for the year of approximately 22 per cent.

The figures are interesting as official confirmation of the results achieved by the Canadian manufacturers in their effort to overtake an insistent demand, which has promised not only a market for all that can be produced, but a market at extremely attractive prices.

Pig Iron

The following table shows the production of pig iron in grades in 1915 and 1916

	First Half 1915.	Second Half 1915.	First Half 1916.
Basic	292,556	367.813	388,387
Bessemer	5,228	8,476	12,575
Foundry, etc.	59,646	66,123	95.602
All other	9,385	6,183	11,186
Total gr. tons..	366,825	458,595	507,750

The output of pig iron, though larger in 1915 than in 1914, was still far below the record of 1912 and 1913. Production for 1915 amounted to 825,420 tons, compared with 705,972 tons in 1914 and the high record of 1,015,118 tons in 1913. Basic pig iron was the only grade showing larger output than in 1913 and 1912. The production of this grade of pig iron was 660.369 tons, compared with 558,524 tons in 1913 and 489,799 tons in 1912. Following table shows production of grades of pig iron from 1910 to 1915:

Years	Basic	Bessemer	Foundry	All Other	Total
1910 ..	365.000	221,494	143.986	9,640	740,210
1911 ..	413.303	186.274	190.324	34,467	824,368
1912 ..	489.709	228,742	194.208	129	912.878
1913 ..	558.524	227.662	225,231	3.701	1,015.118
1914 ..	231.456	184.053	174.346	16,117	705,972
1915 ..	660,369	13.714	125,769	25.568	825,420

Steel Production

The following table shows steel production since 1910:

Year	Open-Hearth	Bessemer	Other Kinds	Total
1910	542,354	199.570	....	741.924
1911	601.074	189,797	....	790.871
1912	645.062	207.569	400	853,031
1913	768.663	273.391	449	1,042,503
1914	556.910	186.158	284	743,352
1915	884,736	22,521	5,498	912,755

Production of steel rails in 1915 was far below the production of any year since 1905. Since that year, excluding 1915, output of steel rails in the Dominion has averaged in excess of 364.000 tons a year, comparing with only 209,752 tons in 1915. As will be seen from the following table, other finished rolled forms of leading products have equalled or exceeded previous year's outputs:

Product	1912	1913	1914	1915
Rails	423,885	508,709	382,244	209.752
Struct. shapes and wire rods.	64,082	68.048	59,050	114,829
Plates & sheets, nail plate, merchant bars, tie-plate bars, etc.	373,257	392,340	218.125	328,737
Grand total, tons	861,224	967,097	659,519	653.318

Miscellaneous

Production of wire nails in 1915 is estimated at 1,636,000 kegs of 100 pounds, as compared with 1,144,000 kegs in 1914, an increase of 492,000 kegs, or nearly 5,000,000 pounds. Output of cast iron pipe amounted to 53,700 net tons, as compared with 93,200 tons in 1914, a decrease of 39,500 tons.

CANADA'S HUGE TRADE INCREASE

THE aggregate trade of Canada in four months has increased by more than 100 per cent. The July trade as shown in the monthly summary issued August 24, by the Hon. J. D. Reid, Minister of Customs, showed the phenomenal rise of 141 per cent., or $139,860,450. The total trade for the month amounted to $238,-860,488, and for the four months ending July 31 it reached the total of $766,-372,832, as against $371,646,906 in the corresponding period of last year.

Imports for consumption amounted in value to $63,622,587 in July as compared with $36,622,190 in July last year, while in the four months period they rose from $134,729,377 to $249,867,767. The July exports reached a value of $104,964,270 compared with $45,590,038. In the four months the exports have risen from $159,168,259 to $350,345,305. These are in the figures for domestic imports and exports only.

In the export of foreign merchandise there has been a notable increase, nearly one thousand per cent. The volume of these exports rose from $11,494,457 in the four months of last year to $122,-627,072 in the same period this year.

An interesting feature of the statement is the substantial rise in the imports of free goods; there has been, however, a corresponding increase in the imports of dutiable merchandise, and the duty collected in the four months has risen from $28,085,471 to $46,063,-507.

Shipments of Canadian manufactured products trebled in July amounting to $38,264,136, while the exports of farm products amounted to $38,585,309, or five times the total of July last year. Exports of foreign mine products, which were less than a million in July last year, reached a total of over fifty-four millions last month.

LAKE SUPERIOR CORPORATION SUBSIDIARIES

AGGREGATE net earnings of the Lake Superior Corporation subsidiaries were $3,503,471, last year, as compared with $1,366,210 in the previous fiscal year. The larger income, however, did not go to the parent company, but remains in the hands of subsidiaries in the form of enlarged reserves and balances. The parent corporation's income consisted of interest on bonds of subsidiaries amount-to $290,000 and other income of $45,795, making a total of $335,759, as against one of $369,032 in the previous year. The disbursements out of income were somewhat less, being $310,305, leaving a net of $25,454. This added to the balance from last year leaves a sum of $50,526, of which $40,000 was applied to reserve for depreciation of securities and the balance carried forward.

Algoma Steel

The amount realized by the Algoma Steel from last year's sales compared favorably with the record year, 1913-1914. The tonnage in each of the last three years was as follows—

	1913-14	1914-15	1915-16
Pig iron, tons	311,904	212,917	258,504
Steel rails, tons	325,680	174,536	*215,416
Merchant. tons	15,576	8,903	......

*This figure includes rails, shell, and merchant steel.

The water power which the company owned has been disposed of for $1,000,-000, which sum is held by trustees and is available for new construction.

COMBUSTION IN THE CUPOLA

THE completeness of combustion and the rate of burning in the cupola depends on the air supply and how it is introduced. It should be the aim when designing a cupola to see that the tuyeres and auxiliary tuyeres are so arranged as to obtain as nearly as possible absolute combustion. To obtain complete combustion the whole of the carbon of the coke should burn to carbon dioxide (CO_2). Carbon dioxide or carbonic acid is a colorless and invisible gas. If the combustion of the carbon or coke be not complete it passes off in the form of carbon monoxide (CO). Carbon monoxide or carbonic oxide is produced when carbon is burned with a limited supply of oxygen. It is the main source of heat when producer gas is burned, and the main agent by which oxide of iron is "reduced" in the blast furnace. It is a poisonous gas when inhaled.

One pound of pure carbon burned to CO_2 produces 15,544 B.t.u. of heat (one B.t.u. being the amount of heat required to raise 1 lb. of water 1 deg. Fah., the water being at 39 deg. Fah.) One pound of carbon burned to CO. only generates 4,320 B.t.u. If carbon monoxide be mixed with a sufficient amount of air, it produces carbon dioxide (CO_2) and evolves 10,220 B.t.u.

It should be the aim, therefore, of every foundryman to produce as much CO_2 from the coke as possible, and with this object in view the introduction of small auxiliary tuyeres immediately above the melting zone is advocated, these being not less than 2 ft 6 in. nor more than 4 ft. above the top of the tuyeres. The total area of these should be about 1/8th the area of the main tuyeres and each about 2 in. in diameter. Care should be taken not to set up another zone of fusion, nor should the auxiliary tuyeres be too high from the main tuyeres, because if placed too high they might only cool the gases.

In cupolas without auxiliary tuyeres a proportion of the carbon of the coke leaves the melting zone in the form of CO. It was, however, possible, to transfer this into CO_2 by bringing it into contact with a necessary supply of air, through the auxiliary tuyeres. It is stated that cupolas in a very important foundry in the West of Scotland are built on this principle and give a continuous average output of 16 of iron to 1 of coke, the bed charge being included.

ARMSTRONG, WHITWORTH, OF CANADA STEEL PRODUCTS

THE very great importance attached to high-speed steel as a result of the development of munition manufacture impart peculiar interest to the fact that this material is now "Made in Canada." The fact that it is produced by Armstrong, Whitworth is sufficient guarantee that it will measure up to requirements, and if visible evidence is necessary, the interested visitor may inspect samples of work done by it at the leading munitions plants of this country. The proportions and color of the cuttings, which might be termed chunks rather than chips, will convince the practical inquirer without any further argument. A manufacturing department has been established at the works at Longueuil, Que., equipped in the most modern manner, which enables the firm to offer a range of miscellaneous shop tools heretofore not made in Canada. Numerous samples of milling cutters, inserted tooth saws, worm hobs, gauges, etc., made of the company's high-speed and carbon steel are tastefully displayed at the Canadian National Exhibition. Other products of the plant include electric furnace steel in all grades of carbon and alloy, locomotive and car wheel tires, rolled steel wheels and heavy forgings to specifications.

A WASTE OF ENERGY

MUCH of the working capacity of men is wasted because their superiors keep them doing little things that are far below their ability. One often sees grown young men working at the elbow of a manager and being employed on errands and details that a boy might do. The manager is sometimes merely thoughtless in the matter. He wants his office-boy work well done, and gives it to a man to do. A manager in turn often receives a lot of little nothings from the man above him, which he must attend to himself because he was asked to, when a young man might do them just as well. An expert is often asked to take on routine that is far below his normal plane of work—even while others are being deprived of growth for want of that very work.

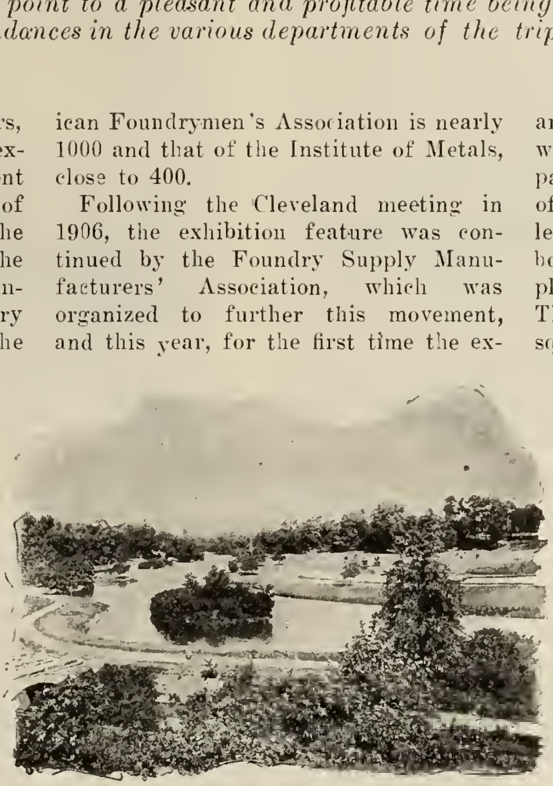
Programme of Foundrymen's Convention and Exhibition

"Contributed"

The annual conventions of the American Foundrymens' Association and of the American Institute of Metals, together with an exhibition of foundry and machine tool equipment, foundry accessories and supplies, are scheduled to be in Cleveland, Ohio, from September 11 to 16. All indications point to a pleasant and profitable time being spent, and to the establishment of record attendances in the various departments of the triple function's activities.

AFTER the lapse of 10 years, Cleveland, the birthplace of exhibitions of foundry equipment and supplies, will again be the host of the great army of foundrymen of the North American continent, during the week of Sept. 11. Prior to 1906, individual manufacturers of foundry devices displayed their product in the rooms of the hotels where the headquarters of the American Foundrymen's Association were established, but in the spring of 1906, a half dozen manufacturers of foundry equipment in Cleveland and vicinity, formed an organization for the conduct of an exhibition in Central Armory. The first attempt, while not nearly on so extensive a scale as the show this year, proved to be a marked success and the attendance was fully three times as great as that at previous annual meetings which were not featured by an exhibition of any kind. In that year the membership of the American Foundrymen's Association was only 300, but with this added stimulus it climbed beyond the 500-mark in 1907, and reached nearly 700 the following year. At that time the membership included brass foundry operators who since have organized the American Institute of Metals, but notwithstanding this transfer of membership, the present enrollment of the American Foundrymen's Association is nearly 1000 and that of the Institute of Metals, close to 400.

Following the Cleveland meeting in 1906, the exhibition feature was continued by the Foundry Supply Manufacturers' Association, which was organized to further this movement, and this year, for the first time the exhibition will be held under the joint auspices of the American Foundrymen's Association and the American Institute of Metals. The wonderful strides that have been made in the foundry industry are best reflected by contrasting the initial exhibition in Cleveland in 1906, with that to be held during the week of Sept. 11. At that time the limited floor area afforded by the Central Armory was more than ample for the 42 companies that made displays. The number of individual exhibits was considerably less than this number, since some of the booths contained the equipment and supplies of two or more manufacturers. This year the Coliseum, with its 60,000 square feet of space, is inadequate to the needs of the exhibition and a temporary building has had to be erected to house the show, directly across from the main exhibition hall. Although at the time that this was written the number of manufacturers who had reserved space totaled 143. it is estimated that when the doors of this wonderful show are opened at 2.00 p.m., Monday, Sept. 11, some 150 individual exhibits will have been installed.



ROCKEFELLER PARK, ONE OF CLEVELAND'S MANY BEAUTY SPOTS.

Convention Sessions

Heretofore the annual meetings of the American Foundrymen's Association and the American Institute of Metals were opened on Tuesday morning of convention week, but on account of the one-meeting-per-day plan inaugurated this year, the opening joint session will be held at the Hotel Statler at 2.30 p.m., Monday, Sept. 11, and the closing meetings will be held on Friday morning, Sept. 15. Another joint session will be

PUBLIC SQUARE, CLEVELAND, THE HUB OF THE CITY.

held on Tuesday morning, to be followed by separate meetings of the two organizations, Wednesday, Thursday and Friday mornings. This arrangement of the program will permit of a closer inspection of the exhibits, while the entertainment features will not encroach upon the technical sessions as in the past.

VIEW IN CLEVELAND HARBOR.

SCENE AT CLEVELAND'S ORE DOCKS.

The headquarters for the American Foundrymen's Association and the American Institute of Metals will be at the Hotel Statler, while that of the exhibitors will be at the Hotel Hollenden. The Coliseum and Annex, where the exhibition will be held, are in close proximity to the hotel headquarters, the Hollenden being three blocks distant, and the Statler one block.

Technical Sessions

The technical programme of the American Foundrymen's Association is the most elaborate and complete in the history of that organization. It contains 40 papers and addresses and 11 committee reports. To provide ample opportunity for discussions, simultaneous sessions will be held on Thursday and Friday mornings. General topics will be considered on Wednesday, followed by steel and malleable sessions on Thursday, and gray iron and steel on Friday. The final business meeting will be called to order at noon on Friday, the gray iron and steel sessions to be adjourned at this hour to enable the members to attend the meeting to close the convention. At the joint opening session, Monday afternoon, the reports of the officers will be submitted and the negotiations leading to the managements of the exhibition by the two allied associations and the incorporation of the American Foundrymen's Association will be outlined in detail. Local and national recognition has been accorded the foundrymen's convention this year. The oddress of welcome will be delivered by Hon. H. L. Davis, mayor of the City of Cleveland, and Hon. Newton D. Baker, secretary of war, will deliver the banquet address.

The program of the American Foundrymen's Association contains three interesting symposiums, by four authors each, respectively on the gating of castings, the relation of the engineer to the foundry and the manufacture of electric steel castings. A new safety code for iron, steel and brass foundries, which is claimed to be a big improvement on the rules now in force in several states, will be presented for adoption and the action that will be taken will be of far-reaching importance throughout the United States. The report of the Committee on Foundry Scrap represents the first effort on the part of any organization to bring order out of the chaos which exists in the purchase of this material, and the making of quototions on a uniform net ton basis in every important scrap center will be recommended. The old material for general foundry use also has been classified and if this report is adopted the first step will be taken toward the elimination of the hit-or-miss method of scrap purchase. The reclamation of waste foundry sand is another topic that will be considered by several authors and the methods to be described will effect economies in every foundry where they are adopted.

EUCLID AVENUE, CLEVELAND'S PREMIER THOROUGHFARE.

Joint meetings of the American Institute of Metals will be held with the

American Foundrymen's Association, at the Hotel Statler, Monday afternoon and Tuesday morning and separate sessions will be held on Wednesday, Thursday and Friday mornings. The program is unusually complete, containing 21 papers on all phases of brass foundry and rolling mill work. Brass foundry practice will be discussed Wednesday morning; heat-treatment, corrosion, etc., Thursday and papers on physical tests, metallography, etc., will be read Friday morning.

Entertainment Features

An unusually elaborate entertainment program has been provided by the foundrymen of Cleveland, which includes tickets for the ball game on Tuesday afternoon, Sept. 12, to witness the contest between the Cleveland and Detroit teams of the American League; a theater party Tuesday evening; an inspection trip to the Cleveland Blast Furnace Co. plant Wednesday afternoon, Sept. 13; a trip to Euclid Beach Park Wednesday evening in special cars which will be parked on Walnut Street between Ninth and Twelfth Streets, two blocks north of the Hotel Statler, and which will leave for the park at 7.30 p.m. The visiting ladies will receive tickets for the ball game, theater party and Euclid Beach Park and in addition they will be given a luncheon at the Hotel Statler at noon, Wednesday, Sept. 13. A 2.00 o'clock the same day they will leave on a sight-seeing automobile trip, which will include the entire park system of the Forest City. The ladies are extended a hearty invitation to attend the banquet, where each will be the recipient of a handsome souvenir.

Hon. Newton D. Baker, Secretary of War, will be the principal speaker at the annual subscription banquet to be held at the Hotel Statler, Thursday evening Stpe. 14. Mr. Baker is a speaker of unusual ability and his address is expected to attract international attention. The only other speaker of the evening will be the noted humorist, Irving Bacheller, whose topic will be "The Cheerful Yankee." Henry A. Carpenter, vice-president of the American Foundrymen's Association, will be toastmaster.

Devotees of the game of golf will be afforded the privileges of the club houses and links of five clubs throughout convention week. All of the expenses will be defrayed by Cleveland foundrymen and the members of the golf committee will be the sponsors of the visitors. Guest cards to any of the clubs may be obtained at the registration desk on the mezzanine floor of the Hotel Statler.

Plant Visitation

Plant visitation will be limited to two days, Thursday and Friday, Sept. 14 and 15. This arrangement will enable the local committee to concentrate its efforts, since there will be no interference with the entertainment program. The inspection of plants by groups of visitors has been provided for at designated hours, which will insure better attention than if plant visitation were continued throughout the week. The most modern shops in the city have been selected by the committee, which insures the success of this feature, although special arrangements can be made for visits to other plants than those specially selected. A list of the plants to be visited, together with the hours set apart for inspection, follows:

Ferro Machine & Foundry Co., Thursday, Sept. 14, from 9.00 a.m. to 12.00 noon. This plant specializes in the manufacture of automobile, motor boat and other gas engine cylinders.

Interstate Foundry Co., Friday, Sept. 15, 9.00 a.m. to 12.000 noon. This plant specializes in automobile work.

Westinghouse Electric & Mfg. Co., all day Thursday and Friday, Sept. 14 and 15. In this plant recently has been installed a continuous system of operation, which includes sand-conveying apparatus linked up to the molding machines, with pouring by a separate gang throughout the day. The new cleaning room is also a model of its kind.

West Steel Casting Co., all day Friday, Sept. 15. This foundry specializes in the manufacture of light steel castings particularly wheels for motor trucks.

Allyne-Ryan Foundry Co., Thursday and Friday, Sept. 14 and 15, 9.00 a.m. to 12.00 noon. This is one of the largest automobile cylinder foundries in the United States and the methods pursued in this shop will prove to be a revelation to the visiting foundrymen.

City Foundry Co., all day Thursday and Friday, Sept. 14 and 15. This is a large grey iron foundry specializing in machinery work.

Best Foundry Co., Bedford, O., all day Thursday and Friday, Sept. 14 and 15. This is one of the largest stove foundries in the United States, all of the work being made on molding machines.

Exhibition Data

The exhibition of foundry supplies and equipment, machine tools and accessories, to be held in the Coliseum and Annex, will be opened formally at 2 p.m., Monday, September 11, and will close at 5 p.m., Saturday, September 16. The two buildings afford approximately 70,000 square feet of floor space, a large part of which will be occupied by operating exhibits. Demonstrations of molding machines and other heavy machinery and equipment will be made in the Annex, although smaller operating exhibits also will be located in the Coliseum. Saturday, September 16, will be Cleveland Day at the exhibition, and it is probable that many local shops will shut down to enable their employees to attend the exhibition.

List of Exhibitors

Arcade Mfg. Co., Freeport, Ill.
Ajax Metal Co., Philadelphia.
Alexander Bros. Lumber Co., Cleveland.
Amalgamated Machinery Corp., Chicago.
American Foundry Equipment Co., New York.
American Gum Products Co., New York.
American Molding Machine Co., Terre Haute, Ind.
Armstrong Cork Co., Pittsburgh.
Atkins & Co., E. C., Indianapolis.
Ayer & Lord Tie Co., Chicago.
B. & B. Mfg. Co., Indianapolis.
Besly & Co., Chas. H., Chicago.
Beighlee Electric Co., Cleveland.
Berkshire Mfg. Co., Cleveland.
Birkenstein & Sons, S., Chicago.
Blystone Mfg. Co., Cambridge-Springs, Pa.
Brass World Publishing Co., New York.
Brown Hoisting Machinery Co., Cleveland.
Brown Specialty Machinery Co., Chicago.
Buckeye Products Co., Cincinnati.
Carborundum Co., Niagara Falls, N.Y.
Cataract Refining & Mfg. Co., Buffalo.
Champion Foundry Machinery Co., Chicago.
Chicago Eye Shield Co., Chicago.
Chicago Pneumatic Tool Co., Chicago.
Cincinnati Pulley Machinery Co., Cincinnati.
Clark, Charles J., Chicago.
Cleveland Blow Pipe & Mfg. Co., Cleveland.
Cleveland Pneumatic Tool Co., Cleveland.
Cleveland Wire Spring Co., Cleveland.
Coale Lumber Co., Thos. E., Philadelphia.
Curtis Pneumatic Machinery Co., St. Louis.
Dalton Adding Machine Co., Norwood, Cincinnati.
Davis, Bournouville Co., Jersey City, N.J.
Demmler, Wm., & Bros., Kewanee, Ill.
Davenport Machine & Foundry Co., Davenport, Ia.
Dixon Crucible Co., Joseph, Jersey City, N.J.
Electric Controller & Mfg. Co., Cleveland.
Excelsior Tool & Machine Co., East St. Louis, Ill.
Federal Foundry Supply Co., Cleveland.
Felt & Tarrant Mfg. Co., Chicago.
Foundry Equipment Co., Cleveland.
Foundry, The, Cleveland.
Gardner Machine Co., Beloit, Wis.
General Electric Co., Schenectady, N.Y.
Gibb Instrument Co., Pittsburgh.
Gisholt Machine Co., Madison, Wis.
Goldschmidt Thermit Co., New York.
Gordon Sand Co., Conneaut, O.
Graceton Coke Co., Graceton, Pa.
Great Western Mfg. Co., Leavenworth, Kas.
Hardy & Co., F. A., Chicago.
Harris & Co., Benjamin, Chicago.
Hauck Mfg. Co., Brooklyn, N.Y.
Hayward Co., New York.
Herman Pneumatic Machine Co., Pittsburgh.
Herold Bros. Co., Cleveland.
Holtz, Herman A., New York.
Hill-Brunner Foundry Supply Co., Cincinnati.
Hill & Griffith Co., Cincinnati.
Hoevel Mfg. Corporation, New York.
Imperial Brass Mfg. Co., Chicago.
Ingersoll-Rand Co., New York.
International Molding Machine Co., Chicago.
Interstate Sand Co., Zanesville, O.
Iron Age, The, New York.
Iron Trade Review, The, Cleveland.
Jennison-Wright Co., Toledo.
Kawin Co., Chas. C., Chicago.
King Optical Co., Julius, New York.
Lake Erie Smelting & Refining Co., Cleveland.
Lakewood Engineering Co., Lakewood, O.
Lane, H. M., Detroit.
Lees-Bradner Co., Cleveland.
Lehigh Coke Co., South Bethlehem, Pa.
Life Saving Devices Co., Chicago.
Lincoln Electric Co., Cleveland.
Lucas Machine Tool Co., Cleveland.
Lupton's Sons Co., David, Philadelphia.
McCormick Co., J. S., Pittsburgh.
MacLean Publishing Co., Toronto, Ont., Canada.
Macleod Co., Cincinnati.
Mahr Mfg. Co., Minneapolis.
Malleable Iron Fittings Co., Branford, Conn.
Manitowoc Electric Implement Co., Manitowoc, Wis.
Metal Industry, New York.
Metal Record & Electroplater, Bridgeport, Conn.

Michigan Smelting & Refining Co., Detroit.
Midland Machine Co., Detroit.
Moldar Co., Maspeth, N.Y.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Engineering & Mfg. Co., Baltimore.
Mott Sand Blast Mfg. Co., Chicago.
Multi-Metal Separating Screen Co., New York.
Mumford Co., E. H., Elizabeth, N.J.
Mumford Molding Machine Co., Chicago.
National Engineering Co., Chicago.
New Haven Sand Blast Co., New Haven, Conn.
Norma Co. of America, New York.
Norton Co., Worcester, Mass.
Obermayer Co., S., Chicago.
Oliver Machinery Co., Grand Rapids, Mich.
Osborn Mfg. Co., Cleveland.
Oxweld Acetylene Co., Chicago.
Paxson Co., J. W., Philadelphia.
Pangborn Corporation, Hagerstown, Md.
Philadelphia Bourse, Philadelphia.
Phoenix Mfg. Co., Eau Claire, Wis.
Pickands, Brown & Co., Chicago.
Pittsburgh Crushed Steel Co., Pittsburgh.
Portage Silica Co., Youngstown, O.
Pridmore, Henry E., Chicago.
Prest-O-Lite Co., Indianapolis.
Railway Age-Gazette, New York.
Robescu Process Co., New York.
Rogers, Brown & Co., Cincinnati.
Sand Mixing Machine Co., New York.
Searchlight Co., Chicago.
Sipp Machine Co., Paterson, N.J.
Sly Mfg. Co., W. W., Cleveland.
Smith Co., Werner G., Cleveland.
Smith Facing & Supply Co., Cleveland.
Smith & Sons, R. P., Chicago.
Snyder Electric Furnace Co., Chicago.
Standard Sand & Machine Co., Cleveland.
Sterling Wheelbarrow Co., West Allis, Wis.
Stevens, Frederic B., Detroit.
Stodder, W. F., Syracuse, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Sullivan Machinery Co., Chicago.
Superior Sand Co., Cleveland.
Thomas Elevator Co., Chicago.
Titanium Alloy Mfg. Co., Niagara Falls, N.Y.
Union Steam Pump Co., Battle Creek, Mich.
U. S. Graphite Co., Saginaw, Mich.
U.S. Molding Machine Co., Cleveland.
United States Silica Co., Chicago.
Wadsworth Core Machine & Equipment Co., Akron, O.
Wallace, J. D., Chicago.
Warner & Swasey Co., Cleveland.
West Haven Mfg. Co., New Haven, Conn.
Wheeler & Holcomb, Chicago.
White & Bros., Ltd., Philadelphia.
Whiting Foundry Equipment Co., Harvey, Ill.
Wood's Sons, T. B., & Co., Chambersburg, Pa.
Woodison, E. J., Co., Detroit.

Condensed Programme

Monday, Sept. 11.

9.00 a.m.—Registration, mezzanine floor Hotel Statler.

2.00 p.m.—Opening of the Exhibition in the Coliseum and the Annex.

2.30 p.m.—Joint opening session. American Foundrymen's Association and American Institute of Metals, Hotel Statler.

Tuesday, Sept. 12

10.00 a.m.—Joint session. American Foundrymen's Association and American Institute of Metals.

3.00 p.m.—Ball game, Cleveland vs. Detroit, American League Park.

8.15 p.m.—Theatre party.

Wednesday, Sept. 13

10.00 a.m.—Professional session of the American Foundrymen's Association at the Hotel Statler, for the discussion of general topics.

10.00 a.m.—Professional session, American Institute of Metals, Hotel Statler, for the discussion of foundry practice.

12.00 m.—Ladies' luncheon at the Hotel Statler.

1.00 p.m.—Inspection of the Cleveland Furnace Co.'s plant. Sight-seeing automobiles will make trips at 30-minute intervals from the Hotel Statler to the blast furnace plant.

2.00 p.m.—Ladies' sight-seeing automobile trip.

7.30 p.m.—Trip to Euclid Beach Park in special cars.

Thursday, Sept. 14

10.00 a.m.—Steel session, American Foundrymen's Association, Hotel Statler.

10.00 a.m.—Malleable session, American Foundrymen's Association, Hotel Statler.

10.00 a.m.—Professional session of the American Institute of Metals, at the Hotel Statler, for the discussion of heat treatment, corrosion, etc.

7.00 p.m.—Annual banquet, Hotel Statler.

Friday, Sept. 15

10.00 a.m.—Gray iron session, American Foundrymen's Association, Hotel Statler.

10.00 a.m. — Steel session, American Foundrymen's Association, Hotel Statler.

10.00 a.m.—Professional session of the American Institute of Metals, at the Hotel Statler, for the discussion of physical tests, metallography, etc.

12.00 m.—Final business session, American Foundrymen's Association, Hotel Statler.

Saturday, Sept 16

5.00 p.m.—Exhibition closes.

Plant visitation is limited to Thursday and Friday, Sept. 14 and 15.

CLEVELAND AS A FOUNDRY CENTRE

THE history of the foundry industry in Cleveland may be traced back nearly to the time when the city itself was founded by the scant handful of pioneers, who endured untold hardships during their journey from the East before they reached the place of their choice where the crooked Cuyahoga empties its muddy waters into Lake Erie. Almost before their crude log cabins were completed, the settlers turned their efforts to shipbuilding, to which industry Cleveland foundries owe their origin. During the first few years of its existence, Cleveland enjoyed a normal growth, but could boast of nothing unusual either commercialy or industrially. The advent of the railroads and the extension of the paths of commerce on the Great Lakes created possibilities for Cleveland that were far beyond the imagination of early settlers, who waited patiently while all of their raw and finished products were hauled in crude wagons or towed in canal boats from the commercial centres of the Atlantic seaboard and the manufacturing districts east of the Alleghenies.

Beginning of Cleveland's Development

When, however, in the middle of the last century, the railroads were established between Cleveland and the coal fields and the boats began to enter the port loaded with iron ore and other products from the wonderful deposits of the Superior region, Cleveland's development started and has continued without pause. Within a few years after the first locomotive reached the city, Cleveland was recognized as one of the leading railroad and shipping centres of the Middle West. Blast furnaces were built to melt the iron ore, and industry after industry was started to convert the raw material into refined products. Thus, in a period of slightly more than 100 years, Cleveland has developed into a city of over 700,000 people, taking high rank among American cities for the diversity of its industries and the quality of its manufactured products.

Cleveland Has 112 Foundries

Cleveland, sixth in the United States in population, ranks third in the number of foundries within the city limits. The following authoritative figures give the number of foundries in the first four cities of United States, but do not include general offices of foundries not located within the city limits:—Chicago, 170; New York, 115; Cleveland, 112; and Philadelphia, 106. That Cleveland has maintained its rank among the leading foundry centres is indicated by similar figures showing the rank of the same cities in 1906. In that year Chicago had 144 foundries; Philadelphia, 100; New York, 90, and Cleveland 81. During the past 10 years, however, the foundry industry of Cleveland has shown the greatest percentage increase, having expanded 38 per cent. in comparison with 28 per cent. for New York, 18 per cent. for Chicago, and 6 per cent. for Philadelphia. If this rate of of growth were continued for a few years, Cleveland would soon assume second place and a period of slightly more than a decade would place Cleveland in the lead.

Well-equipped Shops

A normal and healthy expansion of an industry is gratifying, but cannot always be relied upon as a criterion of progress, if numbers alone are considered. Cleveland foundrymen are reputed to be quick to adopt improvements and innovations in shop methods and the city enjoys the reputation of having some of the best equipped foundries in the country. It also is a centre for the manufacture of molding machines and other foundry equipment. Co-operation between the foundrymen and the several builders of foundry equipment located in Cleveland is responsible, to some extent, for the development which has so materially advanced foundry practice throughout the country within comparatively recent years. Although labor is unusually expensive at the present time, the modern equipment to be found in Cleveland foundries has enabled Cleveland concerns to maintain low production costs and to establish themselves in commanding positions, even in competitive territory.

Leads in Light Grey Iron Castings

The production of light grey iron castings is by far the most important component of Cleveland's foundry industry. In this Cleevland is said to lead the world. The greatest part of the iron melted for light grey iron castings is used in automobile cylinders. Cleveland foundries casts approximately 500,000 complete sets of automobile cylinders every year. The three leading manufacturers of these castings melt, on an average, 300 to 350 tons of iron a day, producing nearly 4,500 sets of cylinders. The automobile industry not only calls upon Cleveland for cylinder castings, but also for a large portion of the various brass and aluminum castings which are so essential in the modern motor car. One of the largest aluminum foundries in United States is located in Cleveland, and although this metal has been generally used but 14 years, the production of aluminum castings is one of the most important phases of Cleveland's foundry industry. During recent years an enormous demand for aluminum castings for vacuum cleaners has developed, while the advent of aluminum pistons promises to make still further demands upon Cleveland's aluminum foundries. Also, this city is noted throughout the United States as a manufacturing centre of brass and bronze plumbing fixtures.

Production of Heavy Castings

Although Cleveland may not be classed as a foundry centre of the first importance in the production of large iron and steel castings, there are several foundries in the city which produce exceptionally heavy castings in large quantities. One of these is operated by a leading shipbuilding concern, and is capable of turning out castings weighing up to 20 tons. The greatest proportion of the work at this foundry is confined to the production of castings used on vessels, such as bed plates, propellers, hubs and other parts made of semi-steel and iron. Several firms in Cleveland specialize in making large steel castings for rolling mills and similar purposes. One foundry has a wide reputation for the production of castings used in sugar mill machinery.

Carriers Aid Development

Excellent transportation facilities have been responsible, in a measure, for the industrial development of Cleveland. This city is served by 10 steam railroads, a number of interurban lines and by 45 steamship companies conducting a strictly freight business. These facilities not only aid the foundry industry by providing a cheap and rapid means of shipping the raw and finished products, but serve to increase the volume of foundry business in Cleveland, because numerous castings are demanded for the construction and maintenance of railroad and vessel equipment. Therefore, in addition to the shipbuilding shops, several railroad foundries are located in Cleveland. Two foundries directly interested in this phase of the work produce thousands of car wheels annually.

NOTES ON THE 1916 CANADIAN NATIONAL EXHIBITION

EACH succeeding year since the outbreak of the war has witnessed the increasing importance of the engineering industry as one of the deciding factors. The co-operation of the Imperial Munitions Board with the authorities of the Canadian National Exhibition has this year resulted in a unique display of war products by the leading munitions firms of the country.

Housed in what was formerly the Education Building, these exhibits possess a double attraction for the discriminating observer; not alone because of the destruction which marks the termination of their existence as manufactured products, but also because of their significance as evidence of the ability and versatility of our manufacturing firms. From motor cars to fuses, from bridges to cartridge cases, from bricks to steel shells, no transfer of effort has been too great to prevent complete success, and as if such incidents were not convincing enough, there is the case of the steel companies who had to produce a new type of steel, and at least one concern which is producing copper bands from the raw metal.

Steel Making

Prominent amongst the large exhibits is that of the Nova Scotia Steel & Coal Co., which consists of samples of the various substances which enter into the composition of shell steel. Coal, coke, iron ore, limestone, magnesite, etc., are all shown in the natural state just as the steel maker uses them. The gradual transformation of these materials into a real live 9.2 shell is illustrated by specimens of pig iron, a full size ingot of shell steel weighing 6,670 lbs., standing eight feet high, and various sizes of bars into which the ingot is rolled and from which the different shells from 18 pdr. to 9.2 in. are forged.

As if in contrast to the massiveness and weight which characterizes the exhibit referred to above, the displays of the Dominion Arsenal, Quebec, and the Russell Motor Car Co., Toronto, show products of the machine shop which vie with each other for accuracy and complexity of manufacture, smallness of component parts, and rigidity of specifications to be met.

NOVA SCOTIA STEEL & COAL CO. EXHIBIT OF RAW MATERIALS, STEEL FORGINGS AND FINISHED SHELLS AT THE 1916 CANADIAN NATIONAL EXHIBITION.

The Grey Iron Foundry of the Montreal Locomotive Works

Staff Article

In addition to the locomotive building and repair plants connected with Canada's principal railroad corporations, outside enterprise, by close attention to and observation of possibilities, has proved itself a valuable adjunct, and has contributed in no small measure to the high degree transportation achievement which the former have placed to their credit.

THE Montreal Locomotive Works was incorporated under the Dominion Companies Act in June, 1902, and in March, 1904, the first locomotive built entirely in every detail in the company's works was delivered to the purchaser, the Toronto, Hamilton & Buffalo Railway Co.

The plant is situated about six miles north-east of the heart of the City of Montreal, between the Canadian Northern Railway on the Northwest and the St. Lawrence river on the southeast and is interested by the Quebec turnpike which is an extension of Notre Dame street, one of the principal streets of Montreal. The property has an area of 68.1 English acres. A system of tracks connects the buildings with the railway mentioned, and through same with all the lines that radiate from Montreal. Tracks also run from the works down to the river front, where the Government has constructed a dock and basin for the accommodation of ocean steamships. It will be seen, therefore that this company possesses every facility for the import of the raw material and export of its finished product in any direction.

Plant Layout.

The layout of the plant which comprises 25 buildings, was the result of a careful study of the problems involved, and is believed to be unique for compactness and minimum distances of handling from raw material to the finished product. One of the distinguishing features of the arrangement is that all the principal shops necessary for the production of a locomotive are included under one roof. Objections raised against this style have been—(1) A possible want of light. (2) Increased insurance; both of which have been met. Indeed, it is believed that no similar shop has been insured at a lower rate; the light shows for itself in the interior photographs. The main building is of structural steel framing, the columns being supported on iron pedestals, which in turn stand on concrete base blocks. The side walls to a distance of four feet above the ground are of stone. At each column is a brick pilaster from the stone work to the roof, the space between the pilasters being

NEW GREY IRON FOUNDRY, SHOWING ONE OF THE CUPOLAS AND SPACES LEFT FOR ADDITIONAL UNITS.

For the most part constructed of glass.

The Foundry

South-east and alongside of the machine shop extension is the foundry 280 ft. long by 220 ft. wide, having two cupolas with capacities of 15 and 20 tons per hour respectively. It will be noticed that ample space is provided on either side of the units shown for additional cupolas. The hot air heating system is also clearly indicated, pipes extending down alongside each main column. At the north end of the moulding department for heavy castings is seen one of the hot air distributing units. A large fan operated by a small vertical engine draws its supply of heated air from the chamber at the right, which is provided with steam coils. The moulding floor occupies a space 280 ft. in length and 63 ft. in width, of which a space 42 ft. by 80 ft. is devoted to machine moulding. By referring to the illustrations it will be seen that all large moulding boxes are designed for their particular purpose. Both in this and in

NEW GREY IRON FOUNDRY, SHOWING A LARGE LOCOMOTIVE CYLINDER BEING POURED.

NEW GREY IRON FOUNDRY, NORTH END OF MOLDING FLOOR FOR HEAVY CASTINGS.

the small castings departments, the equipment is of modern and up-to-date design, every facility being provided, also labor-saving apparatus for the rapid and economic production of all classes of locomotive and grey iron castings. Two large ovens are located in the east end of the foundry for drying cylinder and other large cores, each oven being 8 ft. 6 in. wide, 10 ft high, and 34 ft. long, inside measurements. In addition, there are four core ovens, each 8 ft. 6 in. wide, 8 ft. 5 in. high and 23 ft. long, as well as two reel type ovens for small cores, each 60 in. by 70 in. Six overhead traveling cranes serve this department, there being two of 5 tons capacity each, three of 10 tons, and one of 20 tons. The controlling cage in most cases is located at the middle of the crane, as this position permits the operator a clearer view of all sections of the floor, and offers increased facilities for locating the ladle and heavy moulding boxes. In addition to the travelling cranes, the heavy casting department is equipped with a number of wall cranes, one being located at every other main column. These swinging cranes are provided with one-ton Peerless chain blocks. Owing to the severe weather conditions prevailing in Montreal in winter, all foundry supplies are kept under cover in a large supply storage room adjacent to the main bay and convenient to the charging floor. Such materials as moulding sand, coke, pig iron and scrap are housed therein. The charging floor is served from the storage room by means of skips handled by a 10 ton electric traveling crane.

The various materials are taken as required from the supply in the storage department, loaded into skips and elevated to the extended section of the charging floor shown in the upper right hand corner of the storage bay. The skips, which are constructed of sheet steel and steel angle, are so designed that when placed on the tracks, the flanged edges prevent them from slipping when the load is discharged from the tilting platform located in front of the charging door of the cupola.

NEW GREY IRON FOUNDRY, SHOWING CUPOLA CHARGING FLOOR.

The pattern and carpenter shops are together in a two-storey brick building 65 ft. wide by 111 ft. long. Back of this building is the pattern storage house, a single storey building 65 ft. wide by 98 ft. long.

The water supply for drinking purposes is taken from a drilled well 500 ft. in depth, and is distributed throughout the works by a steam-driven deep-well pump.

NEW GREY IRON FOUNDRY, STORAGE BAY FOR RAW MATERIALS SHOWING CHARGING FLOOR UNDER RIGHT-HAND END OF TRAVELING CRANE.

Locomotive Production

A complete system of gauges and templets is in force by which parts of locomotives of the same class are made in duplicate and interchangeable. The plant is equipped to build locomotives regardless of type or size. At present the works have a capacity of about 460 locomotives per year, the latter having an average weight of 200,000 pounds each. In addition to the locomotive output this company also builds a rotary snow plow, which has a high reputation for handling deep snow.

NEW GREY IRON FOUNDRY, SOUTH END OF MACHINE MOLDING FLOOR.

MODERN STEEL PLANT IN INDIA.

A RECENT issue of the Ironmonger contains some interesting information relative to the Tata Iron & Steel Co. of Sakchi. India, of which we reproduce the following more or less essential notes and operation data. The blast furnace plant consists of two furnaces 77 ft. by 19 ft. with 12 ft. 6 in. hearth, equipped with up-to-date charging and weighing apparatus and four Cowper-Kennedy stoves. The first pig iron was made in December. 1911, all the staff being Americans. The estimated capacity of the furnaces is 160,000 tons per year, and during 1914 the monthly output averaged, roughly, 14.000 tons per month.

Analyses of the coke used are by no means ideal. since they reveal an ash content ranging from 20.94 to 23-74 with moisture 5.52 to 10.22. The sulphur is not excessive, ranging from 0.59 to 0.74. whilst the phosphorus in the ash runs from 0.85 to 1.08 per cent. The approximate cost of the coke during the first six months of 1914 was $2.50 per ton, and the consumption of coke per ton of iron averaged 21 to 22 cwt. The coke consumption appears low, but this is accounted for by the exceptionally high iron content of the ore. The Gurmasini ore contains about 61 per cent. iron and about .090 per cent. phosphorus, whilst the Chanda ore contains about 68 per cent. iron with .035 phosphorus. The Gurmasini ore is mostly used, being conveniently situated for the works, and the average cost of this ore delivered at the blast furnace bins was 50 cents per ton. Coking coal is obtained at an approximate cost of one dollar per ton. A good grade of manganese ore is also available, the approximate manganese content being 48 per cent. Perhaps the most interesting figure in connection with the blast furnaces in the regularity and excellence of the pig-iron analyses. The approximate average for the six months for each furnace is as follows:—

	Manganese	Silicon	Sulphur	Phosphorus
A Furnace	1.80	0.95	0.025	0.35
B Furnace	1.50	2.5	0.025	0.35

The pig iron was produced at an approximate works cost of $6.50 per ton, and the selling price averaged approximately $14.50 per ton. In regard to coke ovens, the original plant consisted of 180 Coppee non-by-product ovens, supplemented later by a number of Beehive ovens. Recently, however, a battery of Kopper by-product ovens has been installed.

Open Hearth Furnaces

The steel works comprises four 50-ton open hearth furnaces, each having an independent plant of four producers. The writer states that the steel works gave the most serious trouble owing to the failure of the German staff to operate them successfully. Considerable trouble was experienced owing to the short life of the furnaces due to faulty manipulation, and also arising from the irregular analysis of the steel stated to be due to the use of coke dust in recarburising. It is very gratifying to read that the steel making was put on a proper basis when, at the request of the Company, Professor A. MacWilliam was allowed by the Government to place his metallurgical knowledge and experience at the Company's service.

The cost of bricks was one of the most serious items, and experiments were being made with local bricks. The output of steel ingots early in 1914 was between 8,000 and 9,000 tons per month, at a works cost of approximately $15.75 per ton. Two more furnaces have recently been constructed, and a greatly increased output should result. The ingots are reheated in soaking pits, and are first rolled into blooms in a 36-in. pinioned reversing blooming mill. After cogging, the ingot is brought back and cut to length, and then charged into reheating furnaces. When rolling 90-lb. rails and other large sections it is possible to roll direct without reheating. The 28-in. finishing mill consisted of three sets of rolls, the first set having a balanced top roll, which was very useful when rolling joists and channels.

In regard to the testing of the steel, the works possess a well-equipped laboratory with the usual testing plant. All structural sections are required to pass the British standard specification, whilst rails and fish plates have to pass the Indian States Railway specification. The inspection is carried out by Professor MacWilliam. A table of analyses taken from representative heats gives an idea of the excellent quality of the finished product. An average analysis for 12 in. by 6 in. blooms showed the following:—

Carbon	0.29
Manganese	0.53
Sulphur	0.025
Phosphorus	0.024

The tensile strength is 30.06 tons per square inch, with 26.56 per cent. elongation in 8 inches. The approximate average selling price at the works during the first six months of 1914 for rails and structural sections was $31.75 per ton, the principal markets being India and Japan.

From the foregoing it will be seen that the works of the Tata Iron & Steel Co. have developed on very sound lines, and there is no doubt that the wonderful resources at the disposal of the Company will render the developments of steel making at Sakchi an important feature in the metallurgical future of India.

Welland, Ont.—The Canadian Steel Foundries, Ltd., are building an addition 40 ft. by 100 ft., to the muck bar mill, and will install hydraulic forging presses and gas furnaces.

Some Scientific Aspects of Steel Founding Practice*

By W. A. Naish, A.R.S.M., A.I.M.M.

The following resumé of facts concerning steel is not put forward as representing new information, but rather with the idea of its being somewhat of an educational message to foundrymen and metal-working operatives whose sphere of activity does not permit of their becoming familiar with the essentials of steel production in specially equipped plants.

UNDER the name "Steel" are now included so many varieties of iron that it is impossible to give a good definition of the term. Until the introduction of mild steel, the term steel was always defined as being iron containing from 0.5 per cent. to 1.5 per cent. carbon, with small quantities of other impurities, and which, when heated and quenched in water, became sensibly harder. Now, however, we have steels containing much less than 0.5 per cent., of carbon, and which do not sensibly harden on quenching. A definition now perhaps more accurate is "any form of iron other than malleable iron, containing 2 per cent. of carbon or less, with small amounts of other impurities."

Classification.

There are many classifications, the most general, perhaps, being "hard steel" and "mild steel," the dividing line being taken at about 0.5 per cent. carbon. The two forms pass gradually into one another, and the hardening on quenching becomes less as the percentage of carbon decreases. Another classification is "high," "medium" and "low carbon steels." The high-carbon steels are used for tools, and the low-carbon for structural purposes.

Another classification is based on the method of manufacture:— (a)—Puddled steel, made from pig-iron which has not been fused, but welded up from a pasty mass. (b)—Cement steel, made from malleable iron. (c)—Crucible cast steel. (d)—Bessemer steel. (e)—Open-hearth steel. (f)—Basic steel. The American Society of Mechanical Engineers in 1876 introduced the terms:—Weld iron, weld steel, ingot iron, ingot steel.

Chemical Composition of Steel.

Steel is essentially a compound of iron and carbon, other constituents being regarded as accidental impurities, except in so far as they are introduced to confer special properties.

Carbon—The carbon content of a steel may vary between 0.1 per cent. and 1.8 per cent. or more. The grade of the steel is usually determined by the quantity of carbon present. Graphitic carbon is never present except, perhaps, occasionally in high-carbon steels. A variety of uncombined carbon known as graphitic temper carbon sometimes separates when high-carbon steels are slowly cooled. The combined carbon exists in at least two forms:—(a)—As a definite carbide disseminated through the metal called "carbide carbon." (b)—Distributed evenly through the mass either in combination with the whole of the iron, or in solution with it. This variety is chiefly present in hardened steel, and is called "temper carbon."

Silicon.—The general effect of this constituent is to harden and strengthen the steel, but to a much less extent than carbon. Turner says that "the increased strength due to 0.2 per cent. silicon is about 1.8 tons." Campbell states that "silicon cannot be classed among the highly injurious elements, and small quantities cannot exert a very deleterious effect, but when the percentage is very high the metal becomes very hard and brittle."

Phosphorus is universally regarded as the greatest enemy of the steelmaker. Up to 0.1 per cent. it increases the tensile strength, but if the metal is subjected to shock it is liable to break readily. The effect of phosphorus seems to be greater in higher-carbon than in low-carbon steels. It produces a typical coarsely-crystalline structure and it lowers the maximum temperature to which the steel may be heated in working.

Sulphur produces "red shortness" and gives a coarsely-crystalline fracture. The metal also tends to crack during rolling and welds badly. If manganese is present in the steel a larger quantity of sulphur is permissible.

Manganese counteracts the effect of sulphur, increases the tensile strength, but also increases the tendency to crack when suddenly cooled. Up to 1 per cent. it has little injurious effect on mild steel, but in larger quantities it tends to make the metal brittle under shock. The effects of nickel, tungsten, chromium, etc., are briefly considered under "Special Steels" later. The compositions of high-, medium- and low-carbon steels are as follows:—

	High carbon %	Medium carbon %	Low carbon %
Carbon	1.2	0.5	0.15
Silicon	0.29	0.2	0.08
Sulphur	0.01	0.04	0.03
Phosphorus	0.01	0.04	0.03
Manganese	1.0	0.85	0.4

Methods of Steel Making.

The method of making steel directly from the ore is now obsolete except in the special case of the Stassano electric furnace. The process of steel-making from malleable iron is one of cementation, and depends upon the fact that if bar iron is heated for a long time at a welding temperature in contact with carbon the latter travels into the iron and the metal becomes carburised. We have to account for two changes in the material: (a)—The transmission of the carbon into the iron. (b)—The formation of "blisters."

There probably is a very slow diffusion of the solid carbon into the iron, but the usually accepted theory is that at the high temperature, and in the presence of excess of carbon, carbon monoxide is produced, $C+O=CO$. This penetrates into the pores of the iron, and is decomposed on contact, carbon being deposited, and carbon dioxide being produced $2CO=CO_2$. This carbon dioxide diffuses out, and is reconverted into carbon monoxide. At welding temperature the carbon combines with the iron, and steel is produced. The "blisters" are probably due to the presence of minute specks of solid impurities, such as oxide of iron. Carbon is deposited in contact with these, carbon monoxide is evolved, and the oxide reduced, the gas attempts to diffuse, and if near the surface the metal cannot resist the pressure and a "blister" is formed.

Crucible Cast Steel.

The process of making crucible cast steel is essentially one of melting, but certain chemical changes also take place. There is always some oxide of iron in the metal and air in the pot, therefore, there is at first, at any rate, a basic silicate formed. As the action proceeds this becomes more and more acid. The composition of the metal may change somewhat, as it will pick up a little silicon from the pot and carbon from the fuel; also the mere fact of the metal being molten for some time will give opportunity for a slight oxidising out of carbon and silicon. The presence of manganese tends to prevent the removal of silicon by oxidising first, and thus using up the available oxygen. The result of melting, then, is almost always to increase the percentage of carbon and silicon and to reduce the manganese. The amount of sulphur also increases

*From a paper read before the London branch of the British Foundrymen's Association.

slightly, either from the pyrites in the clay or from the furnace gases.

As is well known, the freshly-melted metal teems fiery and yields an unsound casting, due to evolution of gas during cooling. The "killed" metal teems quietly. According to Howe, killing probably acts chiefly by enabling the metal to absorb silicon from the walls of the crucible, thus increasing its solvent power for gas and enabling it to retain in solution during solidification the gas which it occludes when molten. The common belief is that killing expels the gas present, so that less remains to escape on pouring; but we find that silicon is rapidly absorbed during killing, and when conditions are such that the metal cannot absorb silicon, holding the metal molten does not kill.

The production of sound castings by "medicines," automatic stirring and by presses is briefly discussed later under "Casting of Steel." The most generally used "medicines" or improvers for steel are manganese peroxide, common salt, salammoniac, fluorspar, potassium chlorate, and, in the case of large ingots, aluminium and silicon. The processes of making steel from pig-iron may next be considered.

Acid Bessemer Process.

The theory of this process is the oxidising out of the impurities by blowing air through the molten metal. The plant is well known. The removal of carbon commences immediately, also silicon is similarly removed, but in the acid process sulphur and phosphorus are not removed. This fact makes it impossible to use a phosphoric iron in this process. The percentage of silicon must be at least 2.25 to 2.5 per cent., as it is the principal source of heat during the operation; but at the same time it should not exceed 3 per cent., as the metal may become too hot and too much iron may be carried away as silicate of iron. A suitable pig would be:—Graphitic carbon, 3.42 per cent.; combined carbon, 0.46 per cent.; silicon, 2.5 per cent.; sulphur, 0.05 per cent.; phosphorus, 0.03 per cent.; manganese, 0.5 per cent. Recarburising by means of spiegel for ferro-manganese fulfils two purposes:—(1)—Adding the requisite amount of carbon. (2)—Improving the metal by removing occluded oxygen.

Basic Bessemer Process.

As mentioned above, the acid process will not remove phosphorus. In order to do this, a basic lining is necessary, and lime is also thrown into the converter. Phosphorus is very little removed until the carbon has gone, that is, during the "after blow." The phosphorus is removed as calcium phosphate in the slag, and an important point is that the basic slag must be poured off before recarburising, or some of the phosphorus will be reduced back again, and re-enter the iron. It is the phosphorus which provides the heat of reaction in the basic process, and the silicon should be low. A suitable pig would be:—Graphitic carbon, 0.82 per cent.; combined carbon, 2.83 per cent.; silicon, 0.63 per cent.; sulphur, 0.07 per cent.; phosphorus, 2.75 per cent.; manganese, 1 per cent. The steel can be made milder than in the acid process, but it is not considered so reliable by some engineers.

As a passing reference to the modification of the Bessemer process, such as the Clapp-Griffiths, the Tropenas, Walrand-Roberts and the Swedish, it may be said the chief difference is merely that of alteration in size and shape of the converter and the matters of side versus bottom blowing, and fixed versus rotating vessels. Small converters can never become general, but at the same time there are obviously cases where their use is advantageous. There is an increased loss of 4 per cent. in side blowing, and less uniform mixing of the metal. As to fixed converters, the time is longer, as the charge must be tapped. They do not permit of bottom blowing, and it is impossible to recarburise in the converter.

Open-Hearth Process.

In this process the oxidising out of the impurities is effected by means of oxide of iron. Recarburising is effected by means of ferro-manganese or carbon (the Darby process). As in the Bessemer process, the phosphorus is not removed in the acid open-hearth. In the basic process lime is added, and the lining is of dolomite, but it is not necessary to use basic bricks above the slag line. As the source of heat is external, the amount of silicon and phosphorus is not so important as in the Bessemer process.

The modifications of the open-hearth process are chiefly mechanical. The Wellman and Campbell tilting furnaces ensure, amongst other things, quicker working. The Bertrand-Thiel process consists of working two furnaces together, nearly purifying in the "primary," and finishing off in the "secondary" furnace. The Talbot process is a continuous one, part of the finished charge being tapped and fresh pig added.

The removal of sulphur by the Saniter process is effected by bringing molten steel into contact with lime and calcium sulphide, whether in the furnace or in the ladle, the sulphur passing into the slag as calcium sulphide. Sulphur is also removed to a certain extent by the use of a mixer, which may be regarded as a reservoir for molten metal previous to steel making.

Electric Smelting.

Extravagant claims have been made for electric smelting, but there is no doubt that high-class steel can be made and cheap materials used, as phosphorus, sulphur, etc., are removed to a trace. Probably it will come into operation for refining materials, and in connection with open-hearth and Bessemer steel. Electric furnaces are used for making high-class steel from pure materials and from rail ends and scrap; for making special steels from open-hearth and Bessemer steel; for making ferro-chrome and ferro-silicon; for the direct production of steel from ore.

The high quality of the steel produced by electric smelting is probably due to the absence of occluded gases, the absence of over-oxidation and less segregation. Steels of highest quality, equal to the best crucible steel, can be made at a lower cost. For special steels for guns it can compete with the open-hearth furnace. For ordinary rail or structural steel it is too costly unless water-power is available. It is highly recommended for refining Bessemer and open-hearth metal. If molten metal is used, the extra cost over the open-hearth is small, and is more than compensated by the low price of the materials used.

Casting of Steel.

In the casting of steel there are four defects to be considered:—

(1) Blowholes.—These are due to occluded gases, carbon monoxide, hydrogen and nitrogen produced from the moisture in the air and in the materials, oxygen from the air, carbon and the constituents of the air itself. These gases cannot completely escape and are mechanically entangled in the pasty metal. An approximate analysis of a gas of this nature is as follows:—Carbon dioxide, 0.48 per cent.; hydrogen, 49.8 per cent.; carbon monoxide, 48.23 per cent.; methane, 0.40 per cent.; nitrogen, 1.40 per cent.

It is a known fact that steels of practically the same composition vary greatly in hardness, tensile strength, etc., when manufactured in different ways. This may possibly be attributable to the presence of nitrogen. Nitrogen is particularly injurious to special steels. Nitrogen and oxygen tend to produce blowholes, and sometimes they produce a peculiar kind of brittleness, due to pickling. This can be removed by annealing. The deleterious effect of these gases should be more widely recognised.

(2) Piping.—This is due to the solidification of the metal nearest the side of the mold, and its consequent contraction. The pipe is formed as an internal

cavity, usually at the top of the ingot.

(3) Segregation.—By segregation is meant the separation of the metal into portions of different composition during solidification. Steel is not a definite chemical compound, and therefore the less fusible constituents solidify first. There is a tendency for pure or nearly pure iron to separate first. In ordinary ingot casting the segregation is not large. In a plate ingot 10 in. thick the carbon may vary from 0.18 per cent. at the top to 0.15 per cent. three inches from the bottom, and the phosphorus from 0.075 per cent. to 0.058 per cent. in the same limits.

(4) Cracks.—These are produced by the expansion of the mold and its drawing away from the metal. If not sufficiently plastic to follow, the metal will crack. The unequal contraction of the external and the internal portions of the ingot may also produce a fracture.

Prevention of Defects in Cast Steel.

Mechanical Pressure.—This involves the use of a press, such as the Whitworth, Illingsworth, or Harmet. In these the contraction of the metal is followed up; it is really casting under pressure.

Agitation and Centrifugal Force is another method which has been tried.

Chemical Methods.—The two substances usually employed to prevent defects are aluminum and silicon. The action of silicon is very marked, and entirely removes blowholes, the explanation probably being the same as that given under "killing" of crucible cast steel. The action of aluminum is quite as marked, but the rationale of the action is less understood. It may be due to the fact that aluminium removes oxygen, and as oxygen diminishes the solubility of the gases in iron, the aluminium may thus indirectly raise the solvent power.

Special Molds.—The principle involved in the use of special molds to prevent the defects mentioned is to make the lower 70 to 80 per cent. of the mold thicker, and therefore of greater heat absorptive capacity than the upper 30 per cent.

Special Steels.

There has been a great advance made of late years in the manufacture of special steels. The following notes relate to the effects of the special constituents introduced:—

Nickel Steel.—The tensile strength increases with the percentage of nickel. Thus 0.3 per cent. nickel gives a tensile strength of 31 tons, whilst with 11.4 per cent. it is 65 tons. The elastic limit increases more rapidly than the ultimate strength. Nickel steel has a high vibrating strength, and is more rigid and tough than ordinary carbon steels. The recalescence point is lower, the annealing temperature is lower, and the metal hardens when quenched from a lower temperature. It resists corrosion, and possesses a high electrical resistance. It loses its magnetism when heated, but regains it when cooled. Nickel 3.5 per cent. has about the same effect on tensile strength as 0.2 per cent. carbon. Other constituents being constant, 0.8 per cent. and from 3 to 5 per cent. nickel gives a good tool steel.

Manganese Steel.—The effect of manganese is to harden the metal as the percentage of manganese increases. Up to about 5 per cent. manganese the metal is very hard, while over 7.5 per cent. it becomes hard and tough. Hadfield's manganese steel has a tensile strength of 67 tons, and the metal is ductile. The electrical resistance is very high, and it is non-magnetisable.

Chrome Steel.—The chief property that chromium confers on steel is that of hardness; hence its use in armour plate and projectiles. Five per cent. chromium will give a tensile strength of 74 tons unannealed .

Tungsten Steel.—Tungsten makes the steel intensely hard, and this hardness is not reduced by slow cooling. Tungsten steels are not hardened by heating and quenching, hence the name, "self-hardening steels." These steels are much in favour as tool steels. An average composition is 1.5 per cent. carbon and from 6 per cent. to 9 per cent. tungsten, although lower percentages are now common. Under this heading may be mentioned a special steel the composition of which is as follows:—Carbon, 0.55 per cent.; chromium, 3.5 per cent.; tungsten, 13.5 per cent.

Molybdenum and Vanadium are used in special steels, the latter especially in some American tool steels. They hav a still greater proportionate effect than those elements mentioned previously. A typical analysis of an American molybdenum steel is:—Molybdenum, 9.65 per cent.; carbon, 0.66 per cent.; manganese, 0.22 per cent.; phosphorus, 0.02 per cent; silicon, 0.05 per cent. Many molybdenum steels have a lower percentage of Mo. From 0.5 to 3 per cent. of molybdenum in a high tungsten steel slightly increases the cutting efficiency.

Vanadium Steel.—Vanadium raises the elastic limit and tensile strength, but slightly reduces elongation; 0.2 per cent. vanadium added to a low-carbon steel raises the elastic limit and tensile strength 50 per cent. or more. This steel is valuable for engine parts and details subjected to alternating stress. It hammers and welds well. A steel containing 0.24 per cent. carbon, 0.28 per cent. vanadium, and 3.38 per cent. nickel gave the following results:—Elastic limit, 50.3 tons; tensile strength, 68.2 tons; elongation, 17 per cent.

It must be pointed out that the foregoing figures are general and are much affected by the percentage of carbon and by the heat treatment.

Hardening of Steel.

When a steel containing more than about 0.2 per cent carbon is heated to redness and quenched it becomes hard. The degree of hardness depends on the rapidity of the cooling, temperature of cooling and percentage of carbon. The changes observable are:—Pure iron heated to about 900 deg. C. and cooled slowly shows three distinct retardations, viz., at 825 deg. C. (Ar_3); 720 deg. C. (Ar_2); and 650 deg. C. (Ar_1). If much carbon is present there is only one point discernible, viz., at 670 deg. C. ($Ar_{.1}$). If iron is heated, three corresponding points are got, about 30 deg. C. above the Ar points, namely, Ac_1, and Ac_2, and Ac_3. The retardation at Ar_1, is accompanied by a change in the condition of the carbon from hardening carbon as it exists in hardened steels to cement carbon (Fe_3C), which is present in normal and annealed steels. To convert cement carbon into hardening carbon it is necessary to heat above the critical Ac_1.

If the steel is heated above Ac_1 (700 deg. C. for 12 per cent. steel), and quenched, the carbon is retained as hardening carbon. When a steel is heated to AC_1 and quickly or slowly cooled, the finest grain it is capable of assuming is produced. If heated above Ac_1 the grain becomes coarser and coarser. The best temperature to quench from is that temperature which gives the finest grain and the greatest strength, and this depends on the percentage of carbon.

Annealing.

The object of annealing is to diminish the abnormal qualities the metal acquires through hardening and mechanical working. The metal should be annealed by heating to the Ac_1, critical temperature, and keeping at that temperature a sufficient time to change a certain amount of the hardening carbon into cement carbon or the hard into the soft allotropic variety of iron. It is immaterial whether it is quickly or slowly cooled. The heating should be slow, and the steel throughout the operation should be shut off practically from the air. The time occupied in actual practice is variable, and whilst there can be no doubt that excessive annealing does no good, and may do harm, a good proportion of the unsatisfactory steel castings is accounted for by erring on the other side.

The typical structure of a normalised steel of 0.5 per cent. carbon consists of ferrite and pearlite. (Pearlite is Fe_3C. in intimate association with Fe and contains 0.9 per cent. carbon.) The amount of each constituent depends on the percentage of carbon. The structure is typical of a mild steel, which after being heated to full redness is allowed to cool in the air. A saturated steel contains 0.9 per cent. carbon, and the structure is all pearlite. As the percentage of carbon increases beyond this point, a new constituent appears, viz., cementite, Fe_3C., which is typical of super-saturated steels.

In a hardened steel there occurs a new constituent, hardenite, accompanied by ferrite in mild steel, and cementite in super-saturated steels. Hardenite is probably pearlite altered by heating and quenching. If a steel is suddenly quenched from 1,000 deg. C. the typical needle structure of martensite is got. Annealed steels show the granular pearlite altered into parallel layers. This banded structure is true pearlite and is typical of slowly-cooled steels.

Defects Produced by Hardening.

Water Cracks.—These are the direct result of enormous stresses produced by contraction. The only remedy is to exercise the greatest care and to have a good quality steel. The steel should be low in phosphorus and manganese; 0.025 per cent. phosphorus is permissible, 0.4 to 0.5 per cent. manganese in mild steel, and 0.2 per cent. manganese in 1 per cent. carbon steels. The whole of the tool should be at a uniform temperature, and the temperature should be the correct one for the percentage of carbon present .

Special Methods of Hardening.

The Barium Chloride Bath is used for taps, etc. The bath is heated to 1,200 deg. C. by gas, and the tool is soaked for a few minutes only, so as to heat up the edges. The tool should then be withdrawn. Electric Furnace methods employ as the heating medium barium chloride for high-speed steels, barium chloride and potassium chloride for carbon steels, and sodium chloride and potassium chloride for lower temperatures. The current is alternating, and iron electrodes are used. The table given below may be interesting to show the effect of annealing and hardening and tempering on gun steel of different carbon contents:—

Carbon	Unannealed Tensile strength	Unannealed Elongation	Annealed Tensile strength	Annealed Elongation
%	Tons	%	Tons	%
0.37	28	8.2	36.7	21.8
0.5	44.4	2.0	44.0	12.0

Carbon	Annealed Tensile strength	Annealed Elastic limit	Annealed Elongation	Hardened and Tempered Tensile strength	Hardened and Tempered Elastic limit	Hardened and Tempered Elongation
%	Tons	Tons	%	Tons	Tons	%
0.35	34.4	17.6	27.0	48.9	29.1	16.5

Case Hardening.

The ordinary methods of case-hardening are too well known to need description, but perhaps one or two points may be of interest. The best carburising steels are those containing from 0.1 to 0.2 per cent. carbon. Manganese has the tendency to make the carburising surface brittle. The outer skin will usually come up to about 0.9 per cent carbon. As a general rule, anneal after carbonising to destroy crystallisation in the core. The limit for the requisite temperature during this operation is about 925 deg. C. Carbon begins to penetrate at about 700 deg. C.

There are many special case-hardening mixtures. Guillet used 60 parts of wood charcoal to 40 of barium carbonate. Heathcote mentions wood charcoal soaked in a 5 per cent. solution of sodium carbonate. The annealing of the castings should be at a cherry red. To ensure refining of grain, the heavy sections will require a longer time for annealing, but they may be cooled quickly if high-tensile strength and elastic limit is required.

ECONOMICAL HANDLING OF CRANE MOTORS

IN a recent issue of the General Electric Review there appeared the following query and answer to same. As motor driven cranes form an important feature in at least large and medium size metal-working plants, and as the tear and wear of the motor enter prominently into the substance of the query and its answer, the latter will be found worthy of a fair measure of study and attention from those responsible for directing and carrying out the particular service operations required of the machine.

Which of the following methods of handling a crane motor will effect the greatest possible saving in current consumption? (a)—To bring the motor up to speed as fast as possible without abusing it. (b)—To bring the motor up to speed slower than described in (a) by making a decided pause on each point of the controller.

The method which will be the more economical depends largely upon whether the motor is a direct or an alternating-current machine and upon the type of controller used.

For example; a series-wound direct-current motor with a standard reversible rheostatic controller will require a smaller consumption of power if method (a) is used, for two following reasons:

(1)—The torque per ampere of the motor is greater when its fields are fully saturated by a large amount of current than when not so fully saturated, therefore, the work will be accomplished in a time that is proportionally shorter than the increase of current.

(2)—When controller is advanced as rapidly as possible without injuring the motor, the work of starting motor is performed in the shortest practicable time; therefore, current is being dissipated in the rheostat for a minimum time only. Of course, the average value of the current taken by the motor through the rheostat during the starting period will be greater for method (a) than method (b), but it will usually happen that, in the apparatus under discussion, the "time" factor of energy consumption has a greater influence than the "current value" factor.

For an alternating current motor the reasoning given in (1) and (2) would apply only to a limited extent, because, when this type of motor draws about 200 per cent, normal current or more, its torque-per-ampere efficiency will be much less than for a current nearer its normal rating, therefore, whatever will be gained by diminishing the rheostatic losses will be sacrificed by an increase in the motor losses. The least possible total current consumption at starting will as a consequence, probably be secured when the controller is advanced just rapidly enough to cause a flow of from 150 to 175 per cent. full-load current.

On direct-current series-wound motors the split-circuit type of dynamic braking controller will give results for hoisting similar to a straight direct-current series-wound motor, and for lowering results similar to an alternating-current motor. The power consumption reasoning that applies to machines of these types has been stated in the foregoing.

NICKEL REFINING COMPANY FORMED

THE Canadian branch of the International Nickel Co., which is to undertake the manufacture of nickel in Canada, has been incorporated at Ottawa by letters patented under the name of the International Nickel Co., of Canada. The new company is empowered to produce, refine, smelt, etc., nickel, copper, iron, steel, cobalt and other minerals, and to occupy and develop lands and concessions relating to or containing nickel, copper, iron, etc. The incorporators of the new company are Britton Osler, K. C., Toronto; W. A. J. Case, and the usual number of office employees. A meeting of representatives of the Ontario Government will be held in Ottawa very shortly, when the plans of the company and the question of the selection of a site will be taken up. The new plant will probably be built in units, and will provide a production of 12,000,000 to 15,000,000 pounds a year at the beginning.

The Mineral Production of British Columbia During 1915

By E. A. Haggen, M.E. *

The data here given details the salient features of the Annual Report of the Provincial Bureau of Mines for the year 1915, and incidentally constitutes the first authentic statement of the mineral production for that year. It will be observed that the aggregate output for 1915 approaches the high records of 1912 and 1913. A noteworthy development is that of the establishment of local refining plants for the treat ment of copper and zinc ores.

THE annual report of the Provincial Bureau of Mines for 1915 is one of the best that has been issued by that department. It gives the first authentic statement of the mineral production for the past year, which stands third highest in the mining records of the Province. The total production is stated at $29,447,508, and was beaten in 1912, when the figures reached a total of $32,440,800; also in 1913, when the production reached $30,296,398. The figures are as follows for the year ending December 31, 1915:—

Mineral.	Quantity	Value	Increase over 1914	Decrease Under 1914
Gold, placer		$ 770,000	$ 15,000	
Gold lode, oz.	250,021	5,167,934	58,530	
Silver, oz.	3,366,506	1,588,991		$ 287,745
Lead, lbs.	46,503,590	1,939,200	167,323	
Copper, lbs.	56,918,405	9,835,500	3,714,181	
Zinc, lbs.	12,982,440	1,460,524	1,114,399	
Coal, tons	1,611,129	5,638,952		699,433
Coke, tons	245,871	1,475,226	67,764	
Miscellaneous		1,571,181		1,281,736
Total		$29,447,508	$5,237,197	$2,268,914

The net increase over the previous year is thus $3,058,685, due mainly to the output of copper and the exceptionally high prices for that metal ruling during the latter part of the period. The remarkable increase was in zinc, the production of which increased nearly 100 per cent., while the selling price showed an increase of over 400 per cent. With the increase of copper production, gold and silver might have been expected to show a greater increase, as these metals always accompany copper in this country.

The decrease in coal consumption is due to the inroads of fuel oil, a condition which the increasing price of oil and the additional cost due to the new tariff will no longer permit to continue.

It is interesting to note that the mineral production of the Province has exceeded the half billion mark, $516,270,253, to be exact. Of this amount gold accounts for $160,803,053, of about 35 per cent. Coal accounts for $156,928,640, or about 30 per cent. Copper ranks next with $96,774,870, or about 18 per cent. Silver comes next to copper in importance, with $39,298,273. Lead figures reach $33,407,662. Building material production, involving bricks and building stone, is valued at $25,398,282. Zinc production amounts to $3,659,473.

*Editor, the Mining and Engineering Record.

Placer Gold

The placer gold return for 1915 is the highest since 1907, and was mainly due to increases in Cariboo and Atlin, which two districts produced 90 per cent. of the total. Owing to the number of men out of work last summer there were more individual parties working than usual on the Fraser, Thompson and Quesnel Rivers. Atlin production is placed at $377,000; Cariboo at $215,000; Quesnel at $85,000; East Kootenay, where for some years placer gold mining has been negligible, produced $15,000, and Similkameen, Nicola and Vernon rose from $3,000 to $12,000; Nelson yielded $1,000; Revelstoke, Trout Lake and Lardeau, $2,000; Boundary and Yale, $2,000; Yale, Ashcroft and Kamloops, $10,000; Lillooet, $8,000; the coast districts, including Vancouver Island, are credited with $2,000.

Lode Gold

Increased ore production in Boundary and Rossland and opening of new properties in Skeena and Omineca accounted for the increase in lode gold, in which the Coast and Nelson districts showed a decrease.

The lode gold production was not so great as in some previous years, the output having been nearly half a million more in 1913, $150,000 more in 1912, $35,000 more in 1910, and nearly $100,000 more in 1908, so that lode gold mining is not making the progress it should. Rossland leads with 142,595 ozs., and Boundary ranks next with 87,870 ozs., mostly derived from the smelting of copper ores carrying gold. Nelson and the Coast districts show a falling off, the former of 6,000 ozs. Similkameen was the largest producer of free gold, the Hedley Gold Mining Co. output being 6,000 ozs. over previous years, and all valued at over $900,000. This district, however, is not specially given credit for the foregoing production, it being included in the Boundary returns. Nelson produced 9,233 ozs., Skeena 5,034 ozs., Coast districts 2,490 ozs., Omineca 1,524 ozs., and other districts combined 1,275 ozs. Rossland shows an increase of 4,027 ozs. over previous year, and Boundary an increase of 2,962 ozs., entirely due to the Granby production, which shows an increase of 8,000 ozs., but this is offset by the falling off in the gold output of the Greenwood smelter and the Jewel mine. Skeena shows an increase of 75 per cent. due to the production of copper ores at Anyox.

Silver Output

The silver production was the lowest in the last three years as regards quantity and the lowest in four previous years as regards value. This was the only metal which did not recover from the slump of prices following the declaration of war. The price was about 5c per oz. less than the previous year and about 10c. per oz. less than for 1913. Slocan produced 62.9 per cent. of the total and Fort Steele 14.3 per cent., the latter being almost entirely from the Sullivan mine. The following is the production of the various mining divisions: Slocan 1,812,550 ozs., Fort Steele 481,258 ozs., Ainsworth 289,565 ozs., Boundary 273,795 ozs., almost entirely as a by-product from the copper smelters; Skeena 175,179 ozs., Trail 159,584 ozs., almost entirely as a by-product of Rossland gold-copper ores; Omineca 79,155 ozs., Coast 66,033 ozs., mainly as a by-product of the copper ores from the Britannia mine; Trout Lake-Revelstoke 16,740 ozs., Nelson 9,405 ozs., mainly from Sheep Creek; and all other districts 3,242 ozs.

Lead Production

This metal showed a falling off of 4,121,458 pounds as compared with previous years, but owing to the price being three-quarters of a cent. per pound more, the value was greater by $167,323. Fort Steele division leads with 57 per cent. of the total production, mainly from the Sullivan mine. Slocan produced 32.10 per cent. of the total. The production of the various mining divisions was: Fort Steele, 26,582,050 pounds; Slocan, 14,925,345 pounds; Ainsworth, 3,436,184 pounds; Nelson, 967,775 pounds; Omineca, 249,279 pounds; all others, 342,957 pounds. The lead output was the lowest in the last three years. This is due to the fact that the lead production is mainly from argentiferous galena, and owing to the low price of silver, most of the Slocan mines were shut down for the first half of last year.

Copper Shows Record

Copper was one of the two metals in which there is a record production for 1915, the amount being over 5,000,000 pounds greater than for 1912, the next highest year. The copper production of the province has doubled in the past fifteen years, and copper mining is making such rapid strides that the production should be doubled again within the next two years. The value was about $1,500,000 greater than for 1906, when the high copper prices of that cycle reached their climax. The exceptionally large production last year was due to the enterprise of the Granby Consolidated Mining, Smelting & Power Co., which provided 66½ per cent. of the total production.

Great changes are taking place in the source of the copper output. Boundary production has fallen off 50 per cent. as compared with 1912, due to lessened ore production and reduced grade of ore. Rossland output has doubled. The output of the Coast districts has more than doubled, owing to the operation of the Granby Co. new mine and plant at Anyox, and the increased production of the Britannia. Yale-Kamloops districts are increasing in importance as copper producers, their output showing an increase of 850 per cent. in three years. Nelson produced only 51,941 pounds, as compared with 586,764 pounds in the previous year, and 815,126 pounds for 1913.

The Coast districts produced 60.65 per cent. of the total for 1915, and Boundary districts produced 30.5 per cent. Coast areas were also the richest in copper, averaging 38 pounds per ton, while Boundary ores averaged only 14 pounds, and Rossland ores only 13½ pounds copper per ton. The ores of the latter camp are, however, gold rather than copper ores.

The growing importance of British Columbia as a copper producing country is evident from the fact that for the past year the value of this metal alone was almost as much as that of all the other metals put together. At the present time Japan is the world's largest copper producer, next to the United States, but at the present rate of progress this province will, within the next two or three years, displace Japan as the world's second largest producer. The history of copper mining, too, is that it affords the most reliable and permanent of all classes of mining, so that the towns being established in connection with the copper camps can, as a rule, look forward to becoming practically permanent communities.

The question of the local refining of copper has attracted much attention during the past two years. Hitherto all copper produced here has been refined in the United States, the Boundary blister copper going to the Nichols refinery in New York State, and the copper from Trail smelter, the Britannia mine and the smaller mines shipping to Tacoma smelter, going to the copper refinery operated in conjunction therewith. The present year will see the copper refining industry established for the first time in British Columbia, a refinery to produce about ten tons of refined copper per day having been almost completed at Trail smelter.

Zinc Production

The zinc production of British Columbia is showing important strides, the amount for 1915 being about double that of 1913, while the increase over the 1914 output was 65 per cent., and about 50 per cent. over 1909, the previous high record year in zinc. The price, too, was about 160 per cent. better than the average due to the exceptional war demand. Two-thirds of the production was from the Slocan mines; 25 per cent. from Nelson division, and the rest from Ainsworth and East Kootenay.

The principal producers were: Standard Silver Lead, 3,778,857 pounds; H. B., on Sheep Creek, 2,387,514 pounds; Silverton Mines, 1,385,859 pounds; Zincton, on Sheep Creek, 739,695 pounds; Retallick Mine, Ainsworth, 576,000 pounds; Lucky Jim, 788,158 pounds; Rambler-Cariboo, 546,660 pounds.

Hitherto all the zinc ores produced in the Province had to be exported for treatment, mainly to the United States. The current year has seen the important addition to the metallurgical plants of British Columbia of a zinc refinery operated at the Trail smelter.

Other Metals

The only other metals of which there was any production were molybdenite and antimony. From the Molly group, on Lost Creek, south of Sheep Creek, in the Nelson district, there were shipped 24 tons averaging 12.26 per cent. molybdenite, and on this property are several thousand tons running from 2 per cent. to 4 per cent., which it will pay to mill, and ship the concentrate. The only other molybdenite property worked is at the Reil Camp, on Alice Arm, where a mill has been built, and shipments have been made to Seattle. Molybdenite, concentrated to a grade of between 85 per cent. to 90 per cent., brings from $2,500 to $3,000 a ton.

Antimony was another of the war metals that went skyrocketing in price to 55 cents per pound, though it is now back at the normal price of about 15 cents. This mineral is common in British Columbia, but only one property is reported to have made shipments last year, and that was the Alps-Alturas, on the North Fork of Carpenter Creek, from which two cars were packed and shipped to Scotland, the content being 50 to 55 per cent. antimony.

Earthy Minerals

Building stone and brick snow a heavy falling off, owing to the small amount of new construction going on, the output for the year being only about half that of recent years. Two new classes of deposits were developed and small shipments made. There were the hydromagnesite deposits at Atlin, owned and operated by Armstrong & Morrison, of Vancouver, from which about 70 tons were mined and shipped. There is likely to be an increasing demand for this mineral on account of the development of the pulp industry. The other mineral deposit worked is at the Bitter Lakes in the Similkameen, where Epsom Salts occur in nature. Three hundred tons were mined and shipped to New York.

Coal and Coke

The output of coal was the lowest in nine years. The coke output showed an increase of about 11,000 tons over 1914, but was still below the returns for 1912, 1913, 1909 and 1908. Vancouver Island produced more coal than the whole of the mines on the mainland put together. The respective production was: Vancouver Island, 1,020,942 tons; Mainland, 951,638 tons. Of the Mainland mines The Crows Nest produced 852,572 tons and Nicola and Similkameen 99,066 tons.

Of the coal production 361,451 tons went into the manufacture of coke for the smelters. Of 245,871 tons of coke produced, 5,450 tons were made at Union Bay and 240,421 tons by the Crows Nest Pass Coal Co. While the British Columbia demand for Vancouver Island coal fell off 17 per cent., exports to the United States increased.

C.P.R. AND CANADIAN TIMBER

THE Canadian Pacific Railroad has taken the lead in using Canadian wood in its car and hotel building. It conserves some 6,000,000 acres of timber limits, and aids in every possible way to make known this source of almost uncountable wealth—knowing that timber wealth always constitutes an eloquent appeal to the settler, prospector, or capitalist. The company has just made up some figures which show the timber wealth of the country, and these, at the present juncture, will not be without interest: Lumber, laths and shingles, $67,500,000; firewood, $60,500,000; pulpwood, $15,500,000; posts and rails, $9,500,000; crossties, $9,000,000; square timber exported, $400,000; cooperage, $1,900,000; poles, $700,000; logs exported, $850,000; tanning material, $22,000; round mining timber, $500,000; miscellaneous exports, $300,000; miscellaneous products, $10,000,000.

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PAPER SHORTAGE AND COST EFFECTS

THE publishing business in Canada and elsewhere is facing a serious crisis. Since the first of the present year there has been a growing scarcity of paper and a corresponding advance all along the line in prices. During that period the best grades of paper—white coated, have gone up fifty per cent. A medium grade of coated paper which cost 6 cents per pound previously cannot now be bought for less than 9 cents; and the mills are dodging orders at any price. Super-calender paper which formerly sold at from $4.35 to $4.50 is now quoted anywhere from $7.00 to $8.25. Newsprint—the rough surfaced paper on which newspapers are printed—has advanced nearly fifty per cent. Many of the best grades of paper have been taken off the market altogether, the manufacturers finding it impossible to keep up the quality. There is, in fact, a very general depreciation in paper quality despite the staggering jump in prices, and, notwithstanding the latter, manufacturers are being compelled to refuse business or to defer shipments for long periods.

This condition is operating in two directions in its bearing on the publishing business. It is forcing publishers to economize on paper in every conceivable way. They are finding it necessary to reduce the number of pages printed. Lavish supplements, containing features whose scope of appeal is limited, have had to be excised. "Extras" are put out only when the news really warrants it. Newspapers, magazines, class papers, are all concentrating on the important problem of printing the really essential matter in the least space and eliminating all non-essentials. In this one respect, the paper shortage will prove a blessing in disguise. Publishers are examining their mailing lists closely, cutting off unprofitable "exchanges" and "dead heads" and are doing everything in their power to economize in other similar directions. In these days of scarcity only the man who wants his paper sufficiently and is willing and ready to pay for it promptly should get his copy.

The situation is reacting in another direction. It is forcing publishers to raise their subscription rates; many newspapers and class publications have already done so. Subscription rates in Canada have, in the past, been hammered down to a more or less ridiculous minimum by strenuous competition, but now it is clearly impossible for publishers to continue to supply their product at such low prices in face of the sudden advance of paper cost.

The reader should bear the foregoing facts in mind. If he is inclined to complain when his favorite periodical comes to him a little thinner, and when his renewal notice quotes a higher figure, let him pause to consider that it is only by such measures that the publisher is able to continue to send him the paper at all.

THE CANADIAN BUSINESS SITUATION

A STATEMENT recently issued by the Customs Department shows that the trade of Canada in the first four months of the fiscal year has increased by more than 100 per cent. July was a remarkably satisfactory month, the returns showing an increase of 141 per cent. The shipments of Canadian manufactured products in July were three times the total for the corresponding month of last year. The situation in metal-working and general manufacturing circles continues satisfactory and what is perhaps of the greater importance, the outlook is highly favorable as regards getting more and even larger business, although the shortage of labor and probably further increase in cost of raw materials are causing considerable anxiety among consumers.

While production is being curtailed on the latter account, business continues to expand, which is proved by the marked increase in railway earnings, trade returns, bank clearings, etc. The increases shown each month reveal the substantial and progressive improvement in the industrial situation. The Customs returns for August, recently issued, show an increase of $3,610,000, the total revenue for the month being $11,941,000. The returns each month have shown increases, which are indicative of the phenomenal expansion in trade.

The most important event locally has been the Canadian National Exhibition, which opened on August 26 and closed September 9. There were, as usual, many interesting exhibits, industrial and engineering, while a new feature was introduced this year in the form of a display of complete shells of various calibres, showing the method of manufacture from the raw materials to the finished article. From every point of view this annual enterprise was a great success, exceptionally fine weather day after day having contributed not a little to the achievement.

That considerable development in the variety and scope of Canada's metal-working activities is both being anticipated and imminent is shown by the fact that a recent debenture issue to the amount of one million Sterling by Canadian Vickers, Ltd., Montreal, has received the Imperial Treasury authorization, giving indication that not only is the importance of this enterprise highly appreciated in Home Government circles, but that considerable expansion may be expected in the scope of its operations. Shipbuilding on a much more extensive scale than was perhaps originally planned will doubtless be the principal direction in which the additional capital will find an outlet.

Foundry plants—iron, steel and brass, are sharing in the general industrial prosperity, munitions requirements contributing perhaps the major portion of the meantime activity. The production of shell steel is being undertaken on an increasingly large scale, both by our old-established steel foundries and by plants whose inception has been brought about as a result of war-created opportunities. The electric furnace is for the most part to be found in the recently established plants, although in a few instances, open-hearth equipment has been installed. In spite of the fact that munitions production overshadows that for domestic requirements, it can be said of the latter that not only is the volume of output meantime well above normal, but there is evidence of the demand becoming immediately more insistent and ready to take advantage of every easing off in the munitions activity.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

CURRENT REGULATION

By Abe Winters

ONE of the most important features, if not the most important feature of plating room equipment, is that of current regulation. Many very fine dynamos have been installed for plating purposes, and the regulation of current has been almost totally neglected, or possibly some home-made contrivance utilized. Perhaps ordinary series type switch-boards are unreliable owing to parts becoming charred or burned. Joints become loossened and eventually the instrument is practically useless; repairs are necessary and finally the original device has become so transformed by mechanics who do not understand the principle of the mechanism that the plater is absolutely without a dependable controller. Furthermore, the best series type current regulators do not furnish the plater sufficiently fine control of the electric current, the steps are too great, the range too limited to be economical and efficient for many purposes which may confront the busy plater during an average working day.

The disadvantages of series type regulators are particularly apparent when used on brass plating baths, or for current control during black nickel plating, silver plating, acid copper plating and electro-coloring of metals. The range is so limited as to make the production of perfect deposits a matter of considerable difficulty unless temporary means are employed to reduce the current to proper tension. Often with a suitable reduction of voltage it is found that the volume of current has been reduced to a point where the production of commercial deposits is impossible. The plater realizes his trouble, he recognizes the cause of the delay, but when an explanation is offered to the manager, the very reference to the purchase of proper regulators for the electric current gets him in wrong and he decides to worry along with the old antiquated series type until a more convenient time for new equipment presents itself.

Parallel Type of Rheostat

The parallel type of rheostat possesses features which commend this truly modern instrument to every intelligent plater, and furnishes relief from worries attending the use of the series rheostat. Parallel type rheostats are an asset to any plating plant and thoroughly reliable. In the parallel type of rheostat for electro-plating current control, each resistant unit or switch is independent of the others and each being of a different value, a great many combinations of current can be made by the combination of switches. Furthermore, the resistance units are so arranged that every increase in current is of a given amount, as for instance a 175 ampere rheostat would have thirty-five steps of regulation in five ampere divisions and each step higher would be five amperes more. The advantages of the parallel rheostat are that the more current the more resistance units are thrown into the circuit, whereas with the old series type of rheostat, in order to get more current, you commence to cut out resistance units.

By the method of the old rheostats, it is possible to reduce the resistance to such a point that the coils or wires will get red rot and sometimes burn entirely off. This is impossible with the modern parallel rheostat, because each resistance unit is so designed that they will carry their rated load without getting red hot. In fact they can be connected across the dynamo mains without injury to the rheostat.

The parallel which presents the above very excellent feature is constructed entirely of brass and the resistance material is of such a nature that it will not rust or deteriorate, neither will acid have effect on same. Another point in favor of this particular parallel rheostat is that the resistance material has a resistance co-efficient which is practically nil. This is a great advantage in resistance material for the reason that when a load is first placed in a tank, and the circuit opened, the current flow through the tank and rheostat remain the same whether the resistance coils are cold or hot, whereas with the old series type of rheostat there is a continual drop of current in the solution if the coils of the rheostat become heated.

In order to turn out satisfactory work the plater must be able to control the current in his solutions regardless of the density thereof or the amount of work in the bath at any time. This can only be obtained with a parallel rheostat constructed along lines as herein described, as such instruments have a very large range of regulation, thereby enabling the plater to so control the current as to obtain the best results without blistering or burning the work. Rheostats of this type are obtainable for nickel, copper, brass, bronze, tin and galvanizing solutions from 50 to 1,000 amperes, with a current regulation from $2\frac{1}{2}$ to 50 amperes per step, according to size, and a voltage regulation from 1-10 to 1-8 volt divisions.

The method of operation is very simple, the rheostat is indestructible and cannot burn out. Current and voltage can be regulated to any desired value. Perfect contact with knife switches is effected, and years of efficiency are added to the life of the operator because he knows what current he has at command; worry is eliminated while time spent in speculating over possible results may be devoted to actual production. Power is saved as no red hot coils consume electrical energy which should be available for deposition or coloring. These instruments cost no more than the old style current regulators which have been the indirect cause of many failures and a hindrance to progressive men. Look over your plating room electrical circuit and satisfy yourself that you are losing money every day the antiquated method of current control is employed.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

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PLACE AND DATES OF MEETING.

The Occident Hall, corner of Queen and Bathurst Streets. Fourth Thursday of each month, at 8 p.m.

THE VALUE OF A NOTE-BOOK

By J. Edgar.

THE writer, in a somewhat long and varied experience in pattern shops and foundries, has met very few men who have kept a private note-book or taken notes of their work or the work going on around them. Even men who are keen on their craft, and in many cases who have acquired a sound, technical education, depend entirely on their memory. A good memory is as valuable to the foundryman as it is to most men, but there is no reason why the mind should be burdened with details that could be more accurately stored in a note-book. In class work, students are invariably impressed with the importance of making voluminous notes, and it

seems even more important that notes should be taken on practical shop work, as it is always more easy to track abstract subjects through text books. Valuable trade hints passed on by old hands never in many cases see print, and are very apt to be forgotten in time. The apprentice—and the journeyman no less—should cultivate a habit of making notes.

It need not be a laborious business, nor need it occupy much time. It should not be allowed to stand until the end of the day's work, but should be done at the moment when the occasion arises. A small pocket note-book into which can be jotted the many little tit-bits of a day's work is sufficient, although the more painstaking man will rewrite them carefully and collate them later. If it is not possible to get particulars of other work which is being done in the shop, observation will show many methods which cannot be hidden.

Pattern Shop and Foundry Notes

The noting of hints is not all that ought to be done. The patternmaker should make a sketch of each job he finishes, stating whether it is a one-off pattern, a good skeleton, or a solid pattern, and underneath should be noted the cubic measurement of the timber used and the number of hours he has been on the job. In the foundry similar particulars should be noted, say, whether the job has been made in green or dry sand, or in loam from boards, and the weight of the casting. The patternmaker in this respect has a decided pull over the moulder, for he can watch the job from the beginning, and usually having access to the foundry he can compute the total cost of the casting more nearly.

Technical Journal Cuttings

Akin to notetaking is the practice of keeping cuttings from technical journals. Space or other considerations may prevent the student or craftsmen from binding these journals, but if he is wise he will file articles which convey useful information for use at some future date. It is surprising the amount of knowledge we allow to wantonly slip from us in quite a short time, and this practice of gathering information will not only be found invaluable to the mechanic while he is such, but, if he aspires to a foremanship and succeeds, he will find it even more valuable.

It is the custom with many firms nowadays, especially with patternmaking, to get quotations from outside firms against which their own foremen have to compete. The foreman is then in a somewhat similar position to the rate fixer in a premium bonus shop. He has to refer to similar jobs which have been made in the past, giving the cost of labor and material. Shop management expenses can be added. It is when placed in this position that a young foreman appreciates his note-books. It also gives him confidence in dealing with men, and a better understanding of what a reasonable day's work is.—Foundry Trade Journal.

Questions and Answers

Question.—The commutator of our plating dynamo has become badly worn; there appear to be high spots on it, or, rather, the commutator appears to be eccentric. We do not care to meddle with the machine without some knowledge of proper remedy. Can you advise us?

Answer. — The effect which you describe may be due to the shaft being loose in bearing, the commutator being probably true on the shaft. If this condition prevails, a chattering sound will be noticeable. If bearing is loose, adjust it, if possible. If no provision is made for adjustment, put in new bearing. If the commutator is very rough or eccentric, the armature should be taken out and the commutator turned off in a lathe. Hard mica between the bars of a commutator, which does not wear as rapidly as the copper, will cause brushes to jump. One or several high copper bars projecting above the others will cause brushes to vibrate or to become thrown out of contact with the commutator. To ensure smooth, efficient working of the commutator, it is good practice to have the armature shaft move freely endwise fully an eighth of an inch in the bearings. Maintain a dull brown glaze on the surface of the commutator by applying a little oil or vaseline occasionally, but avoid applying too much lubricant, as other troubles are directly caused by so doing. The brushes should rest evenly on the commutator with full surface contact, and with a positive but light pressure. A bright or scraped appearance of the commutator indicates that the brush contact is poor or the brush pressure is too strong. If surface of commutator shows scratches or grooves, correct the cause immediately, as such conditions never remedy themselves, and may ruin a splendid machine very quickly. Make one man responsible for the care of the dynamo, and interest yourself in it enough to see that proper care is given it.

* * *

Question.—At what temperature should an acid copper solution be used to obtain best results, particularly when depositing copper upon non-conducting surfaces?

Answer.—The temperature at which an acid copper bath may be operated for best results depends largely upon the current density employed. If from fifty to one hundred amperes per square foot are employed, the temperature should be about 90° to 95° Fahr. If lower current densities are employed—for example, thirty to fifty amperes per square foot, the temperature should be from 70° to 85° Fahr. The composition of the bath should be kept as near uniform as possible. Do not limit the distance between electrodes too closely if uniformity of distributed metal is desired.

* * *

Question.—What form of rheostat or switchboard for electro-plating tanks is considered the best? We have had considerable difficulty with ordinary types of current controlling instruments, and wish to install something more durable and efficient if it is obtainable.

Answer.—The difficulty you have experienced with series circuit rheostats has been identical with the experience of thousands of other platers, and although these inefficient instruments have been condemned for years, it is only recently that a more satisfactory type has been obtainable. The latest form of controller is known as a split circuit rheostat, and its use overcomes practically all of the troubles resulting from imperfect current regulation. The rheostat is constructed along commonsense lines, and is now being included in the best and most up-to-date installations. Modern plating room requirements exclude the old type controller. A description of the parallel type rheostat will be found elsewhere in this issue.

* * *

Question.—As we have experienced more or less trouble from time to time with blackening of silver anodes in silver-plating solutions, we began to experiment with silver from various sources. In order to test practically pure silver for this purpose, we obtained some bar silver and used same as an anode. A black film formed upon the surface of the bar in the same manner as upon manufactured anodes. Can you inform us what the nature of this black film is?

Answer.—The condition favoring the formation of a black film upon silver anodes is admitted by experts to be caused by methods of refining the silver. Analysis of silver, which became black while in the plating solution, indicated the presence of peroxide. Silver anodes, which will remain clean, are obtainable, though the sale of such anodes is practically in the hands of one manufacturer, who guarantees his product not to turn black in a solution. Cathode silver is usually alloyed with copper for the purpose of increasing the profits of manufacturers, but an excess of one and one-half per cent. is seldom used.

* * *

Question.—I would like a formula for making black enamel, such as is used for trays, cycle and auto trimmings.

Answer.—Procure an iron kettle of size suitable for your needs; prepare a brick enclosure for a hot fire, and place kettle over the fire, preferably in the open air. To make approximately two

gallons of enamel, melt 2½ pounds of asphaltum by slow heat, add 2 quarts of boiled linseed oil, 6 ounces of litharge, 4 ounces of powdered zinc sulphate, and 6 ounces of red lead. Boil the mass thoroughly for about two hours, then stir in 8 ounces of fused amber gum (dark and one pint of linseed oil). Boil again for at least one and one-half hours. When the substance becomes thickened, remove the kettle from the fire and add one gallon of turpentine to the contents. This should produce an excellent black enamel of proper consistency for ordinary purposes. Care should be observed while boiling, as the mass is very inflammable.

* * *

Question.—Can you furnish us with information regarding method of platinizing copper? We do not wish an electro deposit, merely a process for producing the color of platinum on copper.

Answer.—Prepare a solution as follows:—In one and one-fifth quarts of hydrochloric acid mix nine ounces of arsenious acid and two ounces of copper acetate. When well mixed and in complete solution, clean the copper articles as for plating and suspend them in the solution until the platinum color is obtained.

* * *

Question.—Please inform me how to get a green bronze color on brass or copper.

Answer.—Immerse the brass or copper in a dilute solution of acetic acid and allow to drain; then expose to fumes of ammonia, or immerse in a solution of two parts water and one part perchloride of iron. The longer the immersion the darker the color. The latter method is more rapid than the former, which requires repeated immersions for deeper shades.

CONCERNING RAPID NICKEL PLATING

DURING the greater part of the half century that nickel plating has been practised, platers have been content to follow in the footsteps of their forefathers and deposit nickel at the snail's pace of three to five amperes per square foot. A few years ago "rapid nickel salts," claimed to permit of nickeling at two to three times the usual rate, were imported from Europe. These proved to be only mixtures capable of yielding more concentrated solutions than that enemy of progress, the "double sulphate," which for so long has masqueraded as the plater's friend. The American plater ultimately learned to make up his own rapid solution, and as a result nickeling at 10 to 20 amperes per square foot is very common today.

Plating With Cobalt

The most recent step in rapid nickeling, if nickel's twin brother and rival, cobalt, may be included in this category, is the remarkable work of Kalmus and Barrows in plating with cobalt at 150 amperes per square foot, turning out commercial plating of high grade in three minutes. These achievements with cobalt suggested the desirability of obtaining similar effects with the cheaper nickel solution. Insofar as the wonderful results of cobalt solution XIIIB depend upon its extreme concentration)312 grams of anhydrous cobalt sulphate, equivalent to 585 grams of the crystalized salt, per liter, or 7½ pounds per gallon), it should be possible to duplicate them with nickel, since its salts are equally soluble. It is, however, in the matter of anode corrosion and in its absorption of hydrogen that nickel is inferior to cobalt as a metal for electroplating.

Nickel anode becomes "passive" on the slightest provocation, and instead of all of the current dissolving nickel as is desired, a portion of it is spent in producing acid at the anode. Besides cutting down the efficiency of deposition, this acid causes hydrogen to be evolved in considerable quantity on the cathode, where some of it is absorbed by the deposit. Absorption of hydrogen by nickel renders it hard and brittle, and is likely to cause it to curl away from the metal on which it is deposited. The addition of a small amount of some chloride to the sulphate solution generally employed for nickel plating is a well known remedy for this passivity of the anode.

Hot Nickel Solutions

Previous experience with hot nickel solutions indicated their use for overcoming the difficulties just mentioned, since in a hot solution anode corrosion is greatly improved and absorption of hydrogen is lessened. A 25 gallon (95 liter), hot nickel bath was used at 125 to 150 amperes per square foot (14 to 16 per sq. dm.), with great satisfaction, producing in five minutes a heavier deposit than is obtained in an hour from the usual "rapid" bath at ten amperes per square foot. In spite of the extreme current density, the deposits were superior in quality and adherence to ordinary nickel plate. Since the electrical instruments and current supply were inadequate for working this bath to its full capacity, a portion was removed to an enameled pail where it could be tested on small cathodes.

This solution contains nickel sulphate (single salt), nickel chloride, and boric acid in the following proportions:

	Grams/Liter	Oz./Gallon
$NiSO_4.7H_2O$	240	32
$NiCl_2.6H_2O$	20	3
H_3BO_3	20	3

At the outset the anodes were the same as have been used in the plating laboratory for a number of years, viz., strips of electrolytic nickel. Later, cast anodes of the same material were employed. Results of some of these tests are presented in tabular form as follows:—

Exp.	Temperature C°	Temperature F°	Time Min.	Amperes per Sq. Dm.	Amperes per Sq. ft.	Ampere-Hours per Sq. ft.	Deposit
No. 10	67	153	5	31.7	295	24.5	Fine
No. 48	71	160	5	47.6	422	28	Good
No. 54	92	198	1	95.3	890	14.8	Fine
No. 4	25	77	3	5.3	49	3	Fine
No. 5	25	77	6	14	130	6.5	Mat. polishes well.

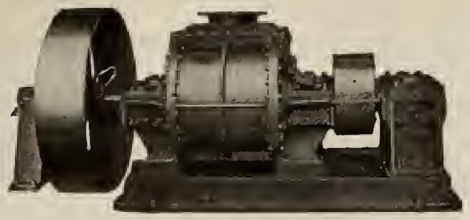
In no case was the deposit "burned." In No. 5 there was a vigorous evolution of gas, indicating a low current efficiency of deposition. Deposits from the hot solution were mat, but polished easily.

Deposit Thickness

It is a matter of general observation that electrolytic deposits become rougher with increasing thickness; when comparing different plating baths it is, therefore, desirable to know the thickness of the deposits as well as their physical qualities. For the same current efficiency, the thickness of nickel deposited will be proportional to the ampere-hours per unit of surface. By a comparison of the ampere-hours per square foot in the accompanying tables, the relative thickness of different deposits may be estimated.

Exp.	Temperature C°	Temperature F°	Time Min.	Amperes per Sq. Dm.	Amperes per Sq. ft.	Ampere-Hours per Sq. ft.	Deposit
No. 12	74	165	20	18.9	176	60.3	Fine, mat
No. 14	35	95	12	11.7	109	22.6	Rolled up, brittle
No. 15	38	100	22	8.2	76	27.9	Mat, tore in buffing
No. 49	71	160	5	24.2	225	18.7	Fine
No. 50	78	172	10	30.7	285	47.6	Fine 0.002 in. (0.05 mm.) thick
No. 53	98	208	25	15.2	141	60	Five successive deposits

At 100 per cent. efficiency, one ampere-hour per square decimeter deposits 0.0123 mm., and 10 ampere-hours per square foot deposits 0.00052 inches, or 0.001 inch in thickness requires 19.2 ampere-hours. One hour at ten amperes per square foot, or ten ampere-hours, is considered good nickeling, and a common cobalt deposit



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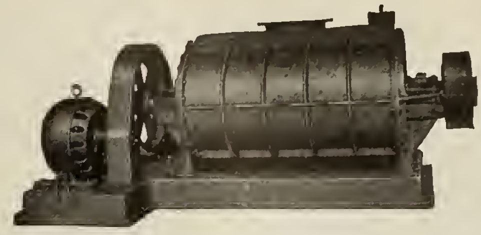

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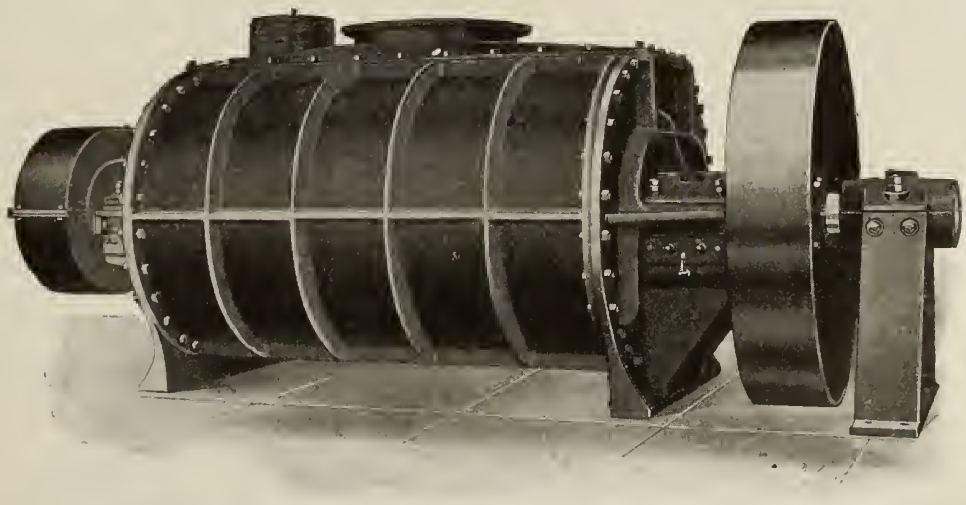

Belt-Driven Blower for Cupolas and Oil Furnaces

P. H. & F. M. ROOTS COMPANY

New York Office: 120 Liberty Street.

CONNERSVILLE, INDIANA

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by Barrows was 150 amperes per square foot for three minutes, or 7.5 ampere-hours. Judging by these standards the results shown in the tables are heavy deposits. In order to secure samples from hot and cold solutions for direct comparison, polished aluminium cathodes were used, from which the nickel was easily stripped.

Plating Aluminium

Plating on aluminium brought out the difference between deposits from cold and from hot solutions. An excellent deposit was obtained from the hot solution in every case. It bore polishing without peeling from the aluminium, and, when stripped from the latter, proved of excellent physical quality. Most of the deposits from the cold solution rolled up and partly separated from the cathode while in the plating bath, and, in the few cases where this did not happen, the deposit was torn during polishing. No. 53 consisted of five successive deposits for five minutes, each coating being polished and immersed in the electric cleaner for ten seconds before replating. It is 0.0025 inch (0.06 mm.) thick, and is harder than the usual deposit from a hot solution.

Current efficiency tests were made by reading the current on a Weston model No. 280 ammeter, and determining the weight of metal deposited in five or six minutes. Since a difference of three seconds changes the weight of a five minute deposit by one per cent., the results are subject to an error of at least this magnitude. Current efficiencies above 90 per cent are obtained in the hot solution at 20 amperes per square decimeter (190 amp. sq. ft.) It is evident from the tests that heating the solution and lowering the current density raises the current efficiency .

Current Efficiency Tests

Exp.	Temperature C°	Temperature F°	Time Min.	Amperes per Sq. Dm.	Amperes per Sq. ft.	Ampere-Hours per Sq. ft.	Cathode Eff. Per cent.
No. 11	45	113	6	31.1	289	28.9	89.6
No. 13	29-40	84-104	6	31.1	289	28.9	19.4
No. 16	60-70	140-158	13	8.6	80	17.3	100.9
No. 46	25-28	77- 82	5	19.4	180	15	31.7
No. 48	91-84	196-183	5	9.5	88	7.4	98
No. 51	77-73	171-163	6	26.4	245	24.5	100.5
No. 52	76-84	167-183	6	51.3	477	47.7	99.2

Polarization at the end of No. 52 was only 0.16 volt. Measurements of polarization at 70 deg. C. (158 deg. F) gave 0.15 volts at current densities ranging between 13 and 26 amperes per square decimeter (121-242 amp. sq. ft.). It is therefore probable that hot nickel solutions can be operated at higher current densities with less anode surface than is at present used for current densities of 10 ampere per square foot.

In experiments with a solution containing 75 grams per liter (10 oz. per gallon) of the "double sulphate," two and a half times the current was required to cause burning at 70 deg. C. (158 deg. F.) that produced this effect in a cold solution, the weight of metal being the same in the two cases. This indicates that concentration of metal is a greater factor in permitting the extremely high current densities used in these hot solutions than is the temperature. The beneficial effect of heating a nickel solution consists in the improved quality of the deposit, and in better anode corrosion. To avoid convection currents, the flame by which the solution was heated was removed at the beginning of each test. At the higher current densities there is noticeable heating of the solution by the current.

A nickel solution that is extensively used consists of the single sulphate, boric acid, and common salt . In order to learn if the substitution of common salt for the nickel chloride of the laboratory plating bath would cause any marked difference in its operation the following solution was tested:—

	Grams/Liter	Oz./Gallon
Single sulphate	240	32
Sodium chloride ...	30	4
Boric acid	22	3

Bath With Sodium Chloride

Exp.	Temperature C°	Temperature F°	Time Min.	Amperes per Sq. Dm.	Amperes per Sq. ft.	Ampere-Hours per Sq. ft.	Cathode Eff. %	Deposit
No. 11	32	90	5	19	177	14.7	25.6	Good
No. 43	71	160	5	19.6	184	15.3	82.3	Burned one edge
No. 44	76	169	5	20.8	193	16.1	82.8	Burned one edge
No. 86c	84	183	3	20.2	187	9.3	....	Fine
No. 68d	78	172	4	25.3	234	15.6	....	Burned

Although this solution gave fine results, it is inferior to the bath containing nickel chloride, in not permitting the use of so high a current density. To make up the bath with nickel chloride proceed as follows: Dissolve the nickel salts in the proper amount of hot water, add nickel carbonate in small amounts at a time and heat until all acid is neutralized; either filter or allow to settle and decant the clear solution, and finally add the boric acid.

Insofar as anode corrosion is concerned, any soluble chloride might be substituted for the nickel chloride, but not without some effect on the character of the deposit. Magnesium chloride or sodium chloride seems to be preferred for this purpose. In case either of these is used, neutralizing might well be done by the carbonate of the same metal. Ammonium salts and the "double sulphate" of nickel are to be avoided, since they are likely to cause crystallization from the solution when cold.

Obtaining Best Results.

To obtain the best results from a hot solution the current density must be high; cables and tank rods must therefore be of ample capacity. Control of a hot solution by regulation of the amount of anode surface will probably be easier than in a cold bath. The heating coil should be of heavy lead (or hard lead) pipe, with a settling space of five or six inches below the lowest coil; lead will also serve as a lining for the tank. If an electric cleaner is operated from the plating dynamo, either the heating coil should be electrically insulated, or all rheostats should be connected on the cathode side of the line. Should gas pitting occur on first using the solution in the morning, it may be avoided by heating the bath to boiling for a few minutes before beginning plating. Seventy deg. C. (158 deg. F.) is a good temperature at which to operate a hot nickel bath. Owing to the peculiar properties of electrolytic nickel, the advantages of a hot over a cold solution are greater in nickel plating than in the deposition of any other metal.

Advantages of Hot Over Cold Nickel Solution.

1.—Heating from 25 to 70 deg. C. (79 to 158 deg. F.) lessens the resistance of the solution one-half.

2.—The current density may be increased two and a half to three fold.

3.—The current efficiency, if less than 100 per cent. in the cold solution, is raised.

4.—Anode corrosion is greatly improved, and higher current densities may be used at the anode as well as at the cathode.

5.—The deposit is superior to ordinary nickel plate in toughness and freedom from peeling.

6.—In the solution tested, plating may be done at 200 to 300 amperes per square foot (22 to 33 per sq. dm.), at which rate the same amount of metal is deposited in five minutes as requires one and a half hours in the "rapid solutions" now in use at ten amperes per square foot.

From a paper presented at the recent meetings of the American Electro-Chemical Society.

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THE MOMENT THE AIR IS TURNED ON the machine is in full operation.

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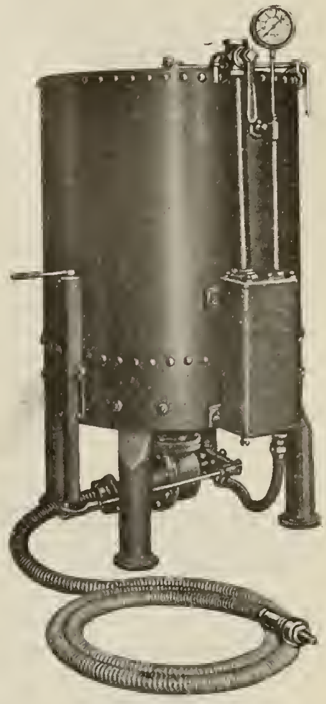

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With the AJAX process it does not make a bit of difference whether we use scrap or virgin metal to begin with. The AJAX process separates the constituents of scrap metal perfectly. When scrap is used in AJAX Process Ingots, either with or without virgin metals, the process guarantees absolute uniformity, maximum security and virtually no dross.

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No. 1 compos'n turnings	12 50	12 00
No. 1 wrought iron	11 00	11 00
Heavy melting steel	9 00	9 00
No. 1 machin'y cast iron	13 50	13 50
New brass clippings	13 50	13 50
New brass turnings	12 00	11 50
Heavy lead	6 00	6 00
Teal lead	5 00	5 00
Scrap zinc	7 50	8 00
Aluminum	34 00	30 00

COKE AND COAL.

Solvay foundry coke, on application	
Connellsville foundry coke	$7.02
Yough steam lump coal	....
Pittsburgh steam lump coal	4.30
Best slack	3.87

Net ton f.o.b. Toronto.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$42 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	55 00

PROOF COIL CHAIN.

¼ inch	$9.45
5-16 inch	9.10
⅜ inch	8.35
7-16	7.15
½ inch	6.95
9-16 inch	6.95
⅝ inch	6.80
¾ inch	6.70
⅞ inch	6.55
1 inch	6.40

Above quotations are per 100 lbs.

MISCELLANEOUS.

Solder, guaranteed	0.27½
Babbitt metals	.11 to .60
Putty, 100-lb. drums	3.00
Red dry lead, 100-lb. kegs, p.cwt.	13.87
Glue, French medal, per lb.	0.20
Motor gasoline, single bbls., gal.	0.31
Benzine, single bbls, per gal.	0.30½
Pure turpentine, single bbls.	0.69
Linseed oil, raw, single bbls.	0.84
Linseed oil, boiled, single bbls.	0.87
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7 00
Lead wool, per lb.	0.11
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½
Lard oil, per gal.	1.35

SHEETS.

	Montreal	Toronto
Sheets, black No. 10	4 60	4 80
Black sheets, No. 28	4 15	4 00
Canada plates, dull, 52 sheets	4 50	4 50
Canada plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized)	6 75	6 75
Queen's Head, 28, B.W.G.	7 75	7 75
Fleur-de-Lis, 28, B.W.G.	7 35	7 35
Gorbal's best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	6 15	6.15
Premier, 10¾ oz.	6 40	6 40

ELECTRIC WELD COIL CHAIN B.B.

3-16 in.	$11.70
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60; headers, 60; flanged unions, 55; malleable bushings, 60; nipples 72½; malleable, lipped union, 60.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.10
Caustic soda	.1½
Copper carbonate, anhy.	.35
Copper, sulphate	.14
Cobalt sulphate	.14
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130 per cent.	.36
Sodium hydrate	.05
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.35 to .38
Tin	.49 to .52
Silver, per oz.	.78 to .80
Zinc	.18 to .20

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt	2.25
Polishing whels, bullneck	1.10
Emery composition	.12 to .14
Pumice, ground	.03
Emery in kegs, American	.05
Tripoli composition	.04 to .06
Crocus composition	.07 to .08
Emery composition	.12 to .14
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Toronto, Ont., Sept. 1.—The shortage of raw materials particularly, semi-finished steel, will doubtless be the most important result of the heavy new demand for steel. The shortage will be reflected in prices and deliveries of practically all kinds of machinery both small and large. Until recently it was thought that the crest of the upward movement had been reached, but the new developments have changed the aspect of the situation and previous calculations have been upset. In addition, the scarcity of skilled labor will help to further complicate matters which have already reached an acute stage. The combined effect of these two causes will mean a further reduction in output at a time when maximum production is so much desired and in the case of munitions and war supplies imperative. Satisfactory crop reports continue to be received from the various grain producing districts and these are having the usual stimulating result on business conditions generally.

Steel

The steel market is again very strong, and is unusually active for the time of the year. The enormous demand for steel for munitions and for other purposes connected with the war has resulted in a new buying movement in the United States and Canada. The mills have as much business booked as at any time before, and deliveries are getting as backward as ever, second quarter of 1917 delivery being about as early as can be promised now. Another upward movement has started in prices of steel products, the principal reasons being the shortage and increased cost of semi-finished material. The higher prices this month include advances on steel bars, on plates, and an increase of approximately 10 per cent. on boiler tubes. The situation as regards boiler tubes is perhaps tighter than in any other line, as the mills are sold up for eight to ten months on both locomotive and merchant tubes. Plates are also in heavy demand, particularly from the shipyards and boilermakers. The leading mills have their entire output sold for this year, and have taken large contracts for delivery in first quarter and first half of 1917. Prices of wire products continue very firm, and an advance is looked for early in the present month. The wrought iron pipe situation is unchanged, but prices may advance. Following the departure of the hot weather, production has materially improved, although the shortage of labor is adversely affecting the situation. The demand for shell steel, however, is so pressing that the mills are making a big effort to increase the output as much as possible.

The market on sheets is firmer and quotations have advanced on black sheets, but blue annealed are unchanged. The hot weather seriously hampered mill operations; the output, therefore, was curtailed and deliveries were further delayed. Prices of galvanized sheets are lower, due to the recent declines in spelter, but the high level of black sheets will tend to steady the market.

The steel market in the United States continues very firm, with prices advancing on some products and deliveries getting more backward. There has been an increase in domestic buying, but consumers are still inclined to be cautious on account of the present high prices. Steel bars are unchanged at 2.60c and shapes at 2.50c, but plates have advanced and are now being quoted at 4c f.o.b. Pittsburgh. Open-hearth sheet bars have declined $2, and are now quoted at $45 per ton Pittsburgh. Billets are unchanged, as are also Chicago warehouse prices.

Pig Iron

The situation in the pig iron market is unchanged, but it is believed that the next movement is likely to affect prices favorably. The heavy production of steel assures a big demand for pig iron for the rest of the year, and prices may accordingly advance.

Supplies

Bnsiness in machine shop supplies continues brisk, with prices of practically all lines very firm. Although there are few price changes of importance to note this month, higher prices on some lines, particularly in steel and brass goods are anticipated. Linseed oil is lower at 84c per gallon for raw and 87c for boiled oil. Crude oil continues weak but there has been no further decline in gasoline, while lubricating and lighting oils are also unchanged. An advance of 5 per cent. has been made on Disston hand saws.

The market continues steady, with prices holding firm on foundry supplies. Trade is fairly good, and the outlook is improving, the foundry business sharing with other industries in the general betterment. The renewed activity in the steel trade and consequent shortage and higher prices of semi-finished steel will have a tendency to stiffen prices of some lines of foundry supplies and equipment, while brass goods will also be affected on account of the renewed strength in the price of copper. Polishing wheels have advanced on account of the increase in cost of raw materials—leather and felt chiefly. Felt wheels are now quoted at $2.25 and bullneck at $1.10. Turkish emery is higher at 10c per lb., but pumice is a shade lower at 3c per lb.

The situation in chemicals has changed very little during the month. With the exception of two or three lines, which have declined, prices are firm. The demand for copper sulphate has fallen off considerably, and prices have again declined. White arsenic is lower, as is also sodium cyanide, while caustic soda is weaker at 1½c per lb.

Metals

The metal markets continue to display considerable activity and are firmer than they have been for some weeks. Although the markets generally are strong there have been no changes in prices with the exception of copper which has again advanced. Business locally continues very good for the time of the year and further improvement is anticipated. Metals for munitions are of course in good demand but ordinary business is keeping up well .

Copper.—The situation in the copper market is unchanged from last month and quotations are again a shade higher. Sales for November, and December are in large volume and export demand continues very heavy a great part, it is said, being for private consumers in the Allied Countries. The buying of the last three weeks is rapidly cleaning up the supplies for the current year. Quotations are higher and nominal at 30c per pound.

Tin.—The situation in the tin market is the same as last month and quotations locally are unchanged although London is higher. The market is quiet but firm with no feature of importance to note. Tin is quoted at 44c per pound.

Spelter.—The market is quiet, and it is reported that there have been some second hand offers at concessions. Producers are now well sold ahead and are not anxious to sell. Quotations unchanged at 14c per pound.

Lead.—The market is less excited now than it was about a week or ten days ago, prices being firmly maintained. The Trust price of 6.50c New York, is unchanged but independent prices are higher at 6.75c New York. The demand for lead is now heavy and producers are sold farther ahead than ever before. Local price 8½c per pound .

Antimony.—The market is now dull following the recent heavy buying movement, quotations being firm but unchanged at 18c per pound.

Aluminum.—The market is dull and quiet and the situation unchanged. Local price 68c per pound.

Trade Gossip

The Dominion Brake Shoe Co. has increased its capital stock to $200,000.

Niagara Falls, Ont.—Work has been commenced on the erection of a plant for the Canadian Aloxite Co.

Dundas, Ont.—The John Bertram & Sons Co. is calling tenders for the erection of a pattern shop.

G. H. Duggan, vice-president of the Dominion Bridge Co., has been elected a director of the Royal Bank of Canada.

Welland, Ont.—The Canadian Steel Foundries, Ltd., will build a forge shop at their plant here to cost about $6,000.

Welland. Ont.—The Electro Steel & Metals, Ltd., will build an extension to the foundry at a cost of about $10,000.

Toronto, Ont.—The Canadian Hanson and Van Winkle Co., will build an extension to their foundry to cost $7,000.

Thetford Mines, Que.—The foundry owned by La Fonderie de Thetford, Ltd., was recently destroyed by fire. Loss, $75,000.

Renfrew, Ont. — The International Molybdenum Co. is planning an electrically operated refining plant here at a cost of $150,000.

Niagara Falls, Ont.—The Pollard Mfg., Co., will shortly begin the construction of a foundry to cost about $40,000.

London, Ont.—London Rolling Mills Co., propose erecting an addition, to their plant to cost $50,000. New machinery will be installed.

C. H. Speer has been appointed chief engineer of the Algoma Steel Corporation, in succession to J. D. Jones, who has resigned.

D. H. McDougall, general manager of the Dominion Steel Corporation, has been gazetted Honorary Colonel of the 187th Nova Scotia Highland Regiment.

William Hall representing Spear & Jackson, Ltd., Sheffield, England, is calling on the trade in Canada, en route to the far East.

Port Colborne, Ont.—It is understood that the International Nickel Co. will establish a nickel refining plant here. Options have been secured on a site and other preliminary work has been started.

The Milton Foundry has been incorporated at Toronto, with a capital of $40,000, to carry on a foundry business at Milton, Ont. Incorporators: A. Fasken, Duncan McArthur, and E. H. Brower, all of Toronto.

The Tivani Steel Co., Belleville. Ont., which has been experimenting for some time on an electric smelting process for the direct reduction of refractory ores, is now about to engage on a commercial scale in the manufacture of high-speed molybdenum steel. A three-phase electric furnace is used.

National Bronze, Iron & Engineering Works, Ltd., has been incorporated at Ottawa with a capital of $750,000 to carry on the business of mechanical and electrical engineers at Montreal. Incorporators: L. A. David, J. S. Lamarre and E. C. Baker, all of Montreal.

Raymond McLaughlin, for 17 years in the offices of the Union Works of the Carnegie Steel Co. at Youngstown, Ohio, has been appointed secretary to Ward B. Perley, vice-president and general manager of the Canadian Steel Corporation at Ojibway, Canada.

The Manitoba Steel Foundries, Ltd., has been incorporated at Ottawa with a capital of $300,000, to carry on the business of steel and iron founders, engineers and metal workers at Winnipeg, with head office at Montreal. Incorporators: Peter J. Smith, A. M. Tirbutt and H. Ormond, all of Winnipeg, Man.

Earl McIntyre, for 17 years connected with the Republic Iron & Steel Co., Youngstown, Ohio, but who resigned recently to take the position of field engineer for the Canadian Steel Corporation at Ojibway, Canada, was presented with a chest of silver by his associates in the Republic Company offices.

C. H. Easson, manager of the Bank of Nova Scotia at Toronto, Ont., and formerly occupying the same position at St. John, N.B., has resigned to accept the position of vice-president of Brown's Copper & Brass Rolling Mills, Ltd. This company has recently made large additions to the plant, which is located at New Toronto, Ont.

The Nova Scotia Steel & Coal Co., New Glasgow, N.S., contemplates making considerable extensions at its iron mines, Wabana, Newfoundland. These extensions include new hoisting equipment, boilers, pumps, compressed air plant, power lines, cables, ventilating plant, industrial railroad track, hauling cable, etc. R. E. Chambers, is manager of ore mines and quarries.

The Manitoba Steel Foundries, McArthur Building, Winnipeg, states that its new foundry is nearing completion, and that one furnace will probably be in operation September 1. The company will make electric steel, both in the form of castings and ingots for rolling, and when in full operation will have an annual capacity of 8,000 to 10,000 tons. A. M. Tirbutt is secretary and treasurer.

New record Ore Shipments.—Great lakes ore carriers established a new record in the month of July, loading 4,750,157 tons, which exceeds by 242,581 tons the movement in June, which at that time was thought to have set a mark that could stand for a year. Up to Aug. 1 ore shipments for the season aggregated 29,365,724 tons, a gain of more than 5,000,000 tons over 1913, the banner year of the trade. Detroit vessel men predict that the year's movement will approximate 59,000,000 tons.

Sulphuric Acid Plant.—The new sulphuric acid plant of the Consolidated Mining & Smelting Co., at Trail, B.C., is now in operation, being the only plant of its kind in B.C. The acid is recovered from the sulphur fumes from the furnaces, previously allowed to go to waste. The output is about ten tons daily, of which five tons is required for use in the company's own works, the balance being readily sold on the market, which at the present time is poorly supplied, prices having risen considerably since the war.

Australian Spelter Contracts.—It is reported from London that an agreement has been reached between Great Britain and Australia, under which Great Britain contracts to purchase 100,000 tons of zinc concentrates, and 45,000 tons of spelter annually from Australia during the period of war, and for ten years afterwards. The effect of the agreement will be to ensure the transfer of the smelting industry from Germany to British hands. The amount exceeds $25,000,000, covering more than half of Australia's annual output. The remainder of the output is expected to be taken over by France and Belgium.

Tungsten in B.C.—Considerable interest attaches to a discovery of tungsten ore on the Mud Creek claims of Wm. Thompson and Barney Halloran and while the amount of this valuable mineral is not yet sufficient to warrant working the property for the tungsten values alone, the fact that this mineral exists has added a new incentive to prospecting and mine development in this district. Advices from the Mines Department at Ottawa are to the effect that tungsten ore carrying 60 to 65 per cent. of the mineral is worth $4500 per ton, and that the ore may be marketed through the Canadian Munitions Resources Commission.

Charles Pascoe, formerly metallurgist for the Canadian Steel Foundries, Ltd., and recently connected with the Thomas Davidson Mfg. Co., Montreal, as consulting metallurgist, has joined the Snyder Electric Furnace Co., Chicago, as metallurgist in that company's electric furnace research plant, at Clearing, Ill. Mr. Pascoe's work in connection with the Thomas Davidson Mfg. Co. had to do with the production of shell billets from a Snyder electric acid steel furnace, and his work in this connection has been peculiarly successful, as evidenced by the fact that approximately 90 per cent. of the billets passed inspection.

Tinplate Industry to be Revolutionized.—It is reported from Cardiff, Wales that the tinplate industry is about to undergo a revolutionizing process owing to the introduction of a new method of tinning and preparing plates for tinning, according to an announcement made by the Mellingriffith Tinplate Works in South Wales. The process now said to be in successful operation dispenses with the necessity of white pickling, and the white annealed plates, after being separated, are, without handling, taken up by machinery and picked, washed, turned, cleaned and piled. It is asserted that the new method increases the production of tinplates in the proportion of more than two to one as compared with the ordinary process.

Dr. Walter Alexander Riddell, late Director of Social Surveys for the Methodist and Presbyterian Churches in Canada, has been appointed Superintendent of the new Trade and Labor Department of the Province of Ontario, created by the legislation of last session. The department includes several branches of the service which formerly acted independently—the Boiler Inspection Branch, Factories Inspection, Stationary Engineers and Labor Bureau. Dr. Riddell will probably commence work by a tour of the United States, and possibly Great Britain, in order to study the methods of employment bureaus, the organization of which will form an important part of the task of the new department.

Granby Copper Output Increase.—Copper production of the Granby Consolidated Mining, Smelters & Power Co., in July amounted to 4,368,846 lbs. This compares with 4,011, 361 lbs. in June and 4,727,929 lbs., in May, which was the high record output.

Of that month's total, 3,092,274 lbs. were produced at Anyox, compared with 2,799,540 lbs. in June and 3,383,230 lbs. in May, while 1,176,572 lbs. were turned out at Grand Forks, against 1,211,821 lbs. in June, and 1,344,699 lbs. in May. The output of copper at the properties since August of last year were as follows, figures in pounds:—

	Anyox	Grand Forks	Total
July, 1916	3,092,274	1,176,572	4,268,846
June, 1916	2,799,540	1,211,821	4,011,361
May, 1916	3,383,230	1,344,699	4,727,929
April, 1916	2,680,056	1,270,413	3,950,469
March, 1916	2,300,227	1,255,184	3,555,411
Feb., 1916	1,618,928	1,071,337	2,690,265
Jan., 1916	1,847,418	1,275,461	3,122,879
Dec., 1915	2,388,497	1,386,838	3,775,335
Nov., 1915	2,411,206	1,164,768	3,575,974
Oct., 1915	2,629,209	1,485,290	4,124,499
Sept., 1915	2,713,309	1,406,078	4,199,387
Aug., 1915	2,557,362	1,489,059	4,046,421

Mitchell Rail, Anchor & Specialty Co. has been incorporated at Ottawa with a capital of $30,000, to manufacture and deal in railway track material at Montreal. Incorporators: L. A. David, J. S. Lamarre and S. H. R. Bush, all of Montreal.

W. E. Clark, Ltd., has been incorporated at Ottawa with a capital of $40,000, to manufacture all kinds of metal products, also heating and ventilating plants and equipment at Toronto. Incorporators: J. F. Coughlin, F. P. O'Hearn and F. J. Meehan, all of Toronto.

Catalogue

Grinding and Polishing Machinery.—Bulletin No. 11 illustrates and describes an interesting line of grinding and polishing machinery made by the Gray Mfg. & Machine Co., Toronto. A specification is included covering each type of machine, while other matter deals briefly with foundry equipment.

Foundry Ladles. — Catalogue No. 122, deals with a line of foundry ladles made by the Whiting Foundry Equipment Co., Harvey, Ill. The various types of crane ladles, crane truck and standard truck ladles, bottom tap ladles, etc., are illustrated and their principal features described. Tables are included giving the capacity and principal dimensions of the various sizes.

Tumblers.—The Whiting Foundry Equipment Co., Harvey, Ill., have issued catalogue No. 120 illustrating and describing their line of tumblers and dust arresters for foundries. A brief specification is included covering the construction of the tumblers with detailed illustrations showing some of the parts, while the principal dimensions are given for the various sizes. Other lines dealt with include dry and wet cinder mills.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

BRAKE SHOES, WHEEL TRUEING
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Woodison, E. J., Co., Toronto, Ont.

BRASS MELTING FURNACES—SEE FURNACES

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit. Mich.
Woodison, E. J., Co., Toronto. Ont.

BRUSHES, ALL KINDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
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Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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W. W. Wells, Toronto.
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CHEMISTS—SEE METALLURGISTS

CHEMICALS
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J. W. Paxson Co., Philadelphia, Pa.
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CORE COMPOUNDS
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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Lindsay, W. W., & Co., Philadelphia, Pa.
Monarch Eng. & Mfg. Co., Baltimore.
Northern Crane Works, Ltd., Walkerville, Ont.
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CANADIAN FOUNDRYMAN

AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields.

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EDITORIAL CONTENTS

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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company Limited, Toronto, Montreal, Winnipeg, and London, England

VOL. VII. PUBLICATION OFFICE, TORONTO, OCTOBER, 1916 No. 10

The Publisher's Page

THE most lasting impression received at the Foundrymen's Convention and Exhibition was of the numerous new types of labor-saving appliances and machinery.

The shortage of men and the high cost of labor have had the natural result of bringing to a higher standard of economy and efficiency many types of foundry equipment.

In Canada, where the scarcity of labor is most marked, the benefit of new inventions of this nature will be much appreciated.

We advise the careful study of these new and improved methods through both the editorial and advertising pages of CANADIAN FOUNDRYMAN. The Buyers' Directory will help you in making selections. In the two pages at the back of this and every issue you will find listed practically every foundry requisite. Under each heading you will find the names of many of the leading manufacturers and dealers making and selling the different lines.

The Buyers' Directory is published solely for our readers' convenience, and you are invited to take advantage of it. If the information you desire is not given, write us, and we will gladly give you special service.

No, we do not claim that all firms making a particular line are listed in our directory, but those who are can be relied on as being progressive, reliable, and as prepared to handle your inquiries in an eminently satisfactory manner. If their selling methods are up-to-date, you can safely assume that their products are also.

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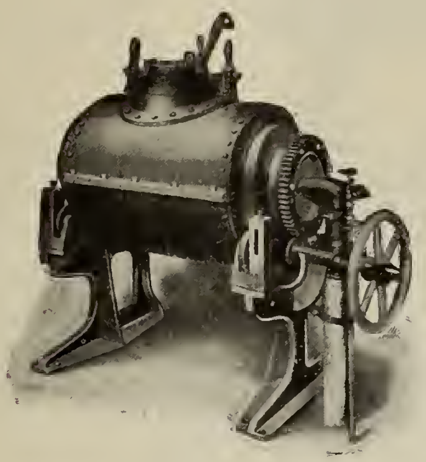


Simplex Fig. No. 92

DISPENSING WITH CRUCIBLES

Use Monarch "Simplex" and Double Chamber Furnaces and the loss by oxidation will be very small, tonnage big, cost small and the profit decidedly larger.

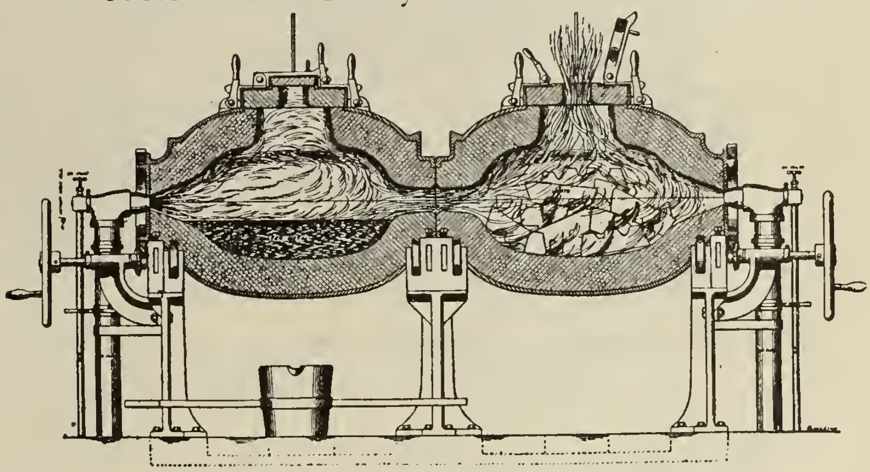
We guarantee quick furnace deliveries.

References in all parts of United States and Canada.

The most prominent manufacturers are our customers. Would you like some of their names?

Monarch Furnaces

Have Created a Remarkable Demand



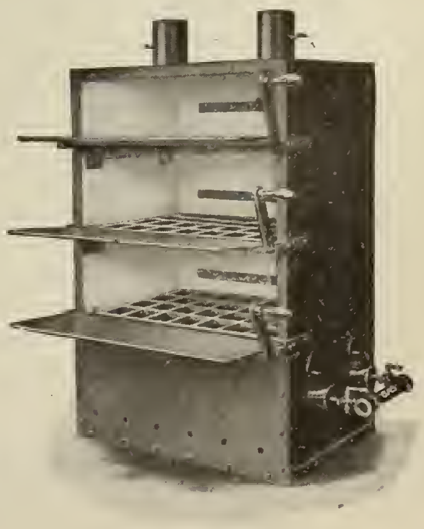
ACTION OF HEAT
Double Chamber Melting Furnace—Oil and Gas

CRUCIBLE FURNACES are shipped QUICKLY, TILTING, STATIONARY, AND PIT. Coke, Coal, Oil Gas-pots from No. 20 to 600. Guaranteed and operated.

CORE OVENS—The Best Made, "Acme" overhead or "Arundel" drop front. All fuels and sizes. Asbestos insulated and yours for immediate delivery. Cupola lighters, portable heaters, mold dryers, blowers, pumps, motors and full foundry equipment.

Specializing exclusively in melting of Non-Ferrous Metals.

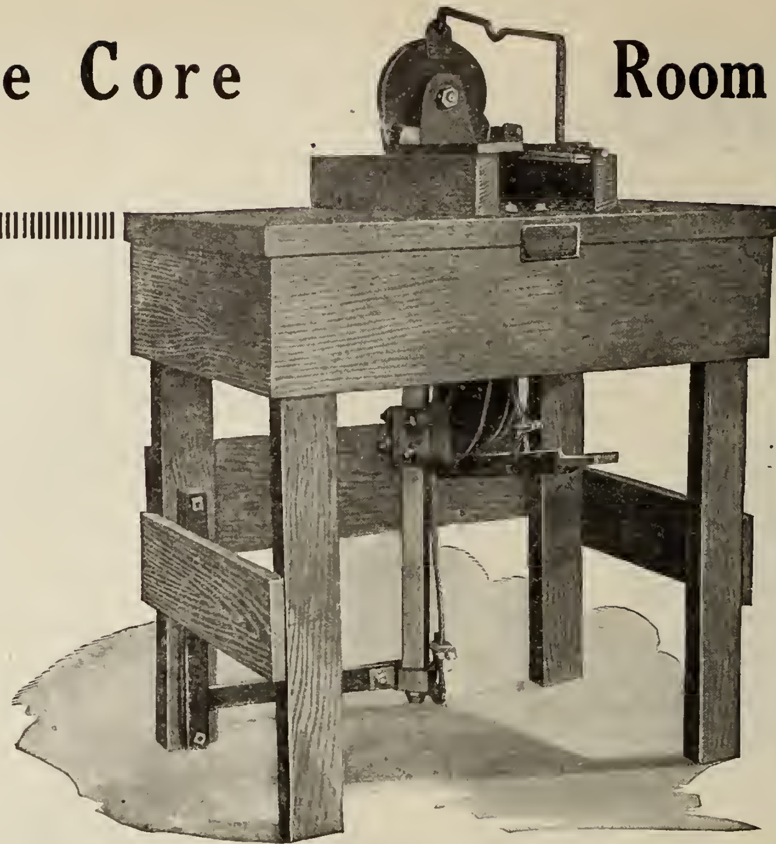
Write for full information and catalog C.F. 10, 1916.



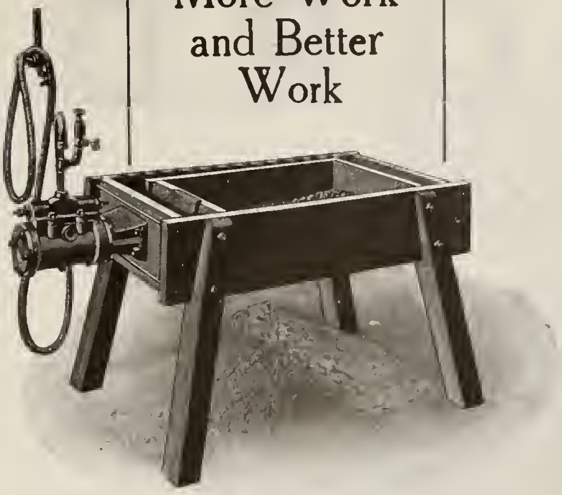
ARUNDEL Drop Front Core Oven

The Monarch Engineering & Manufacturing Co.

1206 American Bldg., Baltimore, Md., U.S.A. Shops: Curtis Bay, Md.



More Work and Better Work



at Half the Cost

The Battle Creek Sand Sifter

The machine is run by a powerful little engine, operated by steam or air and can be regulated to run fast or slow as desired by simply adjusting the throttle valve, and after starting will run continuously without further attention.

It is **plain** and **simple**, with nothing complicated in the mechanism to get out of order.

Can be used on Dry Sand Floors, Core Rooms Facing Floors, or any place in the foundry where it is required. It is the only sifter built that will handle wet sand to perfection.

Guaranteed to do more work with less air or steam than any other machine on the market, and its original cost is only half as great as others.

CONSTRUCTION:

These machines are strong and substantial to withstand the severe usage to which all foundry equipment is subjected. On the hand driven machine the cam has a 3 to 1 motion and runs on a hard steel bearing.

Our NEW STYLE SCREENS are a decided improvement over the old style formerly used, as they can be removed or changed in a moment without removing a screw. All screens are iron bound on all edges making them very strong and they will last 50 per cent. longer than the old style. Three screens, 1/4, 1-3 and 1/2 mesh are furnished with each machine.

Our IMPROVED FRAMES are built of selected yellow pine, reinforced with corner blocks. In fact the machines throughout are made with the very best of material and workmanship. We guarantee a lower cost of upkeep than on any other make of sifter.

We also manufacture the "Duplex" Sand Sifter which allows ONE man to mix facing for 50 molders or core sand for 40 core makers.

ASK FOR DETAILS.

Battle Creek Sand Sifter Co.

BATTLE CREEK, MICH.

Let us assist you in "Grinding Down Costs"

To do this simply give us an outline of your grinding operation and we will furnish the **best possible wheel** for the purpose.

Gresolite

for Grey and Chilled Iron.

Emery

for Steel Foundry and General Purpose.

Corundum and Rexite

for Precision and Fine Tool Grinding.

Write for booklet "Safety as Applied to Grinding Wheels."

Canadian Hart Wheels

LIMITED

Manufacturers Grinding Wheels and Machinery

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GLUTRIN.
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Glutrin is being used successfully in the making of cores ranging in weight all the way from one-tenth of an ounce to twenty-two tons, with ratios running from 1 to 30 to 1 to 200 and over, covering, practically, every phase of the art of metal casting.

Write for free illustrated booklet.

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Foundrymen's Convention and Equipment Exhibition

Staff Article

The Conventions of the American Foundrymen's Association and American Institute of Metals with their affiliated Exhibition held recently in Cleveland, Ohio, were featured by record attendances, and by a high standard of papers read and discussed at the various sessions. The Exhibition was an unqualified success from every standpoint, and was fully indicative of the remarkable progress made in foundry equipment and operation in recent years.

THE 21st Annual Convention of the American Foundrymen's Association was held at Cleveland, Ohio, during the week of September 11th. As usual, joint and also independent simultaneous sessions were held with the American Institute of Metals. The exhibition of foundry equipment and supplies, and machine tools which was formerly conducted by an independent corporation, was this year held under the joint management of the two associations. The first exhibition of foundry equipment and supplies took place in Cleveland in 1906, being the last time it and the convention were held in that city until the present year. This in itself was an interesting feature as it served to show the remarkable progress which has been made in the foundry industry during the intervening period.

Exhibition Feature.

The convention was held in the Hotel Statler, and the exhibition at the Wigmore Coliseum where 60,000 square feet of floor space was available for exhibitors. This space however was inadequate owing to the popularity of the exhibition, so an annex with 10,000 square feet space was erected on vacant ground adjoining the main building. All the available space was occupied, the number of exhibitors being 150. The exhibition was a complete success both as regards attendance and character of exhibits. It was the largest exhibition of foundry equipment and supplies that has ever been held in the United States. The exhibit included all types of modern foundry equipment, both heavy and light, stationary and in operation; general metal working machinery, cutting and welding equipments, pattern lumber, office specialties, coke, pig iron, non-ferrous metals, etc. The whole made a very attractive and interesting display, complete in that it included everything that is required and employed in the foundry. A noticeable feature brought out in the exhibit was the increasing tendency towards labor saving and reduction of operating costs.

Convention Feature

The convention opened on Monday, September 11th, at the Hotel Statler, with a record attendance, the afternoon session being devoted to the annual addresses by president R. A. Bull of the American Foundrymen's Association and president Jesse L. Jones of the American Institute of Metals.

A new departure was inaugurated this year in order to permit of a closer inspection of the exhibits and participation in the entertainment features without encroaching on the technical sessions as in the past. The arrangement consisted of having one meeting per day, in the morning, leaving the afternoons free for other purposes. Joint sessions were held on Monday and Tuesday mornings, these being followed by

GENERAL VIEW OF EXHIBITS IN ANNEX

separate meetings of the two organizations on Wednesday, Thursday and Friday mornings.

The program of the American Foundrymen's Association was most complete. It contained three interesting symposiums, forty papers and addresses and eleven committee reports. General topics were considered on Wednesday, followed by steel and malleable sessions on Thursday and gray iron and steel on Friday. The program of the American Institute of Metals was also very complete. Tuesday was devoted to a joint session with the American Foundrymen's Association while in addition, the program contained twenty-one papers on all phases of brass foundry and rolling mill work. Brass foundry practice was discussed on Wednesday, heat treatment and corrosion on Thursday, while on Friday papers were read on physical tests, metallography, etc. The final meeting of the two organizations was a joint session held on Friday when the new officers were installed and the convention finally closed. A proposal to amalgamate the two associations was defeated. The executive committee of the American Institute of Metals reporting the matter, expressed the fear that amalgamation of the two bodies might result in less prominence of the organization which has now a membership of 350.

VIEW OF EXHIBIT NEAR MAIN ENTRANCE TO COLISEUM

New Officers, A.F.A.

The American Foundrymen's Association elected the following officers for the ensuing year. J. P. Pero, Missouri Malleable Iron Co., St. Louis, president; Benjamin D. Fuller, Westinghouse Electric & Mfg. Co., Cleveland, vice-president; A. O. Backert, Penton Publishing Co., Cleveland, secretary-treasurer. The remaining members of the board of directors are as follows: R. A. Bull, Granite City, Ill.; Henry A. Carpenter, Providence, R. I.; Alex. T. Drysdale, Burlington, N.J.; C. E. Hoyt, Chicago; Alfred E. Howell, Nashville, Tenn.; W. A. Janssen, Davenport, Ia.; S. T. Johnston, Chicago; V. E. Minich, New York City; Jos. T. Speer, Pittsburgh; H. B. Swan, Detroit; S. G. Fagg, Philadelphia, and S. B. Chadsey, Toronto, Ont

New Officers, A.I.M.

The American Institute of Metal elected the following officers for the ensuing year: President, Jesse L. Jones, Westinghouse Electric & Mfg. Co., Pittsburgh, second term; secretary, W M. Corse, Titanium Alloy Mfg. Co., Niagara Falls, N.Y.; senior vice-president, George C. Stone, New Jersey Zinc Co., Palmerston, N.J. Other vice-presidents are: R. S. B. Wallace, National Cash Register Co., Dayton, O.; W. B. Price, Scovill Mfg. Co., Waterbury, Conn.; George K. Burgess, bureau of standards, Washington; DeCourcey Brown, Goldsmith Thermit Co., New York City; Harold J. Roast, James Robertson Co., Montreal; J. P. Salter, Ohio Brass Co., Mansfield, O.; F. H. Schultz, H. B. Mueller Co., Decatur, Ill.; W. A. Cowan, National Lead Co., New York City, and H. S. Gulick, Moore Brass & Metal Co., St. Louis.

Plant Visitations.

The arrangement whereby all sessions were held in the morning left the rest of the day free for visits to plants in

GENERAL VIEW OF EXHIBITS NEAR MAIN ENTRANCE TO COLISEUM the district, a closer inspection of the exhibits at the Coliseum, and other relaxations. As Cleveland ranks third in the United States in the number of foundries within the city limits, a great opportunity was thus afforded to witness operations in modern plants. Although plant visitation was limited to two days, Thursday and Friday, a considerable number of visitors availed themselves of the opportunity of an inspection of the Cleveland Furnace Co. plant on Wednesday afternoon. The inspection of plants by visitors was arranged for at appointed hours on the two days named. The most modern shops in the city were selected and those visited included:—The Ferro Machine & Foundry Co.; Interstate Foundry Co.; Westinghouse Electric & Mfg. Co.; West Steel Casting Co.; City Foundry Co.; and the Best Foundry Co., of Bedford, Ohio.

VIEW IN THE SOUTH-EAST CORNER OF THE COLISEUM

Entertainments.

The entertainment program included a ball game between the Cleveland and Detroit teams of the American League on Tuesday afternoon; a theatre party on Tuesday evening, and a trip to Euclid Beach Park on Wednesday night. The banquet was held at the Hotel Statler on Thursday evening and was attended by about 460 guests. The principal address was delivered by Newton D. Baker, V.S., Secretary of War, while Irving Bacheller the noted poet and novelist delivered a humerous talk on "The Cheerful Yankee."

Convention Papers, A.F.A.

Symposium on **"The Results of Closer Co-Operation Between the Engineer and the Foundry,"** as relating to:

"Gray Iron," by D. W. Sowers, Sowers Mfg. Co., Buffalo.

"Steel," by John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N.J.

"Malleable Iron," by G. F. Meehan, Ross-Meehan Foundries, Chattanooga, Tenn.

"Non-Ferrous Metals," by C. E. Chase, Modjeski & Angier, Chicago.

Symposium on **"The Influence of Gating on Castings,"** covering:

"Gray Iron," by B. D. Fuller, Westinghouse Electric & Mfg. Co., Cleveland.

"Steel," by William Gilmore, Hubbard Steel Foundry Co., East Chicago, Ind.

"Malleable Iron," by A. M. Fulton, Fort Pitt Malleable Iron Co., Pittsburgh.

"Non-Ferrous Metals," by R. R. Clarke, Pennsylvania Lines West, North Side, Pittsburgh.

"Waste Foundry Sand," by H. B. Swan, Cadillac Motor Car Co., Detroit, and H. M. Lane, consulting engineer, Detroit.

"Report of Work on Molding Sand," by S. W. Stratton, director, U. S. Bureau of Standards, Washington, D.C.

"The Significance of the Fire Waste," by Franklin H. Wentworth, secretary, National Fire Protection Association, Boston.

"What the Pratt Institute Has Done, Is Doing and Hopes to Do, in the Training of Men for the Foundry Industry," by Samuel S. Edmunds, Pratt Institute, Brooklyn.

"Analyzing Foundry Operations as a Basis for Improvement in Shop Conditions," by R. E. Kennedy, University of Illinois, Ubana, Ill.

"Foundry Work at the University of Nebraska," by John Grenman, University of Nebraska, Lincoln, Neb.

"Foundry Costs," by Clinton H. Scovell, Clinton H. Scovell & Co., Boston.

"Profit-Sharing as a Factor in Preparedness," by C. E. Knoeppel, C. E. Knoeppel Co., New York.

"How Some Cleaning Room Problems Have Been Solved," by H. Cole Estep, The Foundry, Cleveland.

"The Introduction of the Molding Machine in Foundries," by A. O. Backert, Penton Publishing Co., Cleveland.

Symposium on **"Electric Furnace Practice"**:

"The Ideal Electric Furnace for the Steel Foundry," by F. J. Ryan, E. B. McKee and W. D. Walker, Snyder Electric Furnace Co., Chicago.

"The Electric Furnace in the Foundry," by E. B. Clarke, Buchanan Electric Steel Co., Buchanan, Mich.

"Gronwall-Dixon Electric Melting and Refining Furnace," by John A. Crowley, John A. Crowley Co., New York.

"Electric Furnace Practice in the Manufacture of Steel Castings," by T. S. Quinn, Lebanon Steel Foundry, Lebanon, Pa.

"Electric and Converter Steel Compared," by Peter Blackwood, Blackwood Steel Foundry Co., Springfield, O.

"The Manufacture of Manganese Steel Castings," by W. S. McKee, American Manganese Steel Co., Chicago.

"The Presence of Alumina in Steel," by G. F. Comstock, Titanium Alloy Mfg. Co., Niagara Falls, N.Y.

Malleable Session.

"The 25-Ton Air Furnace," by F. C. Rutz, Rockford Malleable Irou Works, Rockford, Ill.

"What is the Normal Fracture of Good Malleable Iron?" by Enrique Touceda, Albany, N.Y.

"The Commercial Side of the Malleable Iron Industry," by W. G. Kranz, National Malleable Casting Co., Cleveland.

"The Application of Malleable Iron Castings in Car Construction," by Frank J. Lanahan, Fort Pitt Malleable Iron Co., Pittsburgh.

"Suggested Standards for Pattern Parts," by W. W. Carlson, Kansas State Agricultural College, Manhattan, Kan.

Gray Iron Session.

"The Effects of Different Mixtures on the Strength of Chilled Car Wheels," by G. S. Evans, Lenoir Car Works, Lenoir City, Tenn.

"Semi-Steel Classified," by David McLain, McLain's System, Milwaukee.

"Use of By-Product Coke in Foundries," by George A. T. Long, Pickands, Brown & Co., Chicago.

"The Use of Borings in Cupola Operations," by James A. Murphy, Hooven, Owens & Rentschler Co., Hamilton, O.

"The Use of Cheaper Materials," by C. C. Kawin, Charles C. Kawin Co., Chicago.

"One-third of a Century in a Gray Iron Foundry," by Alfred E. Howell, Phillips & Buttorff Mfg. Co., Nashville, Tenn.

"Thermal Reactions in Gray Iron," by Thomas Turner, The University, Birmingham, Eng.

"Application of the Match-Plate to Foundry Work," by J. K. Grill, International Harvester Co., Chicago.

Steel Session.

"The Use of Titanium in the Manufacture of Steel Castings," by W. A. Janssen, Bettendorf Co., Davenport, Ia.

"Acid Versus Basic Steel for Making Castings," by E. F. Cone, The Iron Age, New York.

"Alloy Steel Castings," by David Evans, Chicago Steel Foundry Co., Chicago.

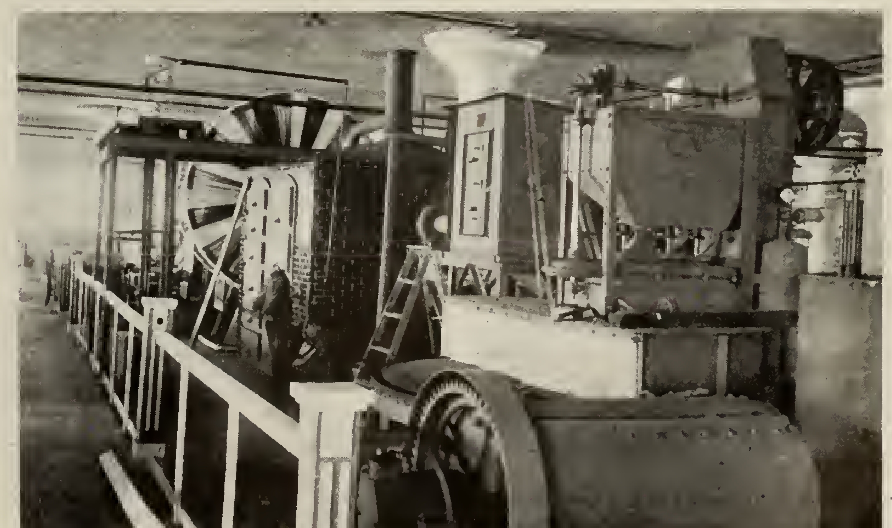
"Theory and Practice in Gating and Heading Steel Castings," by Ralph D. West, West Steel Casting Co., Cleveland.

"The Small Open-Hearth as a Flexible Unit for Either Large Steel Foundries or General Jobbing Shops," by Frank Carter, Milwaukee, Wis.

CONVENTION PAPERS, A.I.M.

Symposium on **"The Results of Closer Co-Operation Between the Engineer and the Foundry,"** as relating to:

"Gray Iron," by D. W. Sowers, Sowers Mfg. Co., Buffalo.



VIEW IN NORTH AISLE OF COLISEUM

"Steel," by John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N.J.

"Malleable Iron," by G. F. Meehan, Ross-Meehan Foundries, Chattanooga, Tenn.

"Non-Ferrous Metals," by C. E. Chase, Modjeski & Angier, Chicago.

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"Gray Iron," by B. D. Fuller, Westinghouse Electric & Mfg. Co., Cleveland.

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"Waste Foundry Sand," by H. B. Swan, Cadillac Motor Car Co., Detroit, and H. M. Lane, consulting engineer, Detroit.

"The Significance of the Fire Waste," by Franklin H. Wentworth, secretary, National Fire Protective Association, Boston.

"What the Pratt Institute Has Done, Is Doing and Hopes to Do, in the Training of Men for the Foundry Industry," by Samuel S. Edmands, Pratt Institute, Brooklyn.

"Analyzing Foundry Operations as a Basis for Improvement in Shop Conditions," by R. E. Kennedy, University of Illinois, Urbana, Ill.

"Foundry Work at the University of Nebraska," by John Grenman, University of Nebraska, Lincoln, Neb.

Foundry Practice.

"Twenty-Five Years' Experience in the Brass Foundry," by E. A. Barnes, Fort Wayne Electric Co., Fort Wayne, Ind.

"Evolution of the Die Casting Process," by Charles Pack, Doehler Die Casting Co., Rochester, N.Y.

"How a Large Manufacturing Concern Disposes of Its Old Metal," by J. M. Bateman, Western Electric Co., Cleveland.

"The Reclamation of Brass Ashes," by Arthur F. Taggart, Hammond Laboratory, Yale University, New Haven, Conn.

"The Small Leaks of a Brass Foundry," by Charles T. Bragg, Ohio Brass Co., Mansfield, O.

"The Application of the Oxy-Acetylene Welding Process in the Repair of Defective Non-Ferrous Castings," by S. W. Miller, Rochester Welding Co, Rochester, N.Y.

"Alloys to Withstand Internal Air Pressure," by S. D. Sleeth, Westinghouse Air Brake Co., Wilmerding, Pa.

"Making Thin-Walled Castings," by R. S. B. Wallace, National Cash Register Co., Dayton, O.

Heat-Treatment, Corrosion, Etc.

"Deterioration of Muntz Metal," by H. S. Rawdon, United States Bureau of Standards, Washington, D.C.

"The Initial Stress Produced by the Burning-In of Manganese Bronze," by Paul D. Merica and C. P. Karr, United States Bureau of Standards, Washington, D.C.

"A Curious Case of Corrosion of Tinned Sheet Copper," by Paul D. Merica, United States Bureau of Standards, Washington, D.C.

"Notes on the Occurrence and Significance of Tinned Crystals in Electrolytic Copper," by H. S. Rawdon, United States Bureau of Standards, Washington, D.C.

"The Annealing Properties of Copper," by G. V. Caesar and G. C. Gerner, Hammond Laboratory, Yale University, New Haven, Conn.

"Some Uses and Properties of German Silver as Applied to the Optical Trade," by G. C. Holder, American Optical Co., Southbridge, Mass.

Physical Tests, Metallography, Etc.

"Aluminum Castings and Forgings," by P. E. McKinney, United States Navy Yard, Washington, D.C.

"Copper-Aluminum-Iron Alloys," by W. M. Corse, Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

"Physical Tests on Common High Brass Taken Parallel and at Right Angles to the Direction of Rolling," by William B. Price and Philip Davidson, Scovill Mfg. Co., Waterbury, Conn.

"Seasoning Cracks and the Self-Annealing of Brass," by W. Arthur, Frankford Arsenal, Frankford, Philadelphia.

"Co-operation with the Metal Industries in Metallographic Work," by C. H. Mathewson, director, Hammond Laboratory, Yale University, New Haven, Conn.

Exhibitors, Exhibits and Representatives

Ajax Metal Co., Philadelphia, Pa.—Ingots of various metals manufactured. Representated by G. H. Clamer, first vice-president and secretary; C. F. Hopkins, general works manager; F. M. Willeson, New England and New York State manager; C. F. McRae, Detroit representative, and L. E. Purnell, Pittsburgh representative.

Alexander Bros. Lumber Co., Cleveland — Pattern and flask lumber specialists. Represented by H. L. Spitler, vice-president, and M. F. Fitzgerald, secretary.

Amalgamated Machinery Corporation, Chicago.—No. 23 Shell Boring Machine. Represented by N. A. Mears.

American Foundry Equipment Co., Cleveland, O.—For description of Exhibit see Sand Mixing Machine Co.

American Gum Products Co., New York.—Goulac Core Binder. Represented by Gordon I. Lindsay, general manager; W. E. Baird, manager foundry department; John F. Gaffney, R. H. Mills and U. W. Frink.

American Foundrymen's Association, Department of Safety.—Victor T. Noonan, Director of Safety of the Industrial Commission of Ohio, chairman. Exhibit of safety and welfare work in Foundries and shops. Loaned by the National Safety Council.

American Molding Machine Co., Terre Haute, Ind.—Jolting machine. Represented by W. C. Norcross, president, and Glen B. Hastings, western representative.

Arcade Manufacturing Co., Freeport, Ill.—Twenty-four inch roll-over machine, piston machine, jolt stripper, No. 2 modern molding machine, core jolt machine, 8-inch air squeezer, No. 90 combined jolt and squeezer and No. 2 hand squeezer. Represented by E. H. Morgan, president; Chas. Morgan, vice-president; L. L. Munn, secretary; Henry Tscherning, master mechanic; R. E. Turnbull, August Christen and G. D. Wolfley, representatives.

Armstrong Cork Co., Pittsburgh, Pa.—Nonpareil insulating brick for furnaces, ovens, blast mains, boiler settings, etc. Nonpareil high pressure covering for steam lines, boilers, feed water heaters, etc. Nonpareil cork covering for drinking water lines, tanks, etc. Linotile for office floors. Represented by P. W. Lamson, Cleveland district manager, and E. C. Lloyd, sales engineer.

E. C. Atkins & Co., Inc., Indianapolis, Ind.—Saws for all purposes, particularly metal cutting saws for all classes of metals and types of sawing, such as circular metal cutting saws, friction discs, metal cutting band saws, hand and power back saws and frames, saw fitting tools and Kwik Kut power hack saw machines. Represented by T. H. Endicott, special metal saw representative, ThomasA. Carroll, trade service department, and A. Mertz, Ohio metal saw representative.

Ayer & Lord Tie Co., Inc., Chicago.—A. & L. interior creosoted wood block floor. Represented by A. H. Noyes, secretary and treasurer; W. H. Blythe , F. W. Maechler, B. S. McConnell, S. C. Conway, and R. G. Inslee.

B. & B. Mfg., Indianapolis, Ind.—Thirty-inch hand jar and squeeze machine, 30-inch power squeezer and 24-inch power squeezer, and W. J. Parker. Represented by Wm. I. Ballentine, president,

Beighlee Electric Co., Cleveland, O.—Beighlee indicating and recording pyrometer equipment. Represented by W. H. Chappel, secretary, and W. O. Little, New York representative.

Berkshire Mfg. Co., Cleveland.—Automatic molding machine, air and hand squeezer molding machines, jolt and squeeze molding machines, vibrators, etc. Represented by R. H. York, president; W. A. Price, treasurer; C. L. V. Evans, assistant treasurer; W. D. Frase manager; F. Hulec and G. L. Cannon, representatives.

Charles H. Besly & Co., Chicago.—Represented by Edward P. Welles, president; Charles A. Knill, Ralph W. Young, Leo. E. Jacobs and George Klemp.

S. Birkenstein & Sons, Chicago.—Non-ferrous metals. Ingot copper, pig tin, spelter, lead, antimony, bismuth, manganese bronze, phosphor bronze ingots, brass ingots. Castings made from special alloys showing working qualities. Represented by Harry Birkenstein, member of firm; Lee Kahn, metallurgical director; M. Sehero, and Chas. B. Raphael, salesmen.

Blystone Mfg. Co., Cambridge Springs, Pa.—Core sand mixer with screen and motor attached, and power dump. Represented by W. J. Pees, president, and Luther G. Conree, general manager.

Brass World Publishing Co., New York.—Brass World & Plater's Guide, and technical books relating to the foundry trade. Represented by C. N. Manfred, business manager; George K. Meyers, M. G. Rosenthal and S. E. Rosenthal.

Brown Hoisting Machinery Co., Cleveland.—Tramrail equipment with switch, turntable, trolleys and chain hoist. Hand traveling crane with trolley and hoist. Represented by A. R. Leeds and F. D. Johnson.

Brown Specialty Machinery Co., Chicago.—Hammer core machines, electric duplex shaker and revolving barrel sand blast machine. Represented by E. A. Rich, Jr., president; J. E. Sweet, sales manager; John Laycock, factory superintendent, and A. G. Coburn, mechanical superintendent.

Buckeye Products Co., Cincinnati, O.—Parting compounds, vibrators, high temperature furnace cement, core compounds, metal fluxes, patent snap flask guides and metal melting furnaces. Represented by C. J. Goebriuger, president; D. S. Marfield, secretary; R. B. Ferguson, B. Bernhaum, C. S. Weigert, C. Gysin, J. B. Carpenter and A. J. Johnson, representatives.

Campanhia Braisleira de Matallurgia, Buffalo, N.Y.— Sensaud-Arens process for casting pipe. Represented by A. Arens and D. L. Savaud.

Carborundum Co., Niagara Falls, N.Y.—Carborundum and Aloxite products, including Carborundum and Aloxite wheels, Carborundum rub bricks, Carborundum and Aloxite cloth discs, Carborundum sharpening stones, Carborundum grains and powders and Carborundum firesand. Represented by C. E. Hawke, sales manager; G. T. Estabrook, Cleveland sales manager; W. U. Parrott, C. W. Barden and W. Walters, O. C. Dobson, C. D. Sargent, and T. B. Woodrow, representatives.

Cataract Refining & Mfg. Co., Buffalo, N.Y.—"Bison" core oils and compounds—parting. Cores and castings made with use of above cutting lubricants, cutting oils. Operating "bolt-cutter" using "Acme" cutting lubricant. Represented by H. C. Hutchins, vice-president; J. E. Chism, assistant to vice-president; J. Purvis, Jr., sales manager, core oil department; D. L. Baldwin, western sales manager, Chicago; E. P. Hughes, central sales manager, Detroit; A. A. Schaefer, eastern sales manager, New York; E. H. Coburn, T. E. Kenefick, H. C. Newton, C. W. Seibold and W. E. Williams, A. C. Breese, F. E. Deacon, R. M. Hitch, R. L. Middleditch, F. N. Tweedy and G. W. Zimmerman.

Champion Foundry Machinery Co., Chicago.—Champion Electric Sand Riddles in operation. Represented by Henry O. Magnuson, president and secretary; Anton Magnuson, vice-president and treasurer; W. B. F. Magnuson, salesman.

Chicago Eye Shield Co., Chicago.—Eye protectors of all kinds. Represented by Robert Malcolm and Dr. Herman Brennecke.

Chicago Pneumatic Tool Co., Chicago.—Chicago air compressor, Keller rammers, Keller and Chicago chipping hammers, pneumatic geared hoists, Duntley electric drills, Chicago hose couplings, Little Giant grinders and Little Giant air drills. Represented by J. G. Osgood, vice-president; A. C. Andresen, T. D. Slingman, T. G. Smallwood, L. J. Wakefield, C. D. Smith and L. E. Summers, manager Detroit plant.

Cincinnati Pulley Machinery Co., Cincinnati, O.—Avey ball bearing sensitive drilling machines, motor driven, in operation. Represented by L. Patterson, president; J. G. Hey, vice-president and general manager; C. K. Cairns, sales manager; J. F. Mirrielees, superintendent, and D. A. Patterson, operator.

Charles J. Clark, Chicago.—The Clark blast meter. Represented by Charles J. Clark.

Cleveland Blow Pipe & Mfg. Co., Cleveland.—Dust collecting system for the removal of dust from emery polishing and buffing wheels, consisting of motor driven exhaust fan, dust trap, galvanized pipe, elbows and various types of hoods, sheet metal shower bath, copper spraying can and photographs. Represented by Edward Coney, manager, and E. E. Toth, secretary.

Cleveland Pneumatic Tool Co., Cleveland.—Riveting hammers, chipping hammers, air drills, corner drills, compound drills, rotary drills, angle gears, holder-ons, corebreakers, sand rammers, valve grinders, emery grinders, Bowes air hose couplings, Never Slip hose clamps, verihest air hose, hose clamp tools, etc. Represented by Claus Greve, president; H. S. Covey, secretary ;L. W. Greve, treasurer; Geo. H. Hall, assistant treasurer; John DeMooy, assistant sales manager; Arthur Scott, superintendent; J. T. Graves and W. L. Orton, salesmen.

Cleveland Tool & Supply Co., Cleveland, O.—Dealers in machinery, factory, mills and plating supplies, and seamless steel tubing. Represented by Robert Locker and W. B. Pleadwell.

Cleveland Wire Spring Co., Cleveland.—Steel barrels, steel boxes, waste cans, steel racks, stools and steel core trays. Represented by

Continued on page 160.

Abstracts of Papers Read at the Foundrymen's Convention

The following abstracts of papers read at the Convention of the American Foundrymen's Association and American Institute of Metals held this year at Cleveland, Ohio, serve to show briefly the character and importance of the subjects dealt with and also emphasize the value of this method of disseminating knowledge relative to developments taking place.

SYMPOSIUM ON THE INFLUENCE OF GATING ON CASTINGS

By B. D. Fuller, A. M. Fulton, W. J. Gilmore, and R. R. Clarke.

CASTINGS are gated largely by rule-of-thumb methods, but in this symposium the authors have made an effort to lay bare some of the principles underlying the gating problem. The symposium is divided into four parts, taking up the gating of gray iron, malleable iron, steel and non-ferrous metal castings, respectively. It is clearly brought out by each of the authors that there is an intimate relation between the location of the gate and the shrinkage problem. When castings are properly gated and are provided with suitable heads, there is very little trouble from shrinkage, and when this work is done correctly, it is possible virtually to eliminate the use of chills in malleable practice. Chills should be avoided since they simply drive the shrinkage to a part of the casting where possibly it may do no harm. The correct gating of any casting is just as important as a proper mixture of metal and should have as much thought devoted to it as to any other feature connected with making the mold or pouring the casting. In designing any gate, two points should be considered: First, can the casting be fed from the proposed gate, excluding slag and preventing misruns, and second, should the heavy portion be fed by a riser located at the top of the casting? The advantages of the bottom-pour, fountain or horn type of gate for gray iron, malleable or steel castings are emphasized in the symposium. For certain forms of steel castings, such as rolls, special whirl gates are necessary. Proper gating is specially important in the production of non-ferrous metal castings, on account of the difficulties resulting from oxidation of the metal and the comparatively low temperature at which the metal freezes.

RESULTS OF CLOSER CO-OPERATION BETWEEN THE ENGINEER AND THE FOUNDRY

By D. W. Sowers, John Howe Hall, G. F. Meehan, C. E. Chase, and Mojeski & Angier.

THIS symposium is designed to bring out the points of agreement and difference between engineers and the foundrymen and to suggest action leading toward more effective co-operation. Each of the authors emphasizes the necessity for closer relations between the engineer who specifies the material and designs the parts and the foundryman who attempts to fulfill the requirements stipulated. Numerous actual instances of effective co-operation are cited in which time, effort and money were saved by working together. The necessity for suitable standard specifications which will be thoroughly understood by all concerned is discussed. It is also pointed out that the various materials used by the foundryman for making castings, such as gray iron, steel, malleable iron, brass, aluminum, etc., each have peculiar physical characteristics which should be considered by the engineer in designing parts. On the other hand, foundrymen, it is emphasized, should constantly strive to improve the quality of their castings in order to provide the engineer with the most satisfactory material.

ANALYZING FOUNDRY OPERATIONS AS A BASIS FOR IMPROVEMENT IN SHOP CONDITIONS

By R. E. Kennedy.

IN foundry work there is no general way of determining whether the method in use is the best, and the common thing to do is to put a man on the job and let him go to it, the amount of advice given him being very small compared with the amount of valuable instruction which could be given. But during recent years, it has been necessary for many shops to make thorough analyses of their operations, to hasten improvements in methods and equipment. For these analyses, time studies, scientifically conducted, show up the following factors:

1.—The improvement which can be made by the management in the conditions, equipment and shop organization, to help the operator improve the quality and increase the output of his work.

2.—The work done by the operator that is unnecessary. By eliminating this effort, the operator can turn out more product in a given time without any more exertion.

The three factors, labor, materials, and equipment, should be thoroughly studied in order to get the best results. With inexperienced labor it usually is advisable to employ the best materials. It is necessary, to get the best results, to take action along the following lines:

1.—Study the methods in vogue in the shop in question.

2.—Study the methods in vogue in the other shops handling the same line of work, or in any other line of work that might suggest ideas.

3.—Clean-up the shop and arrange it for the best work, providing storage places for equipment and materials.

4.—Standardize materials, mechanical equipment, methods and times of operations.

5.—Route and dispatch the work through the shop under these improved conditions.

WASTE FOUNDRY SAND

By H. B. Swan and H. M. Lane.

IN collecting the data for this paper, one of the authors sent a list of ten questions dealing with the sand disposal problem to a large number of representative foundries. The replies received indicated that there is a lively interest in the waste sand question among progressive foundry managers, although in most cases at present no practical reclamation methods have been devised. One foundry reported, however, that "it is absolutely possible, at a very nominal expense, to take refuse sand and convert it back to a condition fit for use. In fact, it is almost impossible to tell the old from the new." Mr. Lane points out that what is wanted is a process that will clean the largest amount of sand at the least expense. "A process that recovers, let us say, 80 per cent. of the sand in a fairly usable condition may be better than one that recovers 90 per cent. in a better condition, but at a higher cost," he states.

THE USE OF BORINGS IN CUPOLA OPERATIONS

By James A. Murphy.

FOR many years iron borings and steel chips have been charged in cupolas to reduce the cost of the mixture and to better the quality of the metal. When borings or chips have been charged loose with pig iron and scrap, the melting loss is excessive and when charged alone, the heat does not penetrate the mass far enough to melt the entire charge. The practice of laying a bed of borings on the cupola bottom is unsatisfactory because heat is wasted. Stanton Griffith accidentally discovered that by using lengths of stove pipe as containers, chips and borings could be charged in the cupola in such a way that the melting loss amounted to only 2 per cent. The stove-pipe cartridges hold about 50 pounds of borings and the cost of preparing them does not exceed \$2.50 per ton. In 1908 Walter F. Prince introduced a method of melting chips in a vertical tube placed in one side of the cupola. Although satisfactory in many respects, this process lacks the simplicity which marks the cartridge method, and is less economical. The briquetting of borings by means of great pressure gives satisfactory results, but the cost of preparing the briquettes is high. Briquettes in which binders are used produce castings containing pin holes and blow holes and the melting loss in the cupola amounts sometimes to 60 per cent. Castings made from similar metal which had been charged with borings in cartridges are sound in every respect.

USE OF BY-PRODUCT COKE IN FOUNDRIES

By George A. T. Long.

AFTER outlining the requisites of a good by-product foundry coke, the author of this paper proceeds to discuss the use of this fuel in cupolas. It is stated that for ordinary soft gray iron castings the bed should be brought up to 24 inches above the tuyeres. The author believes the charge put on the bed should be used all through the heat. Small charges are recommended. In ordinary cupolas 24 to 36 inches inside diameter, 1,000-pound charges are considered satisfactory. In cupolas from 36 to 54 inches, 2,000-pound charges are preferred. In larger cupolas 3,000 pounds is considered the limit. The author believes the blast pressure should be kept as low as possible in order to avoid trouble from slag, hard iron, shrinkage, etc. It is not believed necessary to select large sized coke for the bed, inasmuch as the large pieces leave too much space for the passage of air. Continuous melting is simply a question of how long the lining will last. In conclusion, the author states that a uniform fuel is the greatest asset a foundryman can have.

ACID vs. BASIC STEEL FOR CASTINGS

By Edwin F. Cone.

IN this paper, the author confines his discussion to open-hearth steel, and in the introduction states that in 1915 the open-hearth casting output was 84.9 per cent. of the total. The author states that a distinct dividing line between acid and basic castings has been recognized for a long time. "Castings," he continues, "which before being put to their final use are machined all over are almost universally made of acid open-hearth steel." All other castings, particularly for railroad cars, are poured from basic steel. The principal reason for this is not that one kind of metal is inherently stronger, but because acid steel is usually sounder and more free from defects.

The paper describes an interesting method of avoiding slag contamination in the manufacture of basic steel. The effect of oxygen also is discussed, and it is stated that, other things being equal, basic open-hearth steel is the more highly oxidized. A method of producing basic castings from acid scrap is described and comparative data are presented on the production of acid and basic steel castings in the United States and Germany.

THEORY AND PRACTICE IN GATING AND HEADING STEEL CASTINGS

By Ralph H. West.

IN the introduction to this paper the author states that, "In order that molten steel may enter a mold, we must provide a pouring hole or gate, so that the mold will receive the metal as rapidly as required, according to the size and section of the piece being made." In considering this problem it is pointed out that it is not good practice to leave the molder entirely to his own devices. In order to insure uniformly satisfactory results, it is suggested that a skilled molder be appointed to work out standard methods of gating, relieving the foreman of the details of this work. This paper includes a large number of sketches and photographs illustrating numerous practical gating problems. In conclusion, the author says: "To-day we steel foundrymen are more or less ignorant of our associates' practices. We must open up the gate in order to obtain more knowledge. This knowledge will lead us on to learn more, and through learning we can obtain some wisdom. Thus we may be able to develop a theory in relation to our practice."

THE 25-TON AIR FURNACE

By F. C. Rutz.

IN this paper, the author presents details of a 25-ton air furnace designed for melting malleable iron and voices the opinion that this is the most satisfactory size for a number of reasons. The operating cost of the 25-ton furnace is estimated to be $3.25 per ton, compared with a cost of approximately $3.85 per ton for 12 and 15-ton furnaces. The melting ratio with the 25-ton furnace, covering a year's tonnage actually poured, is said to be 2.75 to 1. The 25-ton furnace will do practically double the work of a 12 or 15-ton furnace. The paper concludes with detailed dimensions of the 25-ton furnace.

PROFIT-SHARING AS A FACTOR IN PREPAREDNESS

By C. E. Knoeppel.

SAVING-SHARING, or profit-sharing, as it is more commonly known, is discussed at length in its various phases. The author refers to the fundamental principle of profit-sharing with employees as follows: "Unless the plan you establish is based on right and justice; unless there is something of the 'give and take' to it; unless there is co-operation between the men and the manager in working this out; unless the men feel that they can have some say in it, by all means save your energy and money, for unless these fundamentals are considered, the plan is doomed to be a failure before ever being put in operation." It is claimed that two-thirds of the profit-sharing plans that have been inaugurated have proven failures. A suggested plan for saving-sharing is presented which bases the reward on individual attainment; fair standards should be determined by motion study or estimates based on detailed analysis and a sliding scale would be paid the men over and above their wages, based on their attainments, as follows: For 100 per cent. efficiency, 20 to 25 per cent. on their wages; for 90 per cent. efficiency, 10 per cent.; for 80 per cent. efficiency, 5 per cent., and for 70 per cent. efficiency, 2 per cent. It is pointed out that the amount to be given to the men should be paid in wages plus premium, and the distribution should be made at least every three months or six months at the most.

THE EFFECTS OF DIFFERENT MIXTURES ON THE STRENGTH OF CHILLED CAR WHEELS

By G. S. Evans.

THIS paper presents the results of a series of comprehensive tests of car wheel mixtures made at the Lenoir Car Works, Lenoir City, Tenn. The tests, which extended over a period of two years, were undertaken to determine the relative strength of wheels made from mixtures containing varying percentages of coke and charcoal pig irons, when made under uniform foundry conditions. During the tests, wheels were cast from some 60 different mixtures, some of which carried as much as 60 per cent. scrap steel; others contained 85 per cent. charcoal and coke pig, and still others as much as 98.5 per cent scrap wheels. It was found that wheels could be made from all these mixtures that would meet the requirements of the latest Master Car Builders' Association specifications. Over 15,000 wheels were cast from the special mixtures and over 1,000 were tested to destruction. The following conclusions were arrived at as a result of these tests: No gain in strength is obtained by increasing the percentage of either charcoal or coke pig iron beyond approximately 12 per cent. The substitution of charcoal pig iron for coke pig does not result in any clearly defined beneficial effects on the strength of the wheels as shown by various tests. The effects, if any, of the different mixtures on the microstructure of either the chilled or gray portions of the finished wheels is not of such a nature as to be clearly defined. The foundry practice, including the melting, casting and annealing, appears to be largely responsible, for the ultimate strength of the finished wheels, and the greatest possible source of betterment of the output as a whole results from the standardization of this practice.

SUGGESTED STANDARD FOR PATTERN PARTS

By W. W. Carlson.

THERE are many factors that influence and greatly affect our industrial conditions. It is the idea of this paper to touch only upon two of these and to put emphasis largely upon one. These factors are specialization and standardization. The principals of specialization and standardization can be applied in the pattern shop, as in other departments of the foundry. It would be an advantage, for instance, for the molder to know just what surfaces of the casting are to be finished, what surfaces or points must make a close fit, etc. For this purpose the author recommends a system of coloring the various parts of the pattern. Standard colors are suggested. A set of standards for core prints also is illustrated and described.

HOW SOME CLEANING ROOM PROBLEMS HAVE BEEN SOLVED

By H. Cole Estep.

IN the past decade tremendous forward strides have been made in cleaning room practice and to-day this department of the foundry is virtually as thoroughly modernized as any other. Progress, however, has been so rapid that the whole significance of the latest achievements has not been fully grasped in all quarters, with the result that many foundrymen have, as yet, failed to take advantage of the methods and apparatus now available. With these facts in mind, it is the purpose of the author of this paper to outline in a general way how certain representative foundries have solved their cleaning room problems, with the hope of calling more attention to this phase of foundry activities. A number of illustrations are presented showing typical cleaning room installments in representative foundries, these illustrations being accompanied by descriptive data.

ALLOY STEEL CASTINGS

By David Evans.

ALLOY steel is a term used to denote any steel that contains any alloy other than the usual elements found in all steel, such as carbon, manganese, silicon, phosphorus and sulphur. The principal kinds of alloy steel include manganese steel, vanadium steel, tungsten steel, nickel steel, and titannium steel. The latter is not really an alloy steel in a strict sense, inasmuch as the titanium does not appear in the finished steel. Its function is that of a powerful deoxidizer. Vanadium steel was developed to meet the needs of automobile manufacturers for a metal that would combine maximum strength and reliability with minimum weight. Nickel steel is the oldest of the alloy steels and is still used in large quantities.

THE THERMAL REACTIONS OF CAST IRON

By Prof. Thomas Turner.

AT the outset of this paper, Prof. Turner explains that conditions in England during the past two years have not been favorable to the prosecution of original research, and therefore all that was attempted was to make clear to practical men some of the scientific facts that underlie the behaviour of cast iron in cooling. Cast iron exhibits remarkable interruptions in its rate of contraction when cooling, in fact, actual expansions take place at certain temperatures. The paper explains this phenomenon clearly. Among other things the following has been demonstrated:—

1.—White cast iron from phosphorus has only one small expansion and one temperature arrest at about 670 degrees Cent.

2.—Gray cast iron free from phosphorus has two marked expansions and two temperature arrests at about 1135 and 695 degrees Cent.

3.—With an increase of silicon these arrest points occur at higher temperatures and nearer together.

4.—In gray iron containing phosphorus, there is an additional or third arrest at about 900 degrees Cent.

FOUNDRY COSTS

By C. H. Scovell.

THE objects of foundry cost accounting are to provide the management with a knowledge of the cost of each line of work to assist in determining selling prices, to furnish summarized reports of the cost of foundry operations, and to supply data from which estimates for special work may be made. An adequate production scheme is the framework for cost accounting. Production orders should be made out in triplicate, one copy being retained for the file in the production department, the other two being issued to the foreman of the foundry for file and as an order for patterns. In distributing direct labor, it should be charged to the following accounts: Cupola, molding, core making, cleaning, pattern work, and carpenter shop. A perpetual inventory should be maintained, and from it the consumption of materials may be calculated. The inventory records should be checked with the actual stock at intervals. The overhead charges are rent, or interest and taxes, insurance, depreciation and repairs on buildings; depreciation and repairs on equipment; cost of power, etc. Salaries of foremen, and the expense of operating the smaller departments are sometimes part of the overhead charges. The elements of cost in a casting are the cost of metal at the spout, the cost of molding, core making and cleaning, and the proportion of overhead expense. These costs should be accumulated on job cards. The general expenses which cannot be pro-rated into the various cost accounts may be pooled and then distributed on a pound basis. In plants where a machine is operated in conjunction with the foundry, special care should be taken to equitably divide the expense of operation.

ONE-THIRD OF A CENTURY IN A GRAY IRON FOUNDRY

By Alfred E. Howell.

THE author, who has had 35 years' experience in foundry work, largely devoted to the manufacture of light castings, compares the conditions of the foundry industry in the early eighties, with those prevailing to-day. The wonderful progress that has been made is recorded and attention is directed to some of the notable advances, such as the Keep shrinkage test and the development of the aluminum match-plate. The operation of the cupola is discussed briefly, and the question of slagging is considered.

THE USE OF CHEAPER MATERIALS

By Charles C. Kawin.

THIS paper points out the economies that may be realized from the use of liberal proportions of stove plate and other scrap in gray iron foundry mixtures. The author points out that silicon is one of the principal elements in a cupola mixture, and demonstrates that the proper proportions of silicon for various classes of castings can be secured when using large amounts of scrap, provided the output is watched carefully and analyses are made regularly. The paper includes a number of tables giving details of three all-scrap mixtures and one 75 per cent. scrap mixture that are said to have been used successfully.

THE INTRODUCTION OF MOLDING MACHINES IN FOUNDRIES

By A. O. Backert.

ALTHOUGH primarily intended to impart information of value to the foundryman who has had no molding machine experience and who may be considering the installation of labor-saving equipment, this paper contains many helpful suggestions from casting manufacturers who have been notably successful in the development of mechanical molding practice in their plants. An investigation to ascertain the wage basis for machine operators showed that piecework prevails generally in shops where molding machines are employed. The men who work on this equipment are designated variously as machine operators, apprentices and molders. Extracts from letters are included, which outline the experience of many foundrymen in the operation of molding machines.

WHAT IS THE NORMAL FRACTURE OF GOOD MALLEABLE IRON?

By Enrique Touceda.

IN this paper, the author first calls attention to the fact that there is a difference in structure between the skin and core of a steel casting, as in a malleable casting, only in the former case it is not visible to the naked eye. When good malleable iron is broken in simple tension, the grains become tapered down to a point, forming what is known as a "tooth." This results in the fracture having a somewhat different appearance when viewed by oblique light than that which it exhibits when viewed in a direct light. These differences are fully plained in the paper, which is illustrated by micrographs. If a bar of malleable is broken transversely, a silvery white area will appear on the compression side and the more ductile the metal, the greater will be the depth of this area.

FOUNDRY WORK AT THE UNIVERSITY OF NEBRASKA

By John Grennan.

IN presenting foundry work in a university, the reason for the course should be considered, together with the limitations of the student. Under ordinary conditions, the freshman student in a university is about 18 years of age and has done nothing but go to school. One of the striking characteristics of the freshman student is his inability to handle tools and make measurements or to take the necessary time to go through all the details required for a skilled piece of work. In laying out the foundry course at the University of Nebraska, which is described in this paper, an effort is made to keep these conditions in mind. Foundry work is given to all engineering students in the second semester of the freshman year. The course covers 72 hours. To present as large a subject as foundry practice in 72 hours a large amount of boiling down is necessary. After the students have finished the course, they are not foundrymen. What they have learned is not remarkable, but it is remarkable that they have learned anything at all. They do know considerable about foundry work and can see the reason for simplicity in the design of castings. Foundrymen can expect little from universities in the development of skilled men until the universities recognize the difficulties encountered.

THE SIGNIFICANCE OF THE FIRE WASTE

By Franklin H. Wentworth.

THE annual per capita fire loss of the United States is $3 and the total waste is $230,000,000 a year. This tremendous loss touches the pocket of every man, woman and child in the country. In this address, the author covers the subject of fire hazard comprehensively, with special reference to foundries. An analysis of the foundry fire record of the United States is presented. The record shows that 30.7 per cent. of foundry fires of known origin are caused by the cupola. The core oven is the next greatest offender, being responsible for 15.3 per cent. of the total number of foundry fires. The records of the National Fire Protection Association show that there have been 475 foundry fires in the United States reported to the Association since 1906. The address concludes with a number of pertinent suggestions for fire prevention.

SEMI-STEEL

By David McLain.

WHILE it is true that semi-steel has not been recognized in iron and steel nomenclature, still, as it ranks among the most valuable products of the gray iron foundry, it should be accorded proper recognition and standard chemical specifications covering the different classes of castings should be clearly defined. More than 1,000,000 tons of semi-steel were made last year and every foundryman sooner or later must be able to make real semi-steel, as engineers are continually demanding stronger metal and lighter sections.

After an introduction containing the foregoing statements, the author discusses the history of semi-steel and also explains the metallurgy of this material thoroughly. The uses of semi-steel also are discussed in considerable detail. The paper is accompanied by a large number of micrographs, showing the structures of various semi-steel castings. Some facts also are presented relating to the hardening of semi-steel, and the author claims that this material has been used satisfactorily for dies and punches. He also states, however, that it is not believed that semi-steel will replace tool steel.

THE USE OF TITANIUM IN THE MANUFACTURE OF STEEL CASTINGS

By W. A. Janssen.

NOTWITHSTANDING all that has been said regarding the harmful effects of phosphorus and sulphur in steel castings, occluded gases and oxides are the real causes of many of the troubles of the steel foundryman. In the elimination of these difficulties, ordinary deoxidizers such as ferro-manganese and ferro-silicon, have their place, but if the best results are to be achieved, a more potent reagent is necessary, and for this purpose ferro-titanium has proved unusually satisfactory. Titanium undoubtedly is one of the most powerful deoxidizers and denitrogenizers known. The chief value and merit of titanium lies in its positive action in the removal of occluded oxides, nitrogen and entrapped slags. The present day method of using ferro-titanium is to augment the incompleted cycle of reactions with ferro-titanium after the other deoxidizers have been added. Ferro-titanium additions are of value to the foundryman in making low or high carbon or alloy steels. The results are not due to any direct or alloying effect of the titanium, but rather to its value as a deoxidizer and cleanser in removing harmful occluded gases and slags. Titanium, however, must not be looked on as a cure-all to rectify the evils of poor stock selection and bad furnace practice. Its function is to make good steel better. In these days of high priced ferro-manganese, ferro-titanium can be used to advantage to decrease the consumption of the manganese alloy.

THE USE TO WHICH MALLEABLE IRON CASTINGS CAN BE APPLIED IN CAR CONSTRUCTION

By F. J. Lanahan.

THE author points out that one of the most important features entering into the construction of a freight car is the character of the castings that are used to join individual sections together. For such fastenings, as well as for other car parts, malleable iron castings are recommended on account of the superior quality of the material. It is pointed out in the paper that most of the failures of malleable car parts have resulted from reckless paring down of metal sections to reduce weight and cost. Where the parts are designed properly the author contends that malleable iron will render exceptionally satisfactory service. The use of malleable for trucks, underframe and centre sill parts, car bodies, etc., is discussed at length in this paper.

NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

CORE MAKING MACHINE FOR GENERAL WORK

THE core making machine shown in the accompanying illustration is capable of making cores from 1 in. to 14 in. long, and will fill boxes using 200

CORE-MAKING MACHINE FOR GENERAL WORK.

cu. in. of sand. The sand is supplied by an elevating and feeding device by means of which the supply of sand is regulated to suit the core being made.

Compressed air is used for supplying the sand to the core boxes, which are filled at the rate of eight per minute regardless of the size of core in each box, the number of cores contained in any one box being limited by the size of box which the operator can handle at the speed of the machine. Surplus air escapes from the core immediately after the box is filled, leaving the core porous, firm, and strong. The presence of air in the sand when being compressed provides a natural vent for the gases to escape by when the casting is poured.

Cores may be made of sharp sand, loam sand or green sand, using any satisfactory binder except excessive flour. The air pressure required for sharp sand cores is from 80 to 90 lbs. per sq. in. and with loam sand, 100 to 115 lbs. per sq. in. The core box is automatically clamped in position to receive the charge of sand, as also the sealing of the ends and the clamping of the box together sidewise.

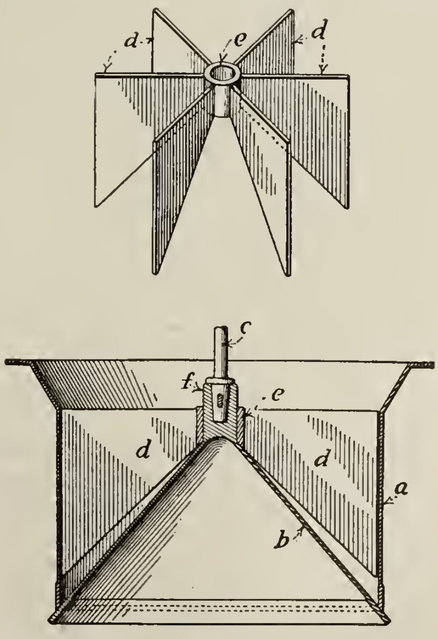
The mechanical operation of the machine requires about one horse-power, while approximately 12 cu. feet of free air are necessary for the pneumatic operation. Its use is not confined to straight cores, but includes all general work of specialty manufacturers also.

The builders of this machine are Wm. Demmler & Bros., Kewanee, Ill.

CHARGING BELL FOR BLAST FURNACES.

AN improvement in charging bells for blast furnaces is covered by a recent patent granted to Julian Kennedy of Pittsburgh. It has been designed for guiding or controlling the charge, and maintaing the bell in its proper position, si that each charge will be approximately equally distributed around the furnace—a feat usually difficult to accomplish.

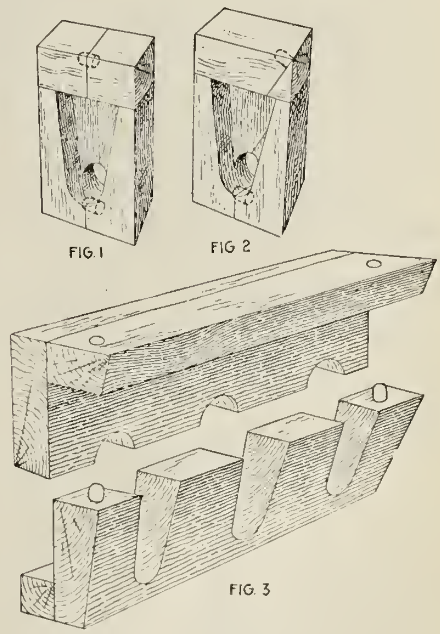
The illustration shows part of the details, in which (a) designates a blast-furnace feed hopper, and (b) the discharge bell with a supporting and operating stem, (c). There are radial wings, (d), so arranged as to retain the bell centrally within the hopper and also to provide guides for the charge, so that the material will move in a radial direction and be restrained from moving at a tangent with relation to the center of the hopper. The wings (d) do not extend to the upper face of the bell at their outer edges, permitting the material passing through one section to spread out and meet that passing through adjacent sections. These wings are cast as part of the hub (e), mounted on the boss (f),



CHARGING BELL FOR BLAST FURNACES.

CORES AND CORE BOXES

ONE of the necessary evils of the pattern shop when the hole to be cored is below parting line of mold is the making of tail prints and core boxes. Pat-



ILLUSTRATING CORES AND CORE BOXES.

tern makers, says a writer in the American Machinist, should appreciate the necessity of allowing plenty of taper to the face as well as the sides of the tail prints, which insures better work in the core room and foundry, and consequently a better casting. It allows the core to drop freely into place without scraping the sand into the bottom of the mold, and also does away with the "fin" back of the hole, caused by clearance being allowed or by the molder filing the teat of the core, as is frequently done.

It is common practice to make the core box as shown in Figs. 1 and 2. Both methods are costly and have their faults. Fig. 1 illustrates the core parted through the centre, when it is apt to break down unless the greatest care is used by the core maker. The method of making the joint shown in Fig. 2 requires more care and time in the pattern shop, and, unless special attention is given, it is likely to stick in the square or closed corner of the box. With both methods the core box is choked with sand in the joint of the box, making the core oversize, which is likely to crush the mold when placing the core in position.

In Fig. 3 is shown a much simpler form of construction, this type of box being used for wood and metal molds for a good many years and found to give excellent satisfaction in the core room, besides being much cheaper to make. It has a further advantage over the methods illustrated in Figs. 1 and 2 in that it can be made up for multiple cores, as shown in the illustration, Fig. 3.

COST-CUTTING ON A TURNTABLE COLUMN

By J. H. Eastham.

THE demand for quick delivery along with high quality of product was very marked during the revival of trade after the South African war, extensive orders being placed with British firms specializing in railroad equipment, such as cranes, turntables, etc. Pressure from purchasers caused many changes to be made in former methods of manufacture, the turntable column described herewith being one instance where the time was not only reduced, but a better job done at the same time.

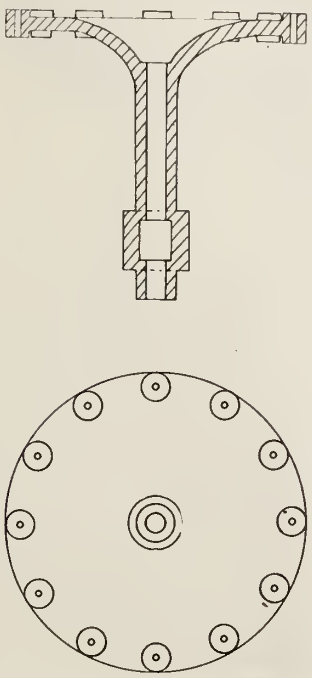


FIG. 1. PATTERN TO BE MOULDED.

The column weighs 4,000 lbs. and is shown in section and plan in Fig. 1. Owing to lack of suitable equipment, the casting was made in green sand, being moulded in a pit as shown in Fig. 2. The pattern had to be shored up from the sides of the pit previous to

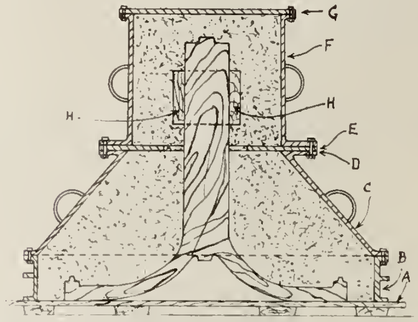


FIG. 3. PATTERN MOULDED ON FLOOR BOARD READY FOR TURNING OVER.

the base being rammed to a height sufficient to prevent the top heavy pattern from falling sideways. The cost of production by this method was a serious

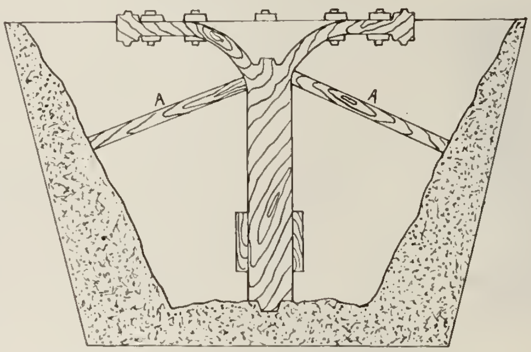


FIG. 2. ILLUSTRATING FORMER METHOD OF MOULDING PATTERN.

matter while the resulting quality of the castings was indifferent.

A reduction of one third of the time spent on each casting was called for along with an improvement in quality at the heavy or root end of the pillar,

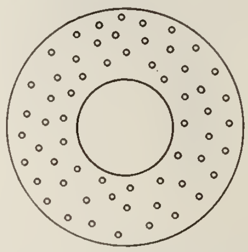


FIG. 4. CIRCULAR PLATE BETWEEN DRAG AND CONICAL FLASK.

these demands being successfully met by improved methods.

Referring to Fig. 3, the pattern was placed on the face board A, surrounded by section B of flask, which was rammed full after which conical section C was placed in position and rammed up level with flange D, where a parting was made. The circular plate E, Fig 4 was then lowered to place, stamped down, and bolted to section C, after which cylindrical section F was placed over the root of the pattern, secured by bolts to plate E, rammed up and surmounted by drag plate G which was bolted in place.

The whole structure was now rolled over carefully into a pit about three feet deep formed by the removal of the sand in the flask, after which the parting on the top of the pattern was made

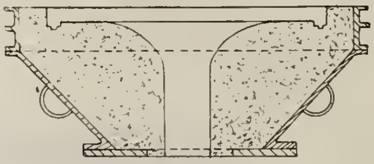


FIG. 5. CONICAL SECTION OF FLASK AFTER DRAWING PATTERN.

in the usual way. A special circular sunk-barred cope was rammed up and removed for finishing after which the pattern was drawn to permit removal of the centre conical section of the flask as shown in Fig. 5, the plate E being still secured in place. Six belt sections H, Fig. 3, were now removed from the drag Fig. 6, which was given a coat

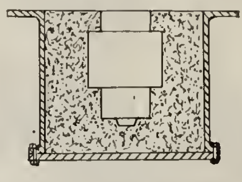


FIG. 6. DRAG PART ON LOWER END OF COLUMN.

of black wash and dried over night on the stove car, while the upper green sand portions of the mould were finished and faced off with plumbago.

The assembled mould ready for pouring is shown in section in Fig. 7, the method of pouring being indicated at J. K. while three risers L are placed around the flange to relieve the pressure developed in a mould of this design.

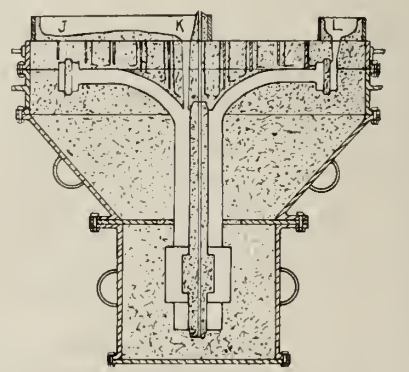


FIG. 7. COMPLETED MOULD READY FOR POURING.

Under previously existing conditions, two moulders took three days to each casting of this type, while with the equipment and methods described, a much superior article was produced in 15 hours, a saving of 50 per cent. instead of the 33 1-3 per cent. asked for.

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CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

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FOUNDRYMEN'S CONVENTION AND EXHIBITION

THE week of September 11 witnessed the holding in Cleveland, Ohio, of not only the Annual Conventions of the American Foundrymen's Association, and American Institute of Metals, but of an Exhibition of foundry equipment and supplies under their joint auspices and direction for the first time. It had been anticipated that in many respects, if not altogether, established records covering convention work, attendance, exhibits, exhibitors, instructional and entertainment features were likely to "go by the board," and that realization in the various directions indicated has been achieved is now beyond question. A fair representation of Canadian foundrymen took advantage of the opportunity to get into closer touch with developments in progress and pending, relative to the more accurate determination of foundry product constituents, and to familiarize themselves with equipment progress towards greater individual plant efficiency.

It occurs to us, however, that Canadian representation at this "Mecca" of foundrymen is each year far below what it should be, in view of the fact that our sphere of foundry enterprise is all the time enlarging in importance and variety of product. The past two years has witnessed quite an abnormal development along lines akin to and dependent in large part upon the foundry industry—grey iron, steel and non-ferrous. We have not, however, become conscious that in the latter directions, equally abnormal achievement may be realized. Our representation at these annual conventions and exhibitions can be comfortably doubled or even trebled in immediately succeeding years, and not only so, but Canada's representative membership in either the American Foundrymen's Association or the American Institute of Metals can easily be proportionately increased.

In the annual report submitted by the secretary of the American Foundrymen's Association, it is somewhat significant that the membership of that body is practically stationary, the figures for July 31, 1915, and July 31, 1916, being 973 and 974 respectively. Mention was made of the fact that in Canada and the United States there are some 5,000 foundries turning out grey and malleable iron, and steel castings, yet only some 20 per cent. of the industry on that basis is represented by membership in the American Foundrymen's Association. As expressed by the secretary, the meagre percentage above stated is a sad commentary on the interest displayed by foundrymen in the attainment of progress by organized effort. Just what percentage the membership of Canadian foundrymen bears to its total foundry plants, large and small, we do not at the moment have figures available, yet we are well within the mark in saying that something less than 10 per cent. may be assumed. The membership fee is more or less nominal compared with that required by Technical Societies and Associations generally, and in the matter of value received—material and educational, the American Foundrymen's Association, through its convention, exhibition and other activities, occupies perhaps premier place.

In this issue we endeavor to feature the recent convention and exhibition proceedings as befits their importance, and so familiarize our readers with the work being accomplished that those of them more directly concerned with foundry enterprises may be disposed to take a larger interest in this co-operative effort for the advancement of the foundry craft and calling.

THE COMING OF THE TECHNOLOGIST

THE term "key" industries has arisen through the prominence which the war has given to many manufacturing lines with the importance of which the general public has hitherto been rather unacquainted, but which, by virtue of their relation to other industries, have exercised a controlling influence over wide fields of semi-finished and finished manufactures. Through the manner in which they developed such lines as optical and chemical glass, photographic and other chemicals, semi-rare metals, dyes and fertilizers, our enemy has been able to seriously handicap our efforts in self-defence, and delay for a regrettable length of time the assumption of that offensive action now developing on the part of the Allies.

While such a course of events was unfortunate at the time, its ultimate effect in awakening the British Empire as a whole to a due recognition of the role played by the chemical engineer, will ultimately prove to have been a blessing in disguise.

Optical glass is a vital part of the observation equipment of miltary and naval forces, laboratory equipment is useless without many items composed of special glass. The large proportion of fine chemicals and dyes made in Germany were produced in plants which had been laid down with the specific intention of being rapidly converted to explosives manufacture, while the control of the potash trade enabled the productivity of other nations to be seriously interfered with.

Through all of these sinister evidences of premeditated action is seen the hand of the chemical engineer, not that anomalous person who, as a contemporary expresses it, is "half chemist, half engineer, and wholly out for his own immediate profit, and who will sell you his wares whether they are suitable for the purpose or not." No! The many advantages enjoyed by our enemy were obtained through the appreciation and application of scientific knowledge, not necessarily abstruse, but requiring a degree of skilled knowledge and supervision which are far in advance of rule of thumb methods still existing in many plants; yet the policy of many firms has been to depreciate the value of such work and question the ability of a highly trained technical man to direct practical work.

The wrongs under which technologists have labored in the past must be removed and the rights of men trained in the mysteries of nature to direct operations of a practical kind be recognized. That such acknowledgment is now on its way is evident in many directions, but its development must not be unnecessarily delayed, let alone its scope narrowed, if our hopes for future achievement are to materialize.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

ROTATING PLATING MACHINE—I

By Abe Winters.

THE rotating plating machine was designed to economically electroplate small articles such as nails, tacks, nuts, screws, and similar metallic products. The first machine was a rather crude affair, yet the results obtained by its use gave the inventar confidence in his idea and by persistent efforts he succeeded in constructing a mechanical plating machine which caused the industrial world to regard the contrivance as a commercial success. Steadily, year after year, new and ingenious improvements have been made upon the original idea.

Some of the improvements have been exceedingly clever, while others have really added nothing to the actual efficiency of the device, but have been used principally as a talking joint by certain supply houses when offering the machine for sale. The writer has used various plating devices and studied the merits of every new feature which has been placed before the public, and in this article will attempt to explain the weak points of the most popular types of mechanical plating machines, and mention the desirable features, which, if possible to combine in one machine, would effect a positive improvement in present methods of plating many articles.

Early Experiences

To those who have not operated a rotating plating machine, the construction of such an apparatus appears rather difficult, but if the fundamental principles of electro-plating are borne in mind, the assembling of the various parts is extremely simple. My first experience with rotating plating appartus was very satisfactory, yet attended with a great amount of labor; nevertheless it proved the feasibility of the idea.

An old-fashioned cane chair bottom was formed into a cylindrical shape by soaking the material in hot water and folding over a piece of pipe, and the ends closed by circular wooden pieces, one of which was removable to allow charging and discharging. Strips of sheet copper were attached to the interior of the cylinder and a wire shaft placed through the centre lengthwise, the end of the wire being formed into a crank shaped handle. The copper strips and wire shaft were connected together and a wire from the cathode rod of an ordinary plating bath was wound around the shaft outside the cylinder. Small brass parts were first tried in this device and were satisfactorily coated with nickel. A small boy kept the cylinder revolving during its partial submersion in the electrolyte at an oblique angle.

Submerged Cylinders

The foregoing reference is entered here to convey to the reader's mind an idea of the simple principle which governs all mechanical plating machines now in use. Several of the latest "up to the minute" machines are constructed of to many parts. They are complicated, and look attractive only when new. Six months' constant use tells the story and their popularity wanes.

Plating machines with cylinders completely submerged have proven to be the most efficient for the greatest number of purposes, because larger quantities of small articles may be treated at one time. The articles being plated are always in the solution, therefore deposition is continuous, as it should be. The cylinder may be filled to its full capacity when light sheet metal stampings are being plated. Greater variation in speed is permissible, as the articles being plated cannot be thrown above the solution when the cylinder revolves at high speed, and a greater volume of light weight articles may be treated at low speed.

Completely submerged cylinders should not be constructed with shaft through interior of cylinder. No material has yet been discovered which can be successfully employed to insulate the shaft for more han a few months, when a voltage sufficient to produce satisfactory results upon iron or steel surfaces for commercial purposes is maintained at the machine terminals. Extra heavy rubber hose will become coated with a metallic deposit in a few weeks; Firoid, and similar materials in the form of sleeves will quickly acquire very heavy, rough coatings of metal, and reduce the efficiency of the machine to the joint of failure before the unsuspecting operator becomes aware of the accumulation of metal upon the insulating material. The best method used to avoid these waste deposits is to completely insulate the driving mechanism from the electrical circuit and equip the cylinder with two four-point contact pieces, one at each end of cylinder. These contacts may be cast as a part of two shafts which extend through the ends of cylinder and are fastened to the inner surface of each end with screws, the latter being covered with wooden slugs to protect them from the action of the plating solution.

Cylinders constructed of wood are expensive when properly made, as mahogany is the cheapest wood of which a really durable cylinder can be built. Teak wood is sometimes used, but has not given good satisfaction; cypress does not wear, the interior of cypress cylinders soon becoming torn to shreds, especially where screws or threaded parts are treated in them. Maple is acted upon in a similar manner, and both cypress and maple, likewise oak, shrink and swell to such an extent when not in constant use, that cylinders made of these woods soon become useless, or at least a constant annoyance.

Cylinder Material

The most durable materials for plating machine cylinders are either celluloid or Bakelite. The idea is more or less prevalent among platers that the use of these materials for plating machine cylinder construction is patented, but such is not the case. One firm in the United States controls the patent upon manner of perforating the material or, rather, the shape of the perforation, but the materials mentioned are now being used by several firms building mechanical plating machines.

OVENS FOR BAKING LACQUER

By F. A. Shepherd

WE have seen ovens made of sheet iron and reinforced with channel or angle iron in construction of frame work. They are made in such a way that they can be shipped assembled, the only thing necessary being to connect them together with bolts and nuts in the centre. Some prefer wooden ovens, but the sheet iron oven seems to be the standard. The heat can be supplied by either steam, gas or electricity.

When installing the heating coils of steam, it is better to have two coils especially where lacquer enameling is to be baked, because as a rule a higher heat is used for this. The engineer can calculate the number of coils and size of piping necessary for the radiation of heat supplied by steam to raise the temperature by one coil to 120 deg. F. or about 50 deg. C. for the lacquer coil, and the other coil to furnish the additional heat to raise the temperature to about 300 deg. F. or about 150 deg. C., each coil to be independent of the other.

The coils should not be placed on the floor, as is sometimes done, because dust settles there when the steam is turned on and forces the dust back into the air. It settles on the work that is being dried or baked. The best and usual way is to have the coils around the sides of the walls of the oven and near the floor, so that the heat works up. If gas is used the heater should be placed in the centre of the oven and on the floor. The fumes from burnt gas being carbon dioxide some other heating device should if possible be used.

No matter what form of heating device is employed, the top of the oven should have an opening to allow the volatile fumes that are evolved from the lacquer in drying to escape. There should be means also for allowing fresh air to enter to replace that carried off by heat; usually there are openings in the walls in back of the steam coils for this ventilation.

Constructional Features

In designing new ovens or replacing old ones, it is better to have the oven divided off in sections that will allow work that has been placed inside to stay there the proper length of time, so that it is thoroughly baked or dry without being chilled by the opening and closing of door when putting in more work. The best plan would be to have angle iron attached to the sides in such a way that work put on trays (made of wire netting with frame of wood or iron), can be slid in like a drawer; say, two of the compartments formed in this way for small work, and two others that have racks which allow rods being placed across on which work that has been lacquered on hooks or racks, may be laid. As a rule the ovens are made with slide instead of swing doors. Some shops make use of compressed air for opening and closing doors. A thermometer should be attached to each section of the oven for the regulation of temperature when baking lacquer.

Dipping and Lacquer Baking Pointers

A few points that should be remembered in connection with the dipping and baking of lacquer are:

1. Do not touch or handle the work just after taking it from the oven; it will be blurred or clouded and in some cases will show finger marks. This also applies to japanning. The film or lacquer has to cool to the normal room temperature before it properly sets.

2. The advantage of separate compartments, in addition to not chilling the work, is that when freshly lacquered work is put in the oven with work that is nearly dry, the volatile gases and fumes given off will soften it so that it is necessary to leave it in longer to get dry again. This is also the reason for ventilation openings, also top openings, as these gases must escape to stop evaporating heat from the work, otherwise the work will not dry or harden.

3. Racks should not be made of material that has to be large to furnish the amount of strength to carry the work. It should be remembered that this surface is lacquered as well as that of the work, but is not paid for; in addition to this, succeeding coats of lacquer will cover the previously coated racks, increasing the surface. It also affects the lacquering solution, robbing it of thinner, which soaks up in the coating on the racks.

4. The thinner used for the lacquer is usually composed of the same solvents of which the lacquer is composed and in the right proportion; such being so, that mixture of lacquer and thinner for the dip should be made at night and be well stirred so as to properly blend the dip. Do this after the work for the day is completed and it will be in good condition for use next day.

5. Do not attempt to lacquer work that has stood in a cold room or has been chilled. If a water dip lacquer has not been used, the work should be inspected for moisture due to steam condensing on it, or other causes. If the work is chilled, or has been in a damp atmosphere, it should be placed either in one of the ovens (not with lacquered work, however), or in a steam table or hot plate to take off the chill. If the work is warmed in this way and lacquered while warm, it should be remembered that it will evaporate the thinner out of the dip lacquer, which will make it necessary to add more thinner. Warming the lacquer will have no other effect than that mentioned, and if specific gravity method be used it checks it so that thinner needed for right consistency is known.

6. The cause of lacquer peeling or chipping is attributed to lacquering when chilled or moist, which will also cause it to whiten or cloud on lacquer other than water dip. Sometimes the work has not been baked or dried long enough, causing the outer part to form a shell with a soft layer inside, needing only a start to make it peel, or strip in flakes.

AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.

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PLACE AND DATES OF MEETING.

The Occident Hall, corner of Queen and Bathurst Streets. Fourth Thursday of each month, at 8 p.m.

Racks for Lacquered Work

Racks for lacquered work should be made of iron wire reinforced with cross pieces and made as small as consistent for rigidity. The hooks should also be made of iron wire not too large. Where it is necessary to fasten them, instead of solder or wrapping with wire and soldering, they should be electric welded. This makes a solid piece, with no extra surface.

The racks should be cleaned every day if necessary. If electric welding of racks on hooks is done, all that is required is a match and a place where there is no danger of fire. Burn off the lacquer and then run the rack through the electric cleaner, which will remove the burnt lacquer and leave the rack clean. Be sure the rack is well rinsed off and absolutely dry before racking work to lacquer. This is the best way of handling racks and with electric weld there need be no fear of soldered joints coming apart; also the electric cleaner displaces the tedious method of scraping off the burnt lacquer by hand.

From an article on the Art and Practice of lacquering in the Brass World.

Questions and Answers

Question.—In the production of a brush-brass finish on fixture parts we have experienced considerable difficulty in obtaining a suitable substance with which a fine uniform finish may be given the brass surface of the goods. Ordinarily we use pumice, but it is difficult to apply, and extremely wasteful when employed in powdered form. Can pumice be used as a base for a brick by using any form of binder?

Answer.—Many economic uses can be made of pumice when moulded in cakes; the great difficulty, however, has been in the selection of a binder which would not adhere to the metal being treated, and which would permit of easy removal in rinsing, and leave no stain or streak. Plaster of Paris fulfills these several requirements, and possesses no grease or oil to contaminate the rinsing water. In fact, the very operation of brushing the brass to obtain a brush-brass finish is also a cleaning operative, and, therefore, much time and labor is saved. To prepare these pumice bricks, proceed as follows:—To three parts No. F pumice mix one part of fresh plaster of Paris. Have in readiness a mould or form in which the bricks may be given shape. A tin box, one foot square by two inches in depth, and divided into eighteen compartments, each two inches wide by four inches long, will serve nicely as a form.

The inner surfaces should be slightly oiled or waxed, and the pumice and plaster of Paris mixed with just sufficient water to make a thick paste; being then poured into the form. If the cakes are made at night, they will be ready for use the following morning. The form is simply turned upside down and gently rapped until the bricks fall out. The mixing of the water with the pumice and plaster of Paris should be performed in an earthenware dish for best results. You will find the above to yield a perfectly practical brushing material, easy to apply, quick in action, clean, economical and efficient. If the No. F pumice is not the proper grade for your particular needs, substitute either a coarser or finer grade, but do not alter the proportions as given. Less plaster of Paris will not suffice, and a greater amount will result in the formation of a brick too hard for use on tampico wheels.

* * *

Question.—Our plater, who evidently is a progressive fellow, wishes us to provide him with nickel anodes 95-98 per cent. pure. During our experience in the manufacture of nickel-plated grey iron castings we have always specified 90-92 per cent. nickel anodes, and as far as our knowledge of electro-plating goes, we have produced a very creditable plate. We now wish to be informed as to the superiority of 95-98 per cent. nickel anodes over nickel anodes of the 90-92 per cent. variety. Is the finish better, the expense of operation less, the output greater, and what is the difference in price?

Answer.—Your plater's request is indeed worthy of your sincere consideration. Anodes being the source of metallic supply, should be as nearly pure as possible. When you buy 90-92 per cent. nickel anodes you pay the price of nickel for at least 6 per cent. of iron, and, with nickel anodes selling at 50 cents per pound, we believe you will agree that this is a high price to pay for iron with which to contaminate the plating bath and the electro deposit, and finally wash down the sewer as a total loss. Pure nickel anodes produce better colored plates; they allow of a wider range of conditions without the appearance of faulty or burned deposit. Pure nickel anodes permit of better maintenance of a constant composition of the bath, and they are more economical because they cost no more accordingly than an anode of less nickel content. The average commercial nickel deposit contains at least three per cent. of iron, when 90 to 92 per cent. anodes are employed. A portion of the iron is precipitated to the bottom of the tank in form of sludge. Ammonium citrate in the nickel bath will hold the iron in suspension and prevent the formation of sludge; the deposit, however, will contain approximately as much iron as was in the anode. This iron in the nickel deposit is one of the principal causes of premature loss of lustre to nickel deposit. The anodes should be fine grained and disintegrate gradually into a smooth soft mass, free from grit. The manner of casting evidently has a greater bearing on this feature of the anode than the actual proportion of metal. The output from a bath equipped with 98 per cent. nickel anodes should be at least 50 per cent. greater than is possible with 90-92 per cent. anodes.

* * *

Question.—Having recently installed mechanical plating barrels for nickeling small parts in large quantities we have experienced considerable difficulty in producing satisfactory results from the method, the solution is a special one and is supposed to yield a very bright deposit of nickel in less time than the ordinary nickel solution. It can be used in still tanks but is particularly adapted to barrel plating. Our results are disappointing and the deposit is very dark and apparently very thin. Can you furnish us with any information which may assist us in getting better plating with fewer failures?

Answer.—We infer from the drift of your letter that you are endeavoring to operate several plating barrels with inexperienced men, and it is evident that you have been induced to purchase a material for preparation of the baths which is unfit for the purpose. Bright plating salts are intended for still plating solutions, and are practicable only on small cheap brass goods which require only a thin coating. All plating solutions which deposit bright plates are very liable to prove troublesome when operated for heavy deposits or as mechanically agitated baths. This is particularly true of bright plating nickel solutions. A nickel solution for barrel plating on iron or steel should be made of double nickel salts with a small proportion of single salts and just sufficient boric acid to prevent the formation of a green slime upon the anodes and surface of the solution. A formula which has given excellent satisfaction for several years is as follows—double nickel salts, 12 oz; single nickel salts, 4 oz.; boric acid, 1 oz.; water 1 gallon. If the quantity of goods plated at one time equals 6 quarts, use at least 75 amperes at 5 volts. If the articles are small, quite uniform in size, and regular in shape, operate the barrel at 25 revs. per min. for good luster. If a heavy deposit is required and a white finish, reduce the speed to about 4 revs. per min. Dark deposits often result from alkaline solutions or too low voltage. Be sure all connections are perfect; solder them where possible. Large light weight pieces will necessitate a few trials before perfect results are obtained.

Question.—Will you please furnish us with a formula for good brass solution which will work well for barrel plating.

Answer. — For brass plating steel goods by means of the mechanical plating machine, the following formula will be found reliable. It produces a clear, bright yellow brass, and if the full proportions are employed the bath will be sufficiently strong to reduce the resistance to current to a very satisfactory degree. Maintain the temperature near 120 deg. Fahr. Presuming you have an 80 gallon tank for the apparatus and will require approximately 75 gallons of solution, proceed to dissolve 60 lbs. of sodium cyanide in the water. Do not heat the water to facilitate the operation. Suspend the cyanide in a bag at the surface of the water and stir the water occasionally. When the cyanide is completely dissolved, add 45 lbs. of plastic carbonate of copper by removing a portion of the cyanide solution and allowing it to take up some of the copper. Repeat until all the carbonate is in solution, then add 30 lbs of plastic zinc carbonate in the same manner. Stir the solution for a few minutes and then suspend a bag cotaining 45 lbs. of sal soda crystals in the solution. When the sal soda is dissolved, add 11½ lbs. of ammonium carbonate and 9 lbs. of sodium bi-sulphite. Stir the completed solution well and heat to 120 deg. Fahr. Electrolyze for a few hours before plating a batch of work. Use good grade yellow brass anodes. As the solution will become warm through heat generated by the resistance of the bath, it will not be a difficult matter to maintain a temperature of at least 100 deg. Fahr. The bath will yield fair results when run cold but much better deposits are obtained if used warm and time is saved, particularly in cold weather. Do not operate the solution above 120 deg. Fahr. as the constituents of bath decompose rapidly at higher temperatures.

* * *

sheet brass. We use same dip for both be prepared of different proportions for brass cast goods than a dip used for sheet brass. We use some dip for both purposes and are not satisfied with results.

Answer.—Use 66 deg. sulphuric acid and 38 deg. nitric acid and for castings employ equal quantities of each acid. For sheet brass use only ¾ as much nitric as sulphuric. Sodium chloride may be added in very small quantities but is considered unnecessary by many very able platers; ¼ oz. to the gallon is ample. Very small additions of water are also used to increase the "biting" property of the dip; care must be exercised however as an excess is sure to cause a rough uneven surface.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey Forge, Pittsburgg		$19 20
Lake Superior, charcoal, Chicago		19 75
Michigan charcoal iron		28 00
Ferro Nickel pig iron (Soo)		25 00
	Montreal	Toronto
Middlesboro No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria, No. 1	27 00	24 00
Victoria, No. 2X	27 00	24 00
Victoria, No. 2 plain	26 00	24 00
Hamilton, No. 1	26 00	24 00
Hamilton, No. 2	26 00	24 00

FINISHED IRON AND STEEL

Per Pound to Large Buyers.	Cents
Iron bars, base	3.25
Steel bars, base	3.50
Steel bars, 2 in. and larger, base	5.25
Small shapes, base	3.75

METALS.

Aluminum	$ .68
Antimony	.18
Cobalt 97% pure	1.50
Copper lake	31 00
Copper, electrolytic	31 00
Copper, casting	30 00
Lead	.9
Mercury	100.00
Nickel	50.00
Silver, per oz.	.75
Tin	.44
Zinc	.14

Prices Per Lb.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal	Toronto
Copper, light	$16 75	$18 50
Copper, crucible	19 75	22 50
Copper, heavy	19 75	22 50
Coper wire	19 75	22 00
No. 1 machine compos'n	15 25	17 00
No. 1 compos'n turninfgs	13 25	14 00
No. 1 wrought iron	11 00	11 00
Heavy melting steel	9 50	10 50
No. 1 machin'y cast iron	13 50	13 50
New brass clippings	13 75	15 00
New brass turnings	12 25	12 00
Heavy lead	6 00	7 50
Tea lead	5 00	5 25
Scrap zinc	7 50	8 00
Aluminum	35 00	30 00

COKE AND COAL.

Solvay foundry coke, on application	
Connellsville foundry coke	$7.02
Yough steam lump coal	....
Pittsburgh steam lump coal	4.30
Best slack	3.87

Net ton f.o.b. Toronto.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$45 00
Open-hearth billets, Pittsburgh	45 00
Forging billets, Pittsburgh	69 00
Wire rods, Pittsburgh	55 00

PROOF COIL CHAIN.

1/4 inch	$9.45
5-16 inch	9.10
3/8 inch	8.35
7-16	7.15
1/2 inch	6.95
9-16 inch	6.95
5/8 inch	6.80
3/4 inch	6.70
7/8 inch	6.55
1 inch	6.40

Above quotations are per 100 lbs.

MISCELLANEOUS.

Solder, guaranteed	0.27 3/4
Babbitt metals	.11 to .60
Putty, 100-lb. drums	3.00
Red dry lead, 100-lb. kegs, p.cwt.	13.87
Glue, French medal, per lb.	0.20
Motor gasoline, single bbls.. gal.	0.31
Benzine, single bbls, per gal.	0.30 1/2
Pure turpentine, single bbls.	0.71
Linseed oil, raw, single bbls.	0.84
Linseed oil, boiled, single bbls.	0.87
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	7.50
Lead wool ,per lb.	0.12
Pure Manila rope	0.22 1/2
Transmission rope, Manila	0.26 1/2
Drilling cables, Manila	0.24 1/2
Lard oil, per gal.	1.35

SHEETS.

	Montreal	Toronto
Sheets, black No. 10	4 15	4 80
Sheets, black No. 28	5 25	4 80
Canada plates, dull, 52 sheets	4 75	4 75
Canada plates, all bright	6 30	6 50
Apollo brand, 10 3/4 oz. galvanized)	6 75	6 75
Queen's Head, 28, B.W.G.	7 75	7 75
Fleur-de-Lis, 28, B.W.G.	7 35	7 35
Gorbal's best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	6 25	6 15
Premier, 10 3/4 oz.	6 50	6 40

ELECTRIC WELD COIL CHAIN B.B.

3-16 in.	$11.70
1/4 in.	8.40
5-16 in.	7.40
3/8 in.	6.35
7-16.	6.35
1/2 in.	6.35
5/8 in.	6.35
3/4 in.	6.35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60; headers, 60; flanged unions, 55; malleable bushings, 60; nipples 72 1/2; malleable, lipped union, 60.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14 1/2
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.10
Caustic soda	.1 1/2
Copper carbonate, anhy.	.35
Copper, sulphate	.14
Cobalt sulphate	.14
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130 per cent.	.36
Sodium hydrate	.05
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.36 to .38
Tin	.49 to .52
Silver, per oz.	.78 to .80
Zinc	.18 to .20

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt	2.25
Polishing wheels, bullneck	1.10
Emery composition	.12 to .14
Pumice, ground	.03
Emery in kegs, American	.05
Tripoli composition	.04 to .06
Crocus composition	.07 to .08
Emery composition	.12 to .14
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Toronto, Ont., Oct. 10.—Not the least important feature of the prevailing prosperity in Canada is the marked improvement in the financial conditions of many companies, particularly those engaged upon war orders. These concerns have been able to liquidate their liabilities and in many cases have accumulated reserves which has placed them in a sound financial position, and will enable them to develop their business, and also withstand dull trade when it comes. This is especially true of the steel companies, which are doing phenomenal business, and all records have long ago been broken both as regards output and profits. Other indications of trade activity are the marked increase in bank deposits and clearings, and also in the big increase in Customs revenues. The revenue for the first six months of the fiscal year, April to September inclusive, amounted to $70,564,547, being an increase of $25,803,717 over the corresponding period last year. For September alone the statement shows that the revenue amounted to $12,110,182, compared with $8,029,665 for September, 1915, representing an increase of approximately 50 per cent.

While factories working on war orders, directly or indirectly, are exceptionally busy and production is exceeding all previous records, the maximum output has not by any means been attained owing to scarcity of labor, particularly of the skilled variety. Shortage of raw materials is also in many cases seriously affecting the situation. War orders are, of course, taking precedence over all other business, with the result that purely domestic trade is to some extent suffering. Apart from the labor situation, the outlook in business circles was perhaps never brighter, and further stimulus will be given to trade by another war credit for $50,000,000, which has recently been established for the purpose of financing purchases by the British Government of munitions and supplies in Canada.

Steel

There is no sign of any break in the extraordinary activity which prevails in the steel trade, and indications point to a continuance of present conditions for an indefinite period. There is no improvement in the situation as regards the scarcity of steel, the demand is exceeding the supply to a greater degree than at any other period in the history of the trade. Although the mills are operating at capacity, they are unable to keep pace with the demand for steel for munitions and general purposes, and are getting further behind all the time on deliveries. The serious shortage of steel rails, which has developed, is due to the war, as those steel mills, with the one exception, which have rail mills, are engaged in producing shell steel and are not taking orders for rails. The urgent demand for steel for munitions precludes the possibility of much improvement in the situation in the meantime, although the proposed remission of the tariff duties to permit rails coming in from the United States may help matters. Whether this will give the desired relief is uncertain, as the mills in that country are congested, and may not be able to make satisfactory deliveries. Much concern is manifest in the trade on account of the proposed increase in freight rates on iron and steel from interior points to the seaboard for export. The steel manufacturers are protesting and some compromise may be affected.

The market continues very firm, and all prices have an upward tendency. Recent advances include 15c on boiler and structural rivets, while it is expected that higher prices on steel and iron bars will be announced in the near future. Boiler tubes and plates will probably advance shortly, the latter being particularly firm and hard to get just now.

The market for galvanized sheets in the United States is considerably stronger and higher prices are anticipated, in which case an advance may be looked for in this market. The reason for the renewed strength is the unusually heavy demand, and also because of the continued high cost of black sheets. The demand for both black and blue annealed sheets is heavy and the market is stronger. As sheet bars will be higher for fourth-quarter delivery, sheet prices will no doubt be advanced in the near future.

Increased activity characterizes the steel market in the United States. The scarcity of steel is becoming more serious; and there is little expectation of any relief in the situation, as capacity production is looked for during the greater part of 1917. The mills are in a sold-up condition, and they are getting further behind on deliveries. Although prices of steel products are now higher than they ever have been, it is certain that the market has not stopped advancing. Wire products and pipe are higher, while sheets are advancing, and higher prices on bars, plates and shapes are looked for any time. The export demand is apparently unlimited, while domestic consumption has increased considerably.

Pig Iron

The pig iron market continues firm, and it is possible that prices of domestic iron will advance. Several brands of United States pig iron have made a further advance during the week, the new prices being as follows:—Basic, Valley furnace, $19; Bessemer, $22.95; and gray forge, Pittsburgh, $19.20. Foundry iron remains steady, but the consumption of steel-making brands is steadily increasing.

Scrap

The market for old materials is firmer, and although there are no important changes to note at present, it is possible that copper may advance in the near future owing to the increased strength in that market. The lead market is stronger and heavy lead has advanced. Prices of heavy melting steel have been well maintained, the demand being good and market firm. Business continues good and the general situation satisfactory.

Machine Tools

Business continues brisk, but would be considerably better if conditions in the shell plants were more favorable. The shortage of labor and difficulty that is being experienced in getting sufficient supply of forgings are adversely affecting production. If the machine shops were able to operate at capacity, as they should be doing, then the demand for tools would be heavier. The demand for heavy duty lathes continues to be the principal feature in the trade, and new designs are still being placed on the market. These special tools for machining munitions continue to keep local machine shops busy, and in some cases considerable export business has been done. Deliveries are fairly good on large lathes, but still very slow on milling machines and grinders.

Supplies

Business continues very good and prices firm, with a higher tendency. Lead wool has advanced 1c, and is now quoted at 12c per pound. Plumbers' oakum is higher at 7½c per pound. Gasoline and benzine are unchanged, but an advance in crude oil is looked for in the United States, which would likely result in higher prices on gasoline here. Brass wire has advanced, and is now quoted at the following discounts:—3 to 24-gauge, list plus 40 per cent., and 25 to 30-gauge, list plus 25 per cent.

Metals

The metal markets generally are firmer, but prices are unchanged, with the exception of copper, which has advanced. The most interesting feature this week has been the closing of a big order for copper by the Allies with American producers. This will have the effect of keeping the market steady. There is little of interest to note in the other metals and prices have been maintained.

Copper.—The market is strong and active, following the big order for about 450,000,000 pounds of copper, which has been placed in the United States by the Allies. The order represents three months' output, and is by far the largest order of its kind ever closed. Delivery is to be made over the first six months of 1917, and the price is stated to be between 26 and 27 cents. The new contract following on reports of the sold out condition of the producers emphasizes the broad extension of current activity. As the buying of copper for domestic account continues heavy, the fact that a quarter of the 1917 output of the American copper producers is bespoken in one block postpones the date at which new orders for home account can be filled well on to the end of the year. Copper has advanced 1c per pound, and is now quoted locally at 31c per pound.

Tin.—The market is firmer, with quotations well maintained, due to increased demand. London market has vanced, and New York is also slightly higher, but local quotations are unchanged at 44c per pound.

Spelter.—The market has improved on large buying recently, and is now firmer, although quotations are unchanged. It is expected that the recent large order for copper will eventually benefit the spelter market, which might result in higher prices. Local prices, 14c per pound.

Lead.—The market is firm and fairly active at unchanged prices, the "Trust" figure still being 7c, New York. The lead situation is a strong one, and will possibly remain so for the remainder of the year. Local quotation, 9c per pound.

Antimony.—Quotations are unchanged and nominal, and the market continues dull. Local price, 18c per pound.

Aluminum.—Sellers report good demand, and the market holds steady at 68c per pound.

Solders.—Prices of solders have advanced ¼c per pound, following the increase in cost of lead. "Guaranteed" is quoted at 27¾c and "Strictly" at 25¾c per pound.

Foundry Supplies and Chemicals

The situation in the foundry supply trade is unchanged and business continues satisfactory. Prices are still very firm with a decided upward tendency, owing to the high cost of raw materials. An event of general interest to the trade, the American Foundrymen's Convention held at Cleveland recently, was featured by an interesting exhibition of foundry equipment and supplies which showed the marked progress made during recent years in foundry methods and decided improvement in labor and time saving machinery. There are no price changes of importance to note this month.

Trade Gossip

Fergus, Ont.—Beatty Bros., are building an extension to their foundry.

Toronto, Ont.—The Canada Metal Co. will build an addition to their plant on Fraser Avenue, to cost about $25,000.

Trail, B.C.—The Consolidated Mining & Smelting Co. have recently installed plants for making nitric acid and aluminum.

Georgetown, Ont.—Harley-Kay have purchased the machine business and plant of the Georgetown Foundry and Machine Co.

New Westminster, B.C. — Henry Schaake has leased a site on Tenth Street, on which he proposes to erect a machine, pattern and boiler shop to cost about $70,000.

Hamilton, Ont.—The Brown-Boggs Co. have taken out a building permit for reconstruction and extension to their factory. H. G. Cristman & Co., have been awarded the contract at $2500.

Charles J. Barr, formerly general superintendent of the Tennessee Coal, Iron and Railroad Co., has been appointed general manager of the Algoma Steel Corporation, Sault Ste. Marie, Ont.

Orillia, Ont.—The first ferro-molybdenum to be produced commercially in Canada was run September 20 at the plant of the International Molybdenum Co.here. Three electric furnaces are now running steadily.

W. J. Parker, who was assistant sales manager of the Standard Tool Co., is now associated with E. E. Lenarz in the Cleveland Power Transmission Co., Garfield Buildings, Cleveland, Ohio. The Company specializes in small tools such as carbon and high-speed drills, reamers, cutters, etc.

Tungsten Found in Canada.—Tungsten deposits are now being worked experimentally near the banks of the Miramichi River, in New Brunswick. Three veins of ore are reported, one being 26 in. thick. A concentrating plant of 20 tons daily capacity and a crusher have been installed.

Proposed Nickel Refinery.—As a result of pressure put on the International Nickel Co., the management has set aside $5,500,000 from its cash on hand for the construction of a refinery at Port Colborne, Ont., and the extension of its smelters and other facilities. All this money will be spent in Canada. It has been realized by the directors of the company that the present capacity of its plant is inadequate to meet the demands for nickel. Consequently the new construction programme will be begun immediately and will be rushed.

Antimony in Alaska.—The considerable demand for antimony during the last year has stimulated the development of certain Alaskan deposits of that metal, from which ore to the value of about $74,000 was mined and shipped during 1915, according to a report published by the United States Geological Survey.

Tungsten Prices in Great Britain.—Ferrotungsten prices in Great Britain have just been revised by the Minister of Munitions. A cablegram to *Commerce Reports* says the new basis is 5s. 6d. per pound of contained tungsten, with powdered tungsten at 6s. 3d. per pound based on 60s. per unit, the price of products on a sliding scale rising or falling 1d. per pound with each variation of 1s. per unit of ore.

Granby August Output.—August production of Granby Consolidated was $3,218,847 pounds of copper, against $4,268,846 pounds in July. A shut-down of several furnaces at the old Grand Forks smelter was responsible for the loss. Within the past fortnight, however, one of the idle furnaces has been put into blast, and the other will be blown in shortly, so that production from that property should be normal for October.

The Independent Pneumatic Tool Co. have recently made arrangements with the Garlock-Walker Machinery Co., 70 Front Street, Toronto, to act as their agents for the sale of "Thor" pneumatic tools in the Province of Ontario, east to Belleville. A stock of "Thor" tools will be carried by the Garlock-Walker people in Toronto, and they will be able to give customers the very best of service. The Independent Pneumatic Tool Co. also maintain their own branch office at 334 St. James Street, Montreal.

Catalogues

Manganese Steel Chains.— Bulletin No. 171 issued by the Jeffrey Mfg. Co., Columbus, Ohio, deals with a line of manganese steel chains, sockets and attachments for elevators and conveyors for severe service in handling gritty or abrasive material. The bulletin is illustrated and also includes price lists for combination manganese and all manganese steel chains.

Pneumatic Tools.—Folder illustrating and describing an interesting line of pneumatic tools made by the Canadian Ingersoll-Rand Co., Montreal. The tools described include "Little David" drills and hammers "Imperial" air hoists and "Crown" sand rammers. The folder contains tables giving particulars covering each size of tool while the illustrations show them in operation, featuring their wide range of application.

ACTIVITY IN AUSTRALIAN LEAD SMELTING

THE Sulphide Corporation, Ltd., a smelting works 10 miles from Newcastle, Australia, is operating at capacity, employing about 450 men, working three shifts of 8 hr. each, according to U.S. Consul Lucien N. Sullivan, of Newcastle. There are three smelting furnaces of respectively 150, 100 and 50 tons capacity of bullion turned out daily, the ore treated being about three times the amount of bullion produced. The gold and silver contents are high, but no separation is made there, the pig lead being shipped to England and Sydney for refining. The weekly output is at present (August, 1916), bullion containing 585 oz. of gold, 61,434 oz. of silver and 685 tons of lead. The company's mines are located in the Broken Hill district.

FOUNDRYMEN'S CONVENTION AND EQUIPMENT

(Continued from page 146)

James W. Campbell, secretary and treasurer, and Chas. H. Erickson, superintendent; J. B. Marshall, western representative and Charles C. Klingman, department manager.

Thomas E. Coale Lumber Co., Philadelphia, Pa.—Michigan soft cork white pine pattern lumber and California sugar pine. Represented by Thos. E. Coale, president; E. C. Anderson, assistant to president, and A. Warren Anderson, salesman.

Curtis Pneumatic Machinery Co., St. Louis, Mo.—Air compressor, reciprocating hoist, single I-beam crane, closed hopper hand blast, single I-beam trolley, photographs of representative installations of Curtis pneumatic elevators, and such equipment that we manufacture which is not exhibited itself. Represented by L. C. Blake, Charles E. Stamp, and F. F. Seaman.

Dalton Adding Machine Co., Cincinnati, O.—Dalton adding, listing and computing machines, hand and electric driven. Represented by R. Lancaster Smith, Ohio, sales agent; D. C. Boyer, A. J. Anderson, A. S. Harris, Miss W. Flynn.

Davenport Machine & Foundry Co., Davenport, Ia.—Molding machines.—Represented by Carl Falk, manager molding machine department, and John T. Anderson, superintendent and manager.

Davis-Bournonville Co., Jersey City, N.J.—Stationary and portable type oxy-acetylene welding and cutting apparatus, including the Davis neutral flames torch, also No. 2 Oxygraph, and No. 1 radiograph for automatically cutting steel. Represented by Hugh H. Dyar, district sales manager, Cleveland; Harry W. Gill, Hugo A. Lindholm, Wm. H. Joyce and Alex. Blaser.

Wm. Demmler & Bros., Wewanee, Ill.—Automatic coremaking machine in operation. Represented by H. L. Demmler.

Joseph Dixon Crucible Co., Jersey City, N. J.—Graphite products, including crucibles, stoppers, nozzles, sleeves, phosphorizers, stirrers, foundry facings and a full line of the Dixon products. Represented by D. A. Johnson, manager, Chicago branch; H. C. Sorenson, F. R. Brandon and J. A. Biel.

Electric Controller & Mfg. Co., Cleveland.—Stereopticon views of lifting magnets and automatic machine tool controllers in operation at various plants. Represented by F. R. Fishback, district manager, and M. Converse and W. H. Beatty, sales department.

Excelsior Tool & Machine Co., East St. Louis, Ill.—Automatic grinding and polishing machine for polishing stove tops, motor driven. Automatic grinding and polishing machine for polishing pipe, motor driven. Motor driven double arbor polishing and buffing lathe. Represented by T. F. Philippi, president.

Federal Foundry Supply Co., Cleveland—Foundry Supplies. Represented by W. J. Adams, president; Ralph Ditty, treasurer and general manager; Thos. Ware, secretary; E. Kaye, C. A. Collins, I. D. Adams, L. H. Heyl, John Bayer, W. J. Smith and John Mertes, salesmen.

Felt & Tarrant Mfg. Co., Chicago.—Adding and calculating machines. Represented by William F. Sims.

Foundry Equipment Co., Cleveland.—Stationary Core ovens of the roller drawer type, brass furnaces, aluminum furnaces, sprue cutters, squeezers, crucible lever lifters, coremakers' benches and oil burners. Represented by Julius Tuteur, president; F. A. Coleman, general manager, and C. A. Barnett, treasurer.

The Foundry and The Iron Trade Review, Cleveland.—A display of artistic gray iron castings which have been collected in all parts of the world.—Represented by A. O. Backert, George Smart, H. Cole Estep, J. D. Pease, R. V. Sawhill, E. C. Krentzberg, A. L. Klingeman, L. C. Pelott, S. H. Jasper, A W. Howland and F. V. Cole.

Gardner Machine Co., Beloit, Wis. — Disc grinders for metal grinding, both belt and motor driven, to carry disc wheels ranging in diameter from 12 inches to 53 inches. Patternmakers' disc grinders and roll sanders, belt and motor driven polishing lathes in various sizes, ring wheel chucks, abrasive discs, and a general line of disc grinder supplies. Finished samples of work done on disc grinding machines. Represented by L. W. Thompson, president; F. E. Gardner, vice-president; E. B. Gardner, secretary; W. B. Leishman, treasurer; D. C. Graves, W. L. Townsend; J. M. Gardner, and E. L. Beisel.

General Electric Co., Schenectady, N.Y.—Industrial control, arc welding equipments, electric motors, "Mazda" damps, cloth gears and pinions. Centrifugal blowers and flow meters. Represented by J. A. Ham, J. A. Seede, J. Eaton, R. E. Wooley, O. W. Buddington, L. W. Shugg, W. J. Haniey, G. E. Guy, and J. A. Boers.

Gisholt Machine Co., Madison, Wis.—A display of the Periodograph as a means of obtaining accurate job time records at low expense. Applications to various factor conditions will be shown. Represented by W. J. Hannum, R. M. Carter and H. E. Preston, sales representatives.

Goldschmidt Thermit Co., New York City.—A complete line of samples of various metals and alloys produced by the Thermit process. Samples of ferro-silicon. Sample thermit welds and photographs of important work. Represented by DeCourcey B. Brown and H. G. Spilsbury, metallurgical engineers; J. G. McCarty, H. D. Kelley and Edwin B. Bloom, representatives.

Gordon Sand Co., Conneaut, Ohio.—Represented by F. E. Gordon, president; U. E. Kanavel, sales manager; W. R. Thompson and H. A. Keener.

Graceton Coke Co., Graceton, Indiana Co., Pa.—Foundry coke. Represented by C. M. Lingle, general manager; M. F. Brandon, mining engineer; W. H. Gates, mine superintendent, and T. M. Doherty, coke superintendent.

Great Western Mfg. Co., Leavenworth, Kans.—Combs gratory foundry riddles with rectangular sieve for continuous riddling, and "Combs" gyratory riddle for contractors' use. Represented by F. A. Pickett, secretary, and George W. Combs, superintendent.

F. A. Hardy & Co., Chicago.—Complete line of safety glasses, helmets and eye protectors for industrial uses, making a specialty of the Hardy welding glass with "Noviweld" lenses and the "Harco" safety gass. Represented by C. S. Wells, Chicago, and W. B. Gosman, New York.

Benj. Harris & Co., Chicago.—Metals. Represented by Nathan Harris, Oscar Harris and Louis Goldman.

Hauck Mfg. Co., Brooklyn, N.Y.—Compressed air and hand pump cupola lighters, skin-drying outfits, kerosene torches, core oven burners, ladle heaters, rivet forges, blacksmith and brazing forge, aluminum melting furnace. Represented by A. Busch Hauck, vice-president, and A. P. Link.

Hayward Co., New York.—Hayward electric motor clam shell bucket, two-line clam shell buckets, two-line orange peel buckets, and drag scraper buckets. Represented by C. F. Hutchings and H. M. Davison.

Herman Pneumatic Machine Co., Pittsburgh, Pa.—Herman plain jarring machines, showing mechanical construction. Represented by Thos. Kaveny, president and general manager; A. M. Frauenheim, vice-president; Alfred Herman, vice- president and superintendent; H. T. Frauenheim, treasurer; Robert Ringle, works manager and engineer; Andrew Rodgers, R. P. Morgan and Robert Walker, sales representatives.

Herold Bros. Co., Cleveland.—A complete line of brushes for the foundry trade, including bristle, horse hair, Tampico and welded wire circular brushes. Represented by A. B. Herold and H. G. Schlneter.

Hill-Brunner Foundry Supply Co., Cincinnati, O.—Foundry supplies. Represented by John Hill, Bruce Hill and Fred J. Brunner.

Hill & Griffith Co., Cincinnati, O.—Electrically operated sand riddling machine. Represented by Wm. Oberbelman, F. McCarthy, J. M. Glass and J. A. Carey.

Hoevel Manufacturing Corporation, New York.—Catalogues, photographs, drawings and other descriptive material of complete line of sand blast machines and axiliary equipment, especially revolving barrel sand blast machines, rotary table sand blast machines, sand blast chambers with turn table and rotary floor, and many special machines, dust filters, dust arresters, etc. Represented by H. F. Hoevel, president; F. W. Weiss, vice-president, and L. B. Passmore, western representative.

Holland Core Oil Co., Chicago.—General exhibit of cores made with "Holland" oils. Featuring radiation and automobile work, made with Holland special foundry linseed. Represented by H. L. Baumgardner, secretary and treasurer, and A. L. Fay, salesman.

Herman A. Holz, New York.—"The Brinell Meter." Portable apparatus for determining the Brinell hardness of metals and metal products. Represented by W. O. Little, sales engineer.

Imperial Brass Mfg. Co., Chicago.—Imperial oxy-acetylene welding, cutting and decarbonizing equipment. Imperial oxy-hydrogen welding and cutting equipment. Represented by Frank McNellis, president; Charles E. Young, manager sales promotion; J. F. Schroeter, sales representative, and J. Meskan, foundry foreman.

Independent Pneumatic Tool Co., Chicago.—Thor pneumatic tools. Represented by J. D. Hurley, vice-president, and general manager, Chicago; W. R. Gummere, Cleveland manager, and R. T. Scott, Pittsburgh manager.

Ingersoll-Rand Co., New York City. — Imperial type belt driven compressor, Imperial motor hoist and complete line of "Little David" pneumatic tools, including sand rammer, riveters, chippers and drills. Represented by George A. Gallinger, manager pneumatic tool sales; W. A. Armstrong, manager Cleveland office, and George C. Williams.

International Molding Machine Co., Chicago.—Molding machines. Represented by Edward A. Pridmore, president; W. W. Miller, vice-president; J. W. Dopp and F. W. Hamel.

Interstate Sand Co., Zanesville, O.—Molding and silica sands, fire clays. Represented by E. M. Ayers, president; L. K. Brown, vice-president, and F. L. Moore, sales manager.

The Iron Age, New York.—Trade publications. Represented by W. H. Taylor, president; M. C. Robbins, general manager; Chas. S. Baur, advertising manager; Fritz J. Frank, secretary; D. C. Warren, New England manager; H. H. Roberts, Philadelphia manager; W. B Robinson, Pittsburgh manager; Emerson Findley, central western manager; F. S. Wayne, western manager; A. I. Findley, editor; E. F. Cone, associate editor; F. L. Prentiss, central western editor, and O. J. Abell, western resident editor.

Jamison Coal & Coke Co., Pittsburgh, Pa.—Foundry coke. Represented by W. G. Ireland and E. J. Clancy.

Jennison-Wright Co., Toledo, O. — Kreolite wood blocks and structural timbers. Display will consist of several types of factory floor blocks designed to meet all conditions to be found in machine shops, foundries, pickling rooms, annealing rooms, forge shops, driveways, loading platforms, etc. Represented by H. G. Jennison, president; W. E. Wright, manager sales; F. W. Cherrington, chief engineer; E. M. Humphrey, H. P. Consaul and A. W. Cobley, salesmen.

Charles C. Kawin Co., Chicago.—Represented by Charles C. Kawin, president, and John F. Nellis, vice-president, Chicago; R. J. Courtney, Wm. J. Mulcahy, and J. H. Hopp, representatives.

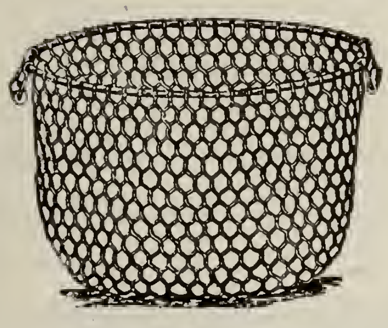
Julius King Optical Co., Chicago.—Complete line of safety goggles, helmets, etc. Represented by W. G. King, vice-president; J. J. Duffy, F. W. King and A. G. Larson, salesmen.

Lake Erie Smelting & Refining Co., Cleveland, O.—Copper, spelter, tin, red ingots and yellow ingots. Represented by Emil A. Stotter, L. B. Stotter, Thomas Thomson and Harry Price.

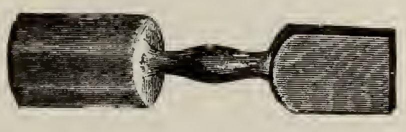
Lakewood Engineering Co., Cleveland O.—Industrial cars, industrial track, factory trucks and handling buckets. Represented by W. A. Meddick and L. R. Wilson.

H. M. Lane Co., Detroit, Mich.—Represented by H. M. Lane, T. A. Leyshon, and C. T. Holcroft.

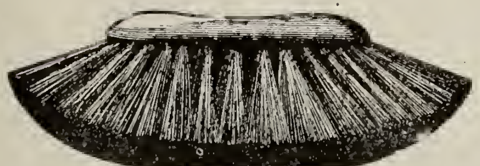
MADE IN CANADA

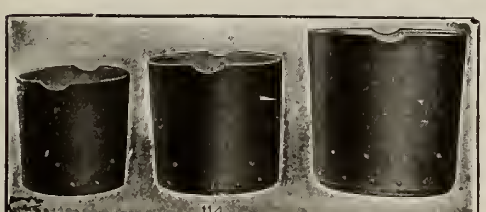


Coke or Charcoal Basket—Made of galvanized steel wire.



Bench Rammers—Made from maple hardwood well oiled.





Foundry Ladles—Flat bottom riveted steel bowls provided with forged lips and vent holes.

Anything You May Require For Your Foundry

Our No. 101 Pure Ceylon Air Floated Plumbago is becoming the recognized standard throughout the leading foundries in Canada.

Our **100% pure** Black Core Compound is, on account of its purity, the strongest black core binder offered to the trade today.

We sell Goulac which is largely displacing flour as a core binder.

We are manufacturers of high grade Parting, of the highest quality. Each barrel carries our guarantee.

The Hamilton Facing Mill Company, Ltd.
HAMILTON, CANADA

Lees-Bradner Co., Cleveland, O.—Gear cutting machine and thread milling machine. Represented by E. J. Lees and H. T. Bradner.

Lehigh Coke Co., South Bethlehem, Pa.—Samples of Lehigh foundry coke. Photographs showing its manufacture. Represented by D. A. Barkley, general sales agent, and Robert MacDonald, assistant sales agent.

Life Saving Devices Co., Chicago.—Lungmotor, a mechanical resuscitating device operated entirely by hand. Represented by E. H. Lyon, special representative.

Lincoln Electric Co., Cleveland. — Electric arc welder and water motor. Represented by R. E. Kinkead, sales engineer.

Lucas Machine Tool Co., Cleveland.—Fifty-ton Lucas power forcing presses, specially adapted for straightening heavy malleable iron castings. Represented by J. A. Leighton, Jr., and F. P. Sprague, special representatives.

David Lupton's Sons Co., Philadelphia, Pa.—Special sash to provide light and ventilation in industrial buildings. Represented by Clarke P. Pond, sales manager; Wm. C. Pfleider, and George J. Wagner.

Maclean Publishing Co., Ltd., Toronto, Ont.—Canadian Machinery and Manufacturing News, Canadian Foundryman and Metal Industry News. Represented by R. G. Langrill, central U.S. representative; B. L. Thompson, special representative, and A. G. Webster, associate editor.

The Macleod Co., Cincinnati, O.—Sand blast tumbling barrels, sand blast hose machine, portable oil burners, dust arrester, and oxy-acetylene welding and cutting apparatus. Represented by Walter Macleod, Oscar P. Gwinner, and August Schmidt.

Mahr Manufacturing Co., Minneapolis, Minn.—Portable foundry torches, and portable oil burning rivet forge. Represented by J. A. Mahr, F. N. Brooker and F. A. Davis.

Malleable Iron Fittings Co., Branford, Conn.—Full line of foundry vibrators with accessories. Represented by George B. Pickop, assistant superintendent, and John C. Page, superintendent of brass and pattern departments.

Manitowoc Electric Implement Co., Manitowoc, Wis. — Electric vibrators for plate, bench, tub, etc. Represented by Rude Stockinger, assistant secretary, and Frank Brixius, engineer.

J. S. McCormick Co., Pittsburgh, Pa.—Electric sand riddler, general foundry supplies. Represented by J. S. McCormick, president; T. E. Malone, secretary, secretary; S. R. Costley and A. T. Richardson.

The Metal Industry, New York.—The Metal Industry. Books and circular matter of particular interest to foundrymen. Represented by Edward B. Fritz, advertising representative.

Metal Record and Electroplater Publishing Co., Bridgeport, Conn.—The Metal Record & Electroplater, and other literature. Represented by Victor H. Borg, secretary and business manager.

Michigan Smelting & Refining Co., Detroit, Mich.—Detroit standard ingot brass, with specimen samples of finished products made from same, general non-ferrous ingot metals, and samples of lead pipe, solders, babbitt metals, etc. Represented by Joseph Silman, president; C. O. Patch, vice-president; Henry Levitt, secretary; A. J. Hall, production manager; Wm. J. Schweitzer, sales manager; R. H. Evans, A. J. Oates, H. E. Berliner, H. D. LeBel and J. D. LeBel, representatives.

Midland Machine Co., Detroit, Mich.—Grimes jolt roll-over molding machines, 1,000-pound lifting capacity, and Grimes hand rammed roll-over molding machine. Represented by George L. Grimes, president; Edwin L. Grimes, secretary; L. C. Grimes and C. J. Skeffington.

Moldar Co., Maspeth, N.Y.—Model of Moldar roller ramming and molding machines and sand handling appliance. Represented by George M. Etzel.

Moltrup Steel Products Co., Beaver Falls, Pa. Steel pattern plates, finished machine keys, finished machine rack, and cold drawn steel bars. Represented by F. H. Guppy, secretary, and N. S. Leyda.

Monarch Engineering & Mfg. Co., Baltimore, Md.—Brass furnaces, tilting coke crucible furnace, tilting and stationary oil crucible furnaces, and Acme core ovens. Represented by Harry D. Harvey, president; James J. Allen, manager; Wm. Raber and Frank Maujean, representatives.

Mott Sand Blast Mfg. Co., New York.—Direct pressure round table machine, direct pressure sand blast barrel, sand blast hose type, sand blast cabinet, sand blast gun, Barefield collector, Multivane exhauster and a full line of sandblast accessories. Represented by David Mayer, president; E. J. Rosenthal, vice-president; Foster J. Hull, engineer; C. T. Bird, Geo. D. Fletcher, E. C. Gilmour and Louis Schroeder, representatives.

Multi-Metal Separating Screen Co., New York City.—Sandblast helmets, respirators, babbitting masks, acid masks, and dust hoods. Represented by Frederick Stern, partner.

E. H. Mumford Co., Elizabeth, N.J.—All standard patented Mumford molding machines. Represented by T. J. Mumford, second president, and H. W. Sinclair, secretary.

Mumford Molding Machine Co., Chicago.—One 10-inch high trunnion squeezer. Represented by James T. Lee, Donald Alexander, Otto F. Weiss, D. M. Whyte, L. R. Palmer and A. F. Jensen.

National Engineering Co., Chicago.—Simpson intensive foundry mixer in full operation. Represented by P. L. Simpson, manager.

New Haven Sand Blast Co., New Haven, Conn.—Self-contained sand blast rolling barrell, sand blast machines and sand blast accessories. Represented by Chas. A. Driesbach, president; C. E. Billings, treasurer, and C. S. Johnson, western representative.

Wm. H. Nicholls Co., Inc., Brooklyn, N.Y.—Power and jolt squeezers.

Norma Co. of America, New York.—A complete line of precision ball, roller, thrust and combination bearings. Represented by E. A. Perkins and O. P. Wilson.

Norton Company, Worcester, Mass.—Grinding wheels for foundries, Norton machines of bench and floor type, showing new style Model D protection and dust hoods, and a Model D bench machine in operation. Represented by Carl F. Dietz, sales manager; A. R. Sandine and R. O. Anderson.

S. Obermayer Co., Chicago. — Hand power molding machines. Represented by S. T. Johnston, vice-president and sales manager; E. D. Frohman, vice-president and Pittsburgh manager; J. E. Evans, O. C. Olson, F. H. Dodge, Wm. Fenton, O. J. Peterson, C. M. Barker and Wm. Fitzpatrick, salesmen.

Oliver Machinery Co., Grand Rapids, Mich.—Oliver pattern shop machinery, and Oliver heavy duty engine lathe, Universal wood milling machine, Universal saw bench, vertical disk and spindle grinder, ball bearing jointer, tool grinder, wood trimmer, and heavy duty engine lathe, all in operation. Represented by J. W. Oliver, president; M. D. Baldwin, vice-president; A. S. Kurkjian, R. F. Baldwin, Arthur Blake, James R. Duthie, J. P. McGrath, and C. A. Charter.

Osborne Manufacturing Co., Ceveland, O.—Plain jolt machines, direct draw roll-over jolt machines, jolt stripping machines, "Little Wonder" roll over machines, rock over drop draft machines, plain air squeezer machines, combination jolt squeezer machines, drop plate squeezer machines, stripping plate machines, shovels, etc. Represented by H. R. Atwater, vice-president; E. T. Doddridge, M. W. Zeman, E. W. Jacoby, J. C. Alberta, A. J. Goss, E. P. Pitfield, sales engineers.

Oxweld Acetylene Co., Chicago.—Working demonstration of Oxweld apparatus for welding and cutting metals. Represented by R. R. Browning, general manager; J. N. Walker, E. E. Radcliffe, F. R. Goerler, J. V. Upton, S. H. Calender, W. C. Swift, R J. Kehl, George Rose and J. Hemerlein, representatives.

Pangborn Corporation ,Hagerstown, Md.—Sand blast and allied equipment. Represented by John C. Pangborn, vice-president; P. Q. Potter, W. C. Lytle and H. P. Furlong, and W. A. Rosenberger.

J. W. Paxson Co., Philadelphia, Pa.—Model of Paxson-Colliau cupola with the Zippler Tuyerage system, and samples of molding sand. Represented by H. M. Bougher, president; F. J. Zippler, cupola expert, and I. F. Kremer, mechanical engineer.

Phoenix Manufacturing Co., Eau Claire, Wis.—Turret lathe heads and other machine tool accessories. Represented by W. L. Harrison.

Pickands, Brown & Co., Chicago.—An exhibit of Solvay coke arranged to form the bow and forward portion of Commodore Perry's flagship "Lawrence." Represented by Bayard T. Bacon, James A. Galligan, George A. T. Long, Edwin A. Bateman, Thomas W. Glasscot, Alex. B, Hawes and Frank T. Lovering.

Pittsburgh Crushed Steel Co., Pittsburgh, Pa.—Samples of angular grit, metallic sand blast abrasive. Packages showing convenient form of shipping. Descriptive literature of angular grit. Samples of resisto concrete hardener and facing and descriptive literature. Represented by G. H. Kann, president.

Portage Silica Co., Youngstown, O.—Photographs of plant and operations. Specimens of the original rock. Samples of steel molding, core, and sand blast sands. Represented by E. E. Klocz, vice-president and general manager; C. M. Bixler, sales manager, and L. R. Farrell, secretary

The Prest-O-Lite Co., Inc., Indianapolis, Ind.—Oxy-acetylene welding and cutting apparatus in operation, blow torches, acetylene soldering irons, "Prest-O-Lite" dissolved acetylene in portable cylinders. Represented by S. M. Paxton, H. S. Smith, A. F. Brennan and C. R. Sutton

Henry E. Pridmore, Chicago.—Pneumatic Power squeezer, hand rock-over drop, air power rock-over drop, stripping plate, electric jarring machine, combination electric jar ramming and air power rock-over drop, combination electric jar ramming and stripping plate machines. Represented by Mrs. Henry E. Pridmore, president and treasurer; H. A. Pridmore, vice-president and secretary; Chas. H. Ellis, D. F. Eagan and A. V. Magnuson, representatives.

Railway Mechanical Engineer, New York.—Railway Mechanical Engineer, Railway Age Gazette, books. Represented by F. H. Thompson, business manager, and H. H. Marsh, district manager.

Robeson Process Co., New York.—Photographs and samples of Glutrin, and interesting cores bound with glutrin. Represented by George N. Moore, T. J. Ryan and R. E. Hughes.

Rogers, Brown & Co., Cincinnati, O.—Unusual castings, pig iron and coke samples, showing the effects of the various chemical elements in each. Represented by L. C. Calkins, F. J. Waldo, A. F. Stengel, W. T. Shepard, J. C. Mears, J. R. Morehead, T. A. Wilson, H. W. Fernald, F. E Fitts, Standish Meacham, A. J. Wentworth, W. H. Knight, F. W. Miller, F. W. Bauer, R. W. Clark, George Sullivan, Cecil E. Bertie, Harwood Wilson and S. W. Hubbard.

Sand Mixing Machine Co., New York.—Self-propelled auto sand cutting machine, American-Wadsworth sand blast tumbling barrels, American-Wadsworth rotary table sand blast machines. Represented by V. E. Minich, vice-president and general manager; H. L. Wadsworth, factory manager; Hutton H. Haley, John D. Alexander, and John Bradley, salesmen.

Searchlight Co., Chicago.—Complete searchlight welding and cutting apparatus in operation. Represented by John S. Rountree, president; Walter Immerman, Warren manager; H. L. Jillson, resident manager; S. M. Greenberg, assistant manager, and Mr. North, special representative.

Sipp Machine Co., Paterson, N.J. — Drill presses. One single spindle horizontal motor drive, alternating current, and one four-spindle machine not under power, and one tilting table machine. Represented by Chas. A. Widmer, sales manager.

W. W. Sly Mfg. Co., Cleveland.—Cleaning mills, and blast mills, core oven, resin mill, dust arrester, sand blast rotary table and pictures. Represented by W. C. Sly, president; Geo. J. Fanner, vice-president; R. J. Emerich, secretary and treasurer, and P. W. Graue, western representative.

R. P. Smith & Sons, Chicago.—Improved safety congress shoes for molders and foundrymen. Represented by J. B. Smith, Jr.

Smith Facing & Supply Co., Cleveland.—General display of foundry facings and supplies. Skeleton mold displays core work on intricate automobile castings together with finished castings. Foundry appliances and novelties. Represented by George W. Fleig, president; F. Ray Fleig, vice-president, and J. S. Smith, secretary and treasurer.

Werner G. Smith Co., Cleveland.—Core oils, cores and castings. Represented by Werner G. Smith, president and manager; Milton S. Finley, vice-president; John C. DeVenne, secretary, and Louis F. Ferster, advertising manager.

Standard Sand & Machine Co., Cleveland.—Photographs and drawings. Represented by Harry E. Boughton, vice-president and general manager; P. E. Lacey, secretary and treasurer, and George R. Lawrence, salesman.

Sterling Wheelbarrow Co., West Allis, Wis.—Foundry flasks and supplies, wheelbarrows, etc. Represented by H. H. Baker, vice-president; I. R. Smith, secretary and treaturer; C. L. Kirk, George Lambkin, E. W. Dowd, J. M. Dickson and J. J. Coyne.

Frederick B. Stevens, Detroit, Mich.—Actual working model plating plant in miniature, with four different plating solutions and an electric cleaner, complete. New line of stamped steel ladle bowls and shanks. Samples of facing mill products, plumbago, core compounds, parting, etc., and samples of polishing and buffing compositions. Represented by Frederic B. Stevens, W. J. Gluff, Henry Krigner, Joseph M. Johnston, James Hughes, Jr., David D. Baxter, T. E. LaMondy and J. M. Mayers.

W. F. Stodder, Syracuse, N.Y.—Cyclone suction sand blast nozzle. Represented by W. F. Stodder.

Strong, Kennard & Nutt Co., Cleveland.—"The Adjustoglas Goggles." Goggles and protection glasses. Represented by B. N. Nutt, secretary.

Sullivan Machinery Co., Chicago.—Air compressor in operation. Represented by M. S. Sloman.

Superior Sand Co., Cleveland.—Complete line of molding sands. Represented by W. H. Smith, vice-president and general manager; H. C. Koontz, secretary and treasurer, and W. I. Sallee, Detroit representative.

Thomas Elevator Co., Chicago.—Full line of automatic lathe chucks in actual operation. Represented by David Siegel, sales manager, and John L. Parker, assistant sales manager.

Titanium Alloy Mfg. Co., Niagara Falls, N.Y.—Titanium alloys, brass and bronze castings. Represented by A. C. Hawley, Pittsburgh district agent in charge of exhibit; W. M. Corse, H. R. Corse, W. J. Evans, and H. H. Cook.

Union Steam Pump Co, Battle Creek, Mich.—Union enclosed type steam driven air compressor; Union short belt driven compressor, and several types of vertical compressors, and a few pumps. All equipment in operation. Represented by C. A. Stuck, vice-president, and K. D. Smith, mechanical engineer.

United States Graphite Co., Saginaw, Mich.—Literature on various graphite products. Represented by H. F. Gump, F. B. Godard, W. W. Lampkin, R. A. Corrigan, and F. J. Hannon.

U.S. Molding Machine Co., Cleveland, O.—Plain air jolt machines, plain air squeezers, combination jolt and squeezing machine, combination jolt squeeze pattern drawing machine, combination jolt squeeze roll-over pattern drawing machine, combination jolt roll-over pattern drawing machine, and combination jolt pattern drawing machine. Represented by J. N. Battenfeld, president; C. B. Battenfeld and Joseph Jirka, representatives.

United States Silica Co., Chicago.—Samples of flint shot and photographs of factory. Represented by A. Volney Foster, president; Lewis B. Reed, secretary, and H. F. Goebig.

Wadsworth Core Machine & Equipment Co., Akron, O.—Core making machines, Wadsworth compounding and sand mill, electrically driven, samples of the Wadsworth never-break all-steel reinforced core trays and bottom plates. Wadsworth-Detroit jar ramming machine in operation. Represented by Geo. H. Wadsworth, present and general manager, and M. C. Sammons, secretary.

J. D. Wallace, Chicago.—Wallace bench planer. Represented by J. D. Wallace.

Warner & Swasey Co., Cleveland.—Universal hollow hexagon turret lathe, with bar equipment and Universal turret screw machine, geared friction head, single pulley drive and chucking equipment. Represented by A. C. Cook, sales manager; Ralph Glaser and W. E. Marshall

West Haven Mfg. Co., New Haven, Conn.—Practical demonstration of "Acme" high speed power hack saw machine. Universal hack saw blades and frames. Represented by Arthur A. Twichell and William A. Gilbert.

Wheeler & Holcomb, Chicago. — Asbestos gloves, mittens, coats, pants, aprons, Steel grip gloves and mittens. Leggins in duck, leather and asbestos. Represented by F. H. Wheeler.

White & Bro., Inc., Philadelphia, Pa.—W. B. products, ingot copper, ingot brass, all grades, rough and finished castings made from W. B. products. Represented by Frank Krug, sales manager; Raymond Hunter, G. W. Proctor, and Harold Reinhardt.

Whiting Foundry Equipment Co., Harvey, Ill.—Folios of drawings and photographs of the latest designs in cranes and foundry equipment, and full line of catalogs and advertising literature. Represented by C. A. Hardy, sales manager; R. H. Bourne, vice-president and assistant sales manager, and G. E. Jones, metallurgist.

T. B. Wood Sons Co., Chambersburg, Pa.—Equipment for the Wood system of taper snap moulding, comprising the Peerless tapered snap flask and automatic adjustable snap jacket. Specimens of castings made with this equipment. Represented by Chas. O. W od, chief engineer; Geo. M. Naylor, and Victor Lesher, foundry foreman.

E. J. Woodison Co., Detroit, Mich.—L. & A. electric vibrators, Woodison liquid core binder, clamps, polishing compositions and foundry supplies. Represented by E. J. Woodison, president; C. D. Yahne, treasurer; J. C. Woodison, secretary; W. J. Wark, Wm. Maybank, Canadian salesman; Harry J. Taylor. A. F. Jordan, R. S. Hoffman, and M. M Wurckman.

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Stevens, Frederic B., Detroit, Mich.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
Manufacturers' Brush Co., Cleveland, Ohio.
Osborn Mfg. Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
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BUFFING AND POLISHING MACHINERY
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Brown Specialty Machy. Co., Chicago, Ill.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Mumford, E. H. Co., Elizabeth, N.J.
Woodison, E. J., Co., Toronto, Ont.

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Brown Specialty Machy. Co., Chicago, Ill.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Lindsay, W. W., & Co., Philadelphia, Pa.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
McCulloch-Dalzell Crucible Co., Pittsburg, Pa.
Seidel, R. B., Philadelphia.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLAS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Lindsay, W. W., & Co., Philadelphia, Pa.
Monarch Eng. & Mfg. Co., Baltimore.
Northern Crane Works, Ltd., Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLAST GAUGES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA BLOWERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA LININGS BLOCKS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

CUPOLA TWYERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

CYANIDE OF POTASSIUM.
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

DIPPERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Gautier, J. H., & Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

DRYING OVENS FOR CORES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

DYNAMOS
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

DUST ARRESTERS AND EXHAUSTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Sly, W. W., Mfg. Co., The, Cleveland, O.

ELEVATORS, FOUNDRY, HYDRAULIC, PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

EMERY STANDS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton.
Woodison, E. J., Co., Toronto, Ont.

EMERY WHEELS—SEE WHEELS

FANS, EXHAUST
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FILLERS (METALLIC)
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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FILLETS, LEATHER AND WOODEN
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Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

FIRE BRICK AND CLAY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Gautier, J. H., & Co., Jersey City, N.J.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FIRE SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Wm. Penn Silica Works, Wm. Penn P.O., Pa.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Tabor Mfg. Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY PARTING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY FACINGS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FOUNDRY GRAVEL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Wm. Penn Silica Works, Wm. Penn Po., Pa.
Hawley Down Draft Furnace Co., Easton, Pa.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Eng. & Mfg. Co., Baltimore.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Hawley Down Draft Furnace Co., Easton.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Monarch Eng. & Mfg. Co., Baltimore.
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Woodison, E. J., Co., Toronto, Ont.

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Woodison, E. J., Co., Toronto, Ont.

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Whitehead Bros. Co., Buffalo, N.Y.
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Woodison, E. J., Co., Toronto, Ont.

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Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphit, Pa.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
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Woodison, E. J., Co., Toronto, Ont.

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J. W. Paxson Co., Philadelphia, Pa.
Seidel, R. B., Philadelphia.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Woodison, E. J., Co., Toronto, Ont.

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Can. Inspection & Testing Laboratories, Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Charles C. Kawin Co., Toronto.
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Woodison, E. J., Co., Toronto, Ont.

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Midland Machine Co., Detroit.
Mumford Molding Mach. Co., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND—SEE SAND

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Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

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Woodison, E. J., Co., Toronto, Ont.

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Whitehead Bros. Co., Buffalo, N.Y.
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Woodison, E. J., Co., Toronto, Ont.

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RIDDLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
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Woodison, E. J., Co., Toronto, Ont.

RESIN
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Woodison, E. J., Co., Toronto, Ont.

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W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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New Haven Sand Blast Co., New Haven, Conn.
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Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

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Whitehead Bros. Co., Buffalo, N.Y.
E. J. Woodison Co., Toronto.

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Standard Sand & Mach. Co., Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

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Woodison, E. J., Co., Toronto, Ont.

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Woodison, E. J., Co., Toronto, Ont.

SPIT PATTERN MACHINES
Mumford, E. H., Co., Elizabeth, N.J.

SPRUE CUTTERS
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Hamilton Facing Mill Co., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SQUEEZER MOLDING MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
E. H. Mumford Co., Elizabeth, N.J.
Mumford Molding Mach. Co., Chicago, Ill.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

SQUEEZERS, POWER AND HAND
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Mumford, E. H. Co., Elizabeth, N.J.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

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Wm. McGregor, Scottish Steel Grit Works, Airdire, Scotland.
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Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

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Woodison, E. J., Co., Toronto, Ont.

STIRRERS, GRAPHITE
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STONES, RUBBING AND OIL
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Hamilton, Ont.

TALC
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Hamilton Facing Mill Co., Hamilton, Ont.
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Woodison, E. J., Co., Toronto, Ont.

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TROLLEYS AND TROLLEY SYSTEMS
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Woodison, E. J., Co., Toronto, Ont.

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Woodison, E. J., Co., Toronto, Ont.

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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

VENT WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Woodison, E. J., Co., Toronto, Ont.

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Mumford, E. H. Co., Elizabeth, N.J.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

WALL CHANNELS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

WHEELS, GRINDING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

WHEELS, POLISHING, ABRASIVE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

WIRE WHEELS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

WIRE, WIRE RODS AND NAILS
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Woodison, E. J., Co., Toronto, Ont.

CANADIAN FOUNDRYMAN

AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields.

Vol. VII. TORONTO, OCTOBER, 1916 No. 10

EDITORIAL CONTENTS

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VOL. VII. PUBLICATION OFFICE, TORONTO, NOVEMBER, 1916 No. 11

The Publisher's Page

TORONTO November, 1916

Selling the Buyer

BEFORE you make a sale it is only reasonable to assume that the buyer must be made familiar with the article or appliance you wish to sell. More than that, he will likely demand to know who you are, where you are, and all about you, or sufficient about you to enable him to determine what you have in the way of reputation to back the goods you have for sale.

* * *

THE process of making an actual buyer out of a prospect consists primarily in educating him. Education in all branches of endeavor is best accomplished by means of the *printed word.* It is not only the most *effective* medium, but it is the most *economic.* It not only accomplishes what it is intended to do, but it does it with the least possible expense.

* * *

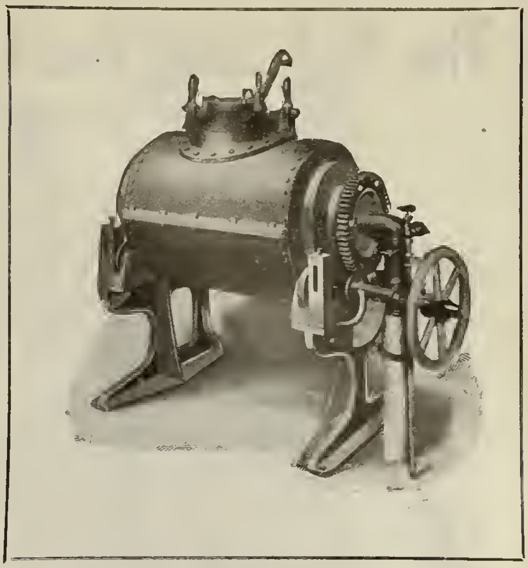
IN every branch of commercial and industrial life we have to-day the *technical* or trade journals. Only the unthinking underestimate the power of those educative mediums. Their rapid growth and increasing circulation alone are convincing evidence of their usefulness. They are specialists in their respective fields of endeavor. They are the great disseminators of practical information and trade news. Their clientele is made up of sober, thinking, ambitious, responsible mechanics and business men. The idly curious and irresponsible do not read them.

* * *

IT is because the technical journal is educational in character that so many manufacturers recognize in it the ideal medium for *educating* their army of probable buyers and customers to understand and appreciate the merits of their respective lines. It is because of this recognition and as a result of it that the advertisements of to-day are so vastly superior to the advertising of a few years ago, when, perhaps, the pulling power and value of the printed word was not so generally appreciated.

Canadian Foundryman and Metal Industry News
143-153 UNIVERSITY AVE. - - - - TORONTO, CANADA.
Also at Montreal, Winnipeg, New York, Chicago, Boston, Cleveland and London

SPEED PLUS EFFICIENCY AND ECONOMY

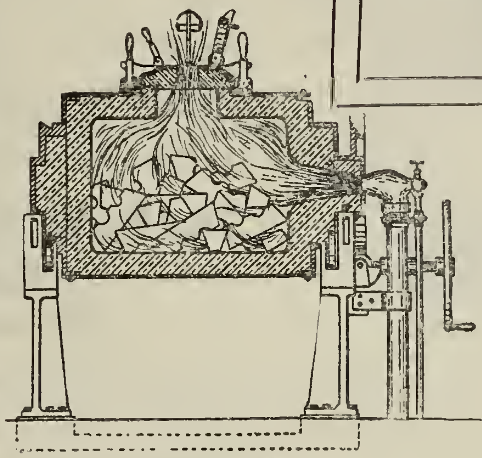


The "MONARCH-ROCKWELL" SIMPLEX WELDING FURNACE

Lessens melting time, eliminates the use of crucibles, and produces a greater quantity of metal at an equally reduced cost.

There is now an enormous demand for Simplex Single and Double Chamber Furnaces without crucibles, and you get them at once — by express or fast freight. If you are in a hole write us.

For Brass, Bronze, Copper. Aluminum, Nickel, Manganese, Silicon, All Alloys for Steel Foundry, and Gold, Silver Cyanides, etc.



Action of Heat

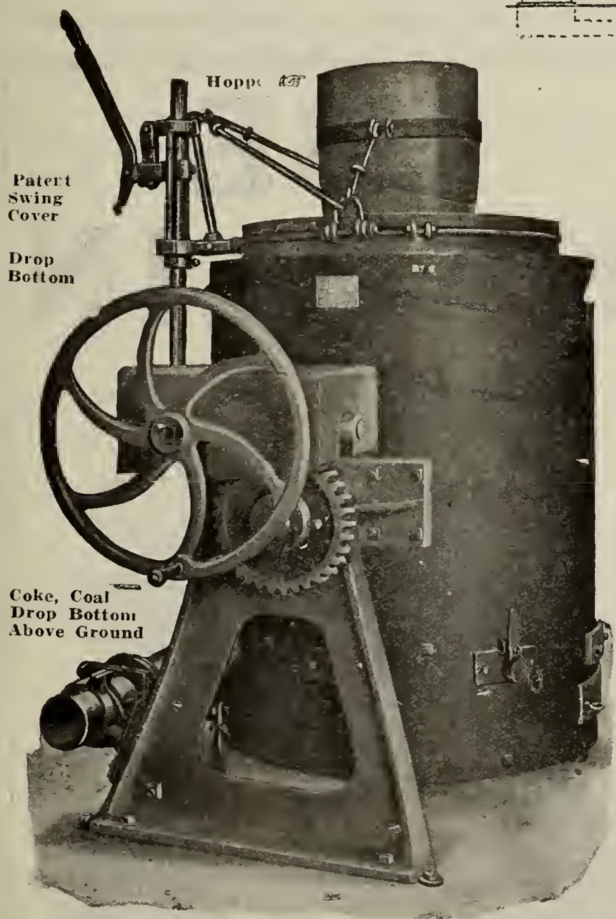
SIMPLEX

No. 91—per heat 300 lbs.
No. 92—per heat 500 lbs.
No. 93—per heat 1,000 lbs.
No. 94—per heat 2,000 lbs.

DOUBLE CHAMBER

No. 1—per heat 500 lbs.
No. 2—per heat 1,000 lbs.
No. 3—per heat 2,000 lbs.
No. 4—per heat 4,000 lbs.

Oil or gas. And each furnace has capacity for 40% more.



Furnace in Melting Position—Hopper Feed, Shaker Grates

Also Crucible Tilting Coke and Coal Furnace above ground. Shaker Grates — fool-proof and drop bottom. Also for oil or gas from No. 20 to 600 pots. Write us. Also air blast pit furnaces. Furnaces for soft metals. Reverberatory and a complete line of melting furnaces.

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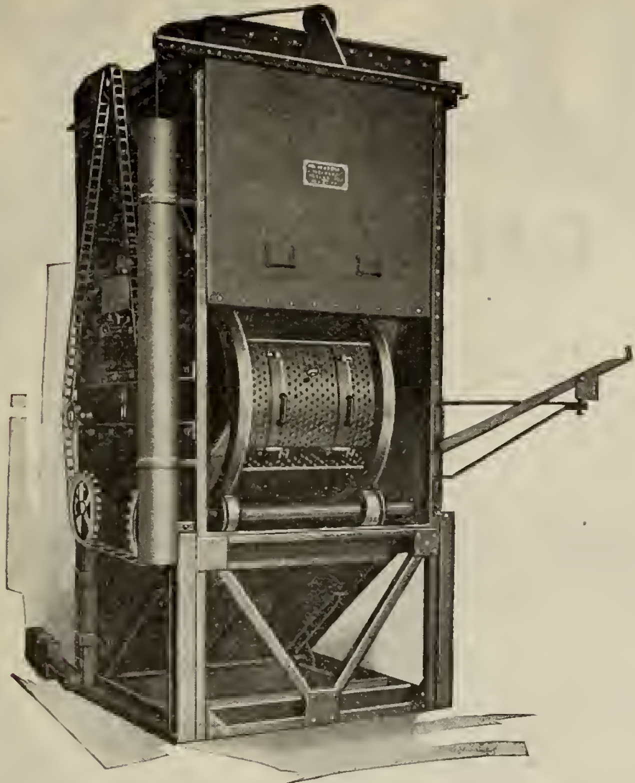
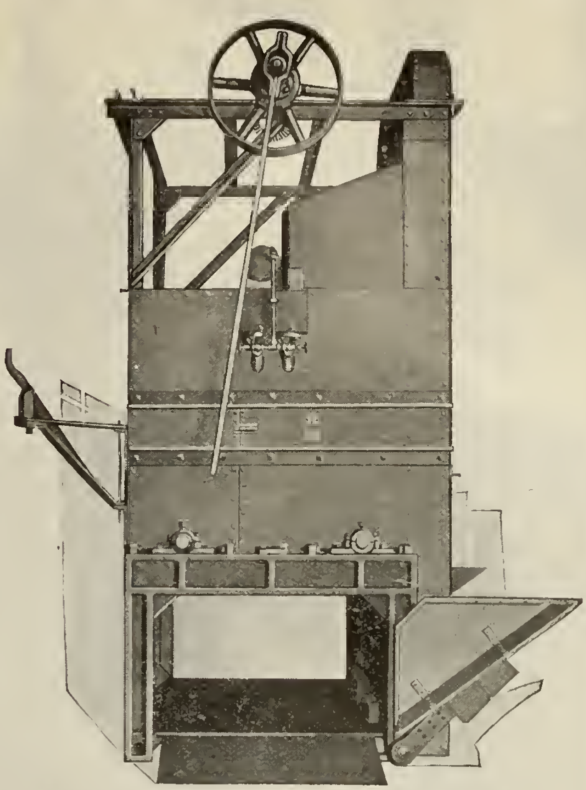


Front View With Sliding Door Raised



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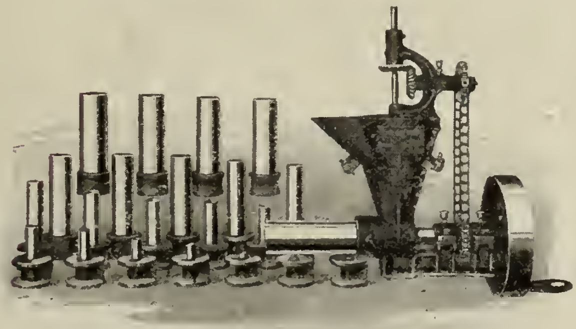

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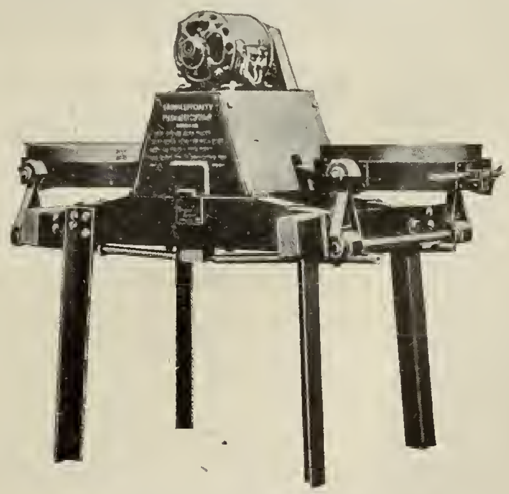

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PLANT OF THE CANADA FORGE CO. DEVOTED TO THE PRODUCTION OF HEAVY MACHINERY FORGINGS.

Attention is directed to the various products of this corporation from the fact that while the output represents quite a wide range of manufacture, much of it is of primary importance to subsequent work by firms in other fields of industry. The broad field of distribution thus available makes for independence of any limited class of industrial effort, and imparts as a result a unique character to the enterprises as a whole as well as individually

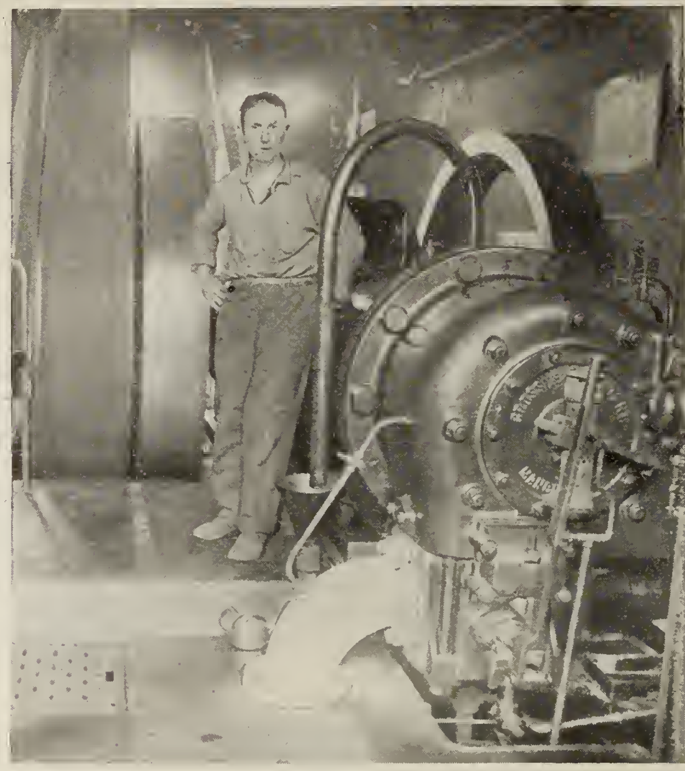
As a producer of a wide range of finished and semi-finished goods, Canada Foundries and Forgings, Limited, occupies a position of present prominence, with all the promise of future potentiality to be derived from the various plants, which, previous to their acquisition by this company, had already established themselves as permanent members of Canada's manufacturing community.

Canada Foundries and Forgings, Ltd., was incorporated in 1912, when it took over the properties of The James Smart Manufacturing Co., Ltd., Brockville; The Canada Forge Co., Ltd., Welland, and Canadian Billings & Spencer, Ltd., Welland, all situated in Ontario, and enjoying established reputations as first rank producers in their respective lines. While sharing in the depression of 1913 and 1914, the outbreak of hostilities and the subsequent readjustments of world trade have maintained the various plants in a hitherto unprecedented state of productive activity. These three plants, by virtue of their community of interests and progressively related products, form a unit which, from a manufacturing standpoint, possesses an envious range of products adapted to a wide market both at home and abroad. Thus it is that while much of the activity has been due to the requirements of semi-manufactured products for war purposes, there has arisen at the same time an ever-increasing demand for many lines of hardware for domestic consumption and export. As a result of the present tide of prosperity, the various plants have attained a high degree of excellence in their equipment which augers well for their successful participation in the future world trade.

GENERAL VIEW OF MOULDING DEPARTMENT WITH MOULDS LAID OUT READY FOR POURING, JAMES SMART MFG. CO., BROCKVILLE.

The James Smart Manufacturing Co. has been in existence over 60 years, and manufactures stoves, furnaces, ranges, hot air generators, lawn mowers, hammers, axes, and tools of a similar character, including all lines of hardware. Next in seniority is the Canada Forge Co., with a record of eleven years' active production of high grade machinery forgings, such as crank shafts, generator and motor shafts, marine forgings, large engine parts, and many similar lines. Canadian Billings & Spencer commenced operations two years later as a branch establishment of the Billings & Spencer Co., Hartford, Conn. This plant specializes on drop forging work of all sizes and descriptions, much of its product being of a finished nature, such as wrenches, turnbuckles, eyebolts, clamps, lathe dogs, etc., thus covering much of the ground intermediate between the two first mentioned plants, while the product of the three plants together finds outlets in almost every line of industry and commerce, from large engineering shops, building mammoth machines, to the smallest hardware store selling wrenches, hand hammers, axes, and domestic hardware.

The office of the holding company is situated at Brockville in the eastern part of the Province of Ontario, the officers and board of directors being at present constituted as follows:—President, Wm. M. Weir, Montreal; Vice-President, J. Gill Gardner, Brockville; Sec-Treas., John H. A. Briggs, Brockville, who, with the following gentlemen, constitute the board:—Henry Bertram, Dundas, Ont.; F. D. Canfield, New York; Hon. Geo. P. Graham, Brockville; F. C. Billings, Hartford, Conn.; John T. Dillon, Titusville, Pa.; Thos. J. Dillon, Welland, Ont; Clarence F. Smith, Montreal; H B. Housser, Toronto; Hon. W. J. Shaughnessy, Montreal.



ONE OF THE PRODUCER GAS ENGINES IN THE POWER PLANT.

JAMES SMART MFG. CO., BROCKVILLE

THE plant of the James Smart Manufacturing Co. is located in the City of Brockville, Ont., and though apparently out of the beaten track of the industrial life of the country is ideally situated, both for home and export trade, being adjacent to the main line of both the C.P.R. and G.T.R., on the north shore of the St. Lawrence River, 126 miles above Montreal.

While the record of this enterprising concern may not be unique in all respects, it is truly representative of the rise, development and steady growth of Canadian trade and industry. The James Smart Manufacturing Co. is one of the landmarks of Brockville, and an important contributor to the town's commercial prosperity. Like many another of Canada's industrial assets, the early progress of this company was such as to necessitate the construction of wings and additions to the original plant, until the general appearance of the building reflects the long but constant growth of the enterprise. The business was first established in the early fifties, being founded by James Smart in 1854. It became incorporated in 1881 and has since that date progressed steadily, and may now be considered as one of the oldest, best known, and most efficient manufacturing plants in Canada.

MAKING SLEDGE HAMMERS IN THE FORGE SHOP.

It is not alone on the Canadian trade that the sound reputation of the firm has been established, as for many years the arms of progress have extended out to lands beyond the seas, bringing back to Canada some portion of the world's trade that is rightfully hers. The products of the factory are now being exported to great Britain, Australia, South Africa, and other countries, and trade conditions are being studied to enlarge on their present field, while the company also maintains a branch office and warehouse in Winnipeg, Man., to handle its extensive and rapidly growing North-West and Pacific Coast trade.

Range of Output.

To fully describe the various articles manufactured would be impossible in the space here permitted, as almost every conceivable piece of forged or cast hardware is produced. Among the principal lines are heating stoves and ranges, warm air furnaces and registers. Their speciality in furnaces is the well known "Kelsey Warm Air Generator," which has revolutionized the practice of warm air heating giving results in the way of ventilation combined with thorough warming that cannot be attained by any other method. In the general hardware department, builders' house furnishings, cabinet and carriage makers' hardware in cast and wrought iron and brass, pumps and plumbers' goods, wrought steel butts and hinges, lawn mowers and rollers, jack screws, vises, warehouse trucks, copying presses, and many lines of labor saving tools and machines are produced in large quantities.

VIEW OF PART OF THE MACHINE EQUIPMENT IN THE WOODWORKING DEPARTMENT.

Moulding Shop.

As castings of all sizes enter largely into nearly all of the lines of general hardware produced, the moulding shop may be considered one of the leading departments. Including the building where the brass furnaces are located, the total floor space is approximately 25,000 square feet, and will accommodate 80 workmen. Two cupolas—one of 25 tons and the other 5 tons capacity—are installed; the molten metal being distributed to the various sections of the shop by means of one and two ton ladles, travelling on monorails overhead. For the rapid production of the smaller castings, moulding machines are used exclusively; over 20 of these being in continuous operation. In order to meet the constantly increasing demand for certain brass castings, it has been necessary to augument the brass equipment, until at present 8 brass furnaces are operating for 23 hours each day, with an output of about three tons of metal.

Adjacent to the moulding shop is the tumbling room, where the smaller castings are subjected to the rumbling process to remove the sand. This department contains 14 mills, and in connection with the foundry, there is a three story fire-proof stone building, 60 x 40 feet, containing approximately 7,000 patterns.

Machine Shop and Wood Working Departments.

The main machine shop, three stories high, is 160 x 60 feet, with a total floor space of about 30,000 square feet. This shop is fully equipped for maintaining a maximum production of all sizes and types of machined hardware. In order to handle the large variety of work that passes through the shop, it is difficult to arrange the machinery so that each piece will follow a set course, but by means of jigs and fixtures, adaptable to several machines, the progress of the work has been arranged in a systematic and efficient manner.

A new wood working shop has been recently completed. It is 3 stories high, 140 x 80 feet, of modern construction, well lighted and fully equipped. The chief products of this department are school furniture, plumbers' cabinetware, hammer handles, etc., in addition to manufacturing all necessary shipping crates and boxes. A small section of this building is used for the pattern shop, where all the wooden patterns are designed and constructed. A feature of this department is the completeness with which safety devices are applied to all of the machines and apparatus.

Hammer and Axe Department.

High grade cast steel hammers, sledges, hatchets and axes constitute the main articles manufactured in the forging department, which is equipped with 12 trip hammers, two heavy drop hammers, eight forging presses and all the necessary furnaces and auxiliary equipment required for the efficient and economical handling of the various makes and sizes. To facilitate the rapid progress of the work, and at the same time turn out a uniform product, all the forging machines are fitted with special jigs and dies, so that each piece—as it is finished—is a duplicate of its fellow. The various operations in the making of these forgings are very interesting, and

A CORNER OF THE MACHINE SHOP.

the speed and accuracy that is maintained in their production is truly remarkable.

In connection with the forging department is the grinding room, where the tools are edged, scale removed and otherwise shaped and polished. Twelve 6 ft. wet grind stones are used in this process. These stones, and all other grinders or dust producers, are fitted with exhaust system to carry off the dirt and dust.

Power Supply.

Power is supplied to the main machine shop and forging department by two 150 h.p. Crossley and Hunter gas engines, operated by producer gas. These engines are belt connected to the main shaft, and provision is made by means of two Dodge clutches, so that one or both sections of the shafting can be operated as desired. The hammer and axe department is operated by means of a rope drive of 100 h.p., the remaining 200 h.p. being used in the machine shop.

The entire plant is lighted from a unit in the engine room, there being 1,400 lights throughout the building. Cluster lights are fitted in the main machine shop. Throughout the plant are several electric elevators for facilitating the transfer of material from one department to another.

In addition to being connected, by siding, with the two leading railroads, there is a wharf 450 feet long, which will accommodate vessels of 18 feet draft. During recent years, considerable land has been reclaimed by filling in the shallow portions of the river, adjacent to the company's property. The entire plant, while composed of many buildings, is very compact, and with the shipping facilities at hand and a plentiful supply of labor, the future progress of this industry is well assured.

RECOVERING TIN FROM SCRAP

INCREASED efforts toward the recovery of various metals are being made as a result of prevailing high prices. Copper, tin and brass are amongst the principal non-ferrous metals now receiving close attention, tin being of especial interest to metal users on this continent because of the fact that the supply has to be almost all imported from foreign sources.

The recovery process used in a large American tinplate works consists of three stages. Tin scrap is first "leached" in large vats by a 20 per cent. solution of stannic chloride, containing about 0.5 per cent. hydrochloric acid, the latter being to prevent formation of oxides and oxy-chlorides of tin. Working at 150 deg. F., the leaching process occupies from 3 to 20 minutes, according to the condition of the solution. When the latter is saturated with tin—that is, completely converted to stannous chloride, it is pumped into small electrolyzing vats and electrolyzed at 5 volts, using a current density of 30 amps. per sq. ft., with two graphite plates as anodes and removable iron rods as cathodes. Electrolysis is continued till the liquor is again converted to stannous chloride, when it is ready for leaching a fresh batch of scrap. Tin is deposited on the cathodes in very fine crystals, which are scraped off the iron rods at intervals.

The final operation is to reduce the tin crystals to pig, and this is difficult, owing to their fineness and the ease with which they become oxidized. An electric furnace is found the only really satisfactory type, and the one actually used is of the shaft pattern, resembling a miniature blast furnace and standing about 3 ft. high. Once the fluxing slag is melted, the furnace is worked on the resistance principle, wet tin crystals mixed with carbon being fed in at the top of the furnace. The top of the latter is quite cool and, air being excluded from the furnace, there are no oxidation troubles. High quality pig tin is run off from the bottom of the furnace, and up to one ton of crystals can be melted daily.

CANADA'S TRADE SHOWS HUGE INCREASE

THE total of Canadian trade, exclusive of coin and bullion, for the twelve months ending September 30 last, amounted to $1,738,204,256. This is an increase of $803,038,833 over the total for the corresponding twelve months of 1915, and of $737,140,757 in 1914. The total trade for the month of September amounted to $161,067,661, an increase of several millions over the trade for September, 1915, and of eighty millions over the same month in 1914.

The total imports of merchandise for twelve months ending September 30 last amounted to $685,278,605, an increase of 268 millions over that for the corresponding period of 1915, and of 154 millions over that for the 1914 period. Total imports for September amounted to $68,796,262, an increase of 30 millions, or nearly double that of September, 1915, and of 32 millions over September, 1914.

Duty Collected

The duty collected during the twelve months amounted to $129,610,574, an increase of 50 millions over that collected during the 1915 period, and of nearly 40 millions over the amount collected during the 1914 period. During September, $11,942,791 was collected, an increase of four millions over September, 1915, and of nearly six millions over September, 1914.

The total exports of merchandise amounted to $1,052,925,651 during the year, an increase of 535 millions over those for the 1915 period, and of nearly 600 millions over 1914. For the month, the exports totaled $92,271,399, an increase of nearly 40 millions over the total for September, 1915, and of 51 millions over that for 1914. During the twelve months, agricultural and animal products provided just about 50 per cent. of the Dominion's total exports.

Manufactures Higher

Manufactures provided about 33 per cent.; mining products came next with 7 per cent.; forestries with 5 per cent., and the fisheries with about 2½ per cent.

Some idea of the effect of the war may be gathered from the fact that while during the 1915 and 1914 periods the products of the farm provided about 40 per cent. of the exports, manufactures in the 1915 period provided only about 25 per cent., and in the 1914 period only about 14 per cent., as against a proportion of 33 per cent. in 1916.

In the total export trade for the twelve months ending in September, agricultural products headed the list with a total of $396,455,537, animal products totaling $111,331,332, while those of manufactures were $361,381,419. Exports of agricultural products trebled as compared with 1915 or 1914, while manufactures did the same as compared with 1915, and were nearly six times those for 1914.

For the month of September, manufactures led the exports with nearly 38 million dollars, as against only 9 millions for September, 1915, and 5 millions for the same month in 1914; agricultural products came next with 25 millions, as against 11 millions for 1915 and 7½ millions for 1914. Animal products provided 12 million dollars worth of exports, as against 10 for September, 1915, and 7 for September, 1914. Exports of the products of the forest were nearly a million less for September, 1916, than for September, 1915.

MOLYBDENITE

THE great demand for molybdenite has had the effect of producing a much-increased output from many of the mines now operating in Queensland, and numbers of prospectors have been induced to examine areas of country where indications of the mineral appear in the outcrops of lode formations, but no phenomenal developments have taken place as a result of these operations. The principle molybdenite lodes are at Wolfram, in the Chillagoe field, other important deposits occurring at Bamford, in the same district. Official records show common occurrences of the mineral in small quantities in quartz lodes on many fields throughout Queensland.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

MOULDING AN ANGLE IRON FORMER CASTING WITHOUT A PATTERN

By J. H. Eastham

A RUSH order for a number of 24 inch diameter angle iron rings of 1 inch by 1 inch by 3-16 inch section necessitated the provision of a former casting of dimensions and shape as

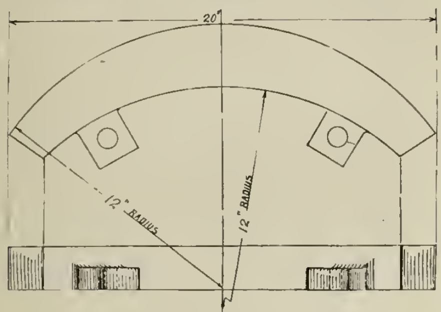


FIG. 1. PARTICULARS OF FORMER BLOCK TO BE MOULDED.

shown at Figure 1, the order for this casting being handed over from the blacksmith department to the foundry at four o'clock in the afternoon, with a request that the piece be delivered the following morning without fail. Obviously, at that late hour, time to make a pattern, except of the crudest type, was out of the question, hence the introduction of the material and means of production described herewith.

Preparatory Operations

A circle 24¼ in. dia. was marked out on the smithy floor, and a piece of 2 in. by ¼ in. flat was heated, its outside face bent to the radius just described as accurately as possible, cut off at twenty inches long from tip to tip, cooled, and handed over to the foundry foreman. Meantime a bed had been leveled and struck off on two straight-edges

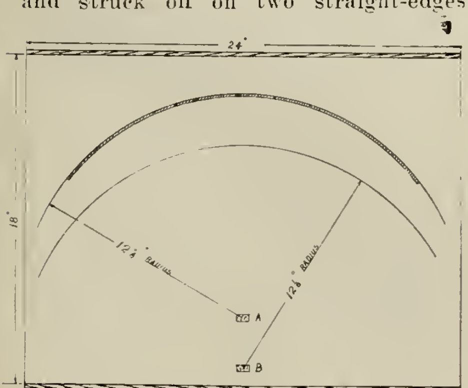


FIG. 2. IRON HOOP IN POSITION FOR RAMMING UP.

24 inches long, and placed 18 inches apart, while a wooden wedge A, Fig. 2, was driven in level with the surface at the point indicated to serve as a support for one end of the trammels which are now employed to mark the outer radius as shown. This radius was 12⅛ in., the extra ⅛ being contraction allowance.

The wedge was now withdrawn, moved back three inches to position B. and again driven in to act as centre for a curve of the same radius which is drawn out on the bed to mark off the inside surface of the casting.

Ramming the Hoop Iron

The hoop iron segment was now laid on the bed, its outer face touching the outer circle as in Fig. 2, rammed up on the outside only and then drawn forward till its inner face touched the circle struck from wedge B. Sand was then rammed to its inner surface, and strickled off level, the hoop being next finally removed, leaving a mould which, after the ends were stopped in by the aid of a 2 in. flat strip, measured 20 in. long over all, 2 in. square at each end, and 2 in. deep by 3 in. wide at the centre. The extra thickness at that point was desirable, as at that particular place the

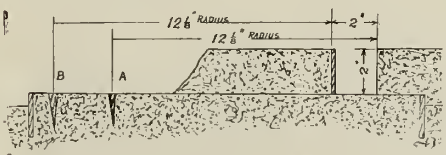


FIG. 3. SECTION OF RAMMED MOULD.

former block would naturally receive the maximum number of blows with consequent tendency to fracture, if of too light a section. The mould at this stage and previous to withdrawal of the hoop pattern is shown at Fig. 3, both radii being shown at the end or 2 in. square section of the casting.

Cutting and Coring Lugs

The lugs needed to secure the former block to a foundation plate whilst in use were next cut out with trowel and cleaner, being approximately 2 in. by 2 in. across, and 1 in. deep, and heavily filleted on their under and outer junctions with the main casting, a coreprint ¾ in. dia. being next sunk in the centre of each.

Pieces of ¾ in. round stock core were now sawn off to the required length, and pushed down till level with the joint, the holes formed by these cores being intended to accomodate ⅝ in. bolts, which, along with the size and location of the lugs were considered ample to secure the greatest degree of rigidity whilst in use.

Slabs of core, one inch thick were now filed to fan shaped sections to suit the circular mould and placed end to end in the form of a cover, one being pierced with a one inch round hole to facilitate pouring.

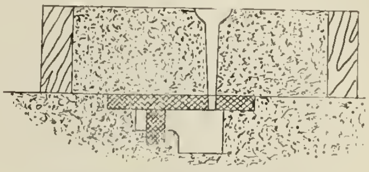


FIG. 4. SECTIONAL VIEW OF MOULD READY FOR POURING.

These cores, with pouring arrangement, are shown in the cross sectional view of the finished mould Fig. 4, as well as in plan in the composite view Fig. 5.

Forming Cope and Pouring

Sand was now rammed lightly round the entire mould and the slab cores, up to their upper surface, and struck off to a level joint, and a 24 in. by 12 in. cope part was rammed up over the whole, to prevent displacement of the cores when pouring. The mould was then weighted and cast, well inside the stipulated time, a little grinding of the marks caused by the core joints being the only treatment the casting required after rumbling.

HINTS ON THE USE OF CRUCIBLES

By H. Noble.

THE great increase in the price of crucibles renders it very necessary that every brass foundry foreman and melter should exercise the greatest possible care in their use, not only on account of the increased cost, but because of the

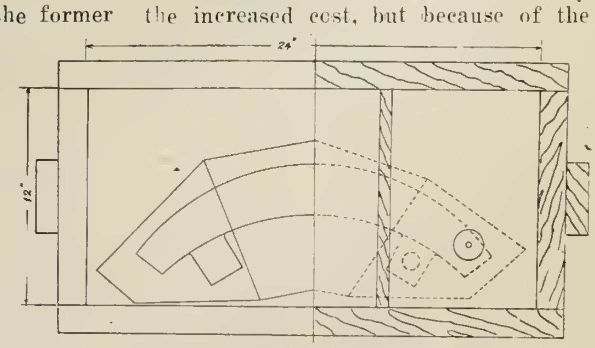


FIG. 5. PLAN VIEW OF MOULD SHOWING SLABS OF CORE.

difficulty in obtaining a satisfactory substitute for the clay from Klingenburg, Bavaria. Despite these difficulties, of manufacture, most makers have a greater output than ever before, and when in addition we consider the price of Ceylon plumbago, the present cost of crucibles is not to be wondered at.

Crucible Manufacture Takes Time

It takes from six to ten weeks to prepare a graphite crucible for service in the foundry. The writer considers two weeks at least as the shortest allowable time to allow for annealing before using. The longer they are kept the better they get, provided they are kept warm. They quickly absorb moisture, and for this reason should not be placed on a brick floor. After being seasoned as long as possible, they can be annealed by putting them over the cover of the furnace, bottom side up for one night, reverse them the next night, and then after they have been well warmed up, they can be placed in the furnace the following night.

Using Fresh Crucibles

Let the crucibles come to a red heat before using them. When putting pigs, gates and other pieces of metal in, do not wedge them tightly, but leave room for expansion of the metal as it heats. Have tongs and shanks carefully fitted to the different sizes in use; it is best to have one set for new crucibles and another set for old ones. See that the tongs grip the body of the crucible, as that is the strongest part and best adapted to withstand the pressure when lifting.

Never drop cold metal into a crucible after the heat is melted. Place the cold metal on the furnace cover to get hot, then it will not chill the molten metal. Use the poker or stirrer carefully, as it is very easy to punch a hole in a hot crucible. Don't leave metal in a crucible after use; if possible recharge again while it is still hot. Wet coke should not be used in the furnace, and when oil firing is used, the air pressure must be carefully regulated.

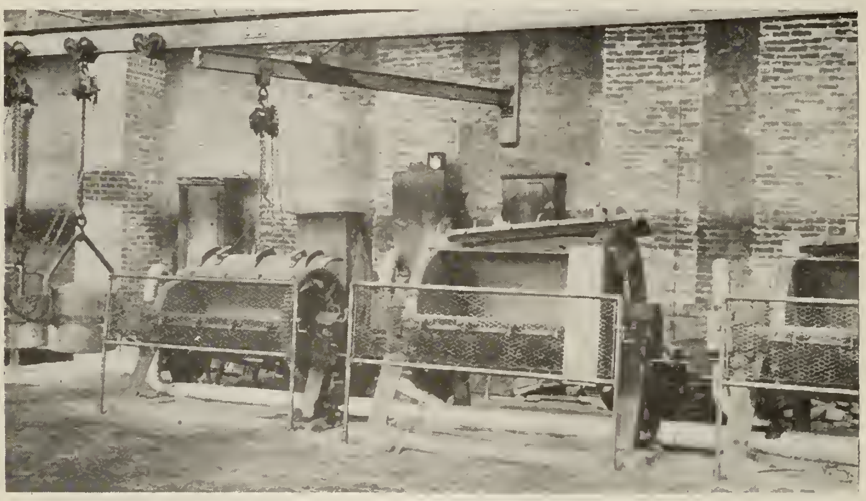
Avoid Drafts

After using, a crucible should not be left in a cold place or near a window; see also that no clinkers are on the bottom when it is drawn from the furnace. Keep an accurate record of heats and in a short time it will be possible to decide which make of crucible is best suited for use under certain conditions.

PROTECTING TUMBLING BARRELS

By D. O. B.

IN many factories the proper guarding of tumbling barrels is not given the necessary attention which the conditions demand. Many cases might be mentioned in which accidents have happened in this connection. In the cut is shown the method of protecting tumbling barrels as employed in one large agricultural plant. These guards are constructed of one-inch pipe with ordinary woven wire across the upper halves. They are merely dropped into holes in the floor and held by flat braces attached to the pedestals. These guards are extremely effective, and prevent anyone coming in contact with the moving barrels, yet at the same time being readily removable.



GUARDS MADE OF WOVEN WIRE AND PIPE FOR PROTECTING TUMBLING BARRELS.

CULTIVATING INITIATIVE

By A. E. R.

NO man should content himself with absolute subordination. Strict obedience is very often a highly desirable factor; but to carry it to extremes, at the expense of personality, is to sacrifice all self-respect and confidence in one's personal ability. Original thought and individual initiative have invariably been two of the greatest forces in the advancement of mankind; the first—whether visionary or the development of previous ideas—has always found expression in the latter, where an active brain and willing hand has been ready to put into concrete form the fruits of mental conception.

Everyday Requirements.

Workmen should always be mentally alert; quick to see an opportunity wherein their own and the firm's interests can be advanced. Because work has been performed in a certain way for a long period of time, is no reason that it should be accomplished in the same identical way indefinitely. While in the majority of cases, present methods of doing certain operations might not very well be improved on, there are many instances where a little thought, logically applied, would greatly increase the productiveness of a man or machine; often eliminating much labor otherwise uselessly expended.

A man's loyalty to the firm may be shown in the implicit way he follows the directions of his superiors, and yet he may be quite indifferent to efficiency possibilities that would be clear to a more receptive mind or observant eye.

How Initiative Originates.

Concentration of thought upon the work in hand is the forerunner of a creative mind. While many trains of thought carry no freight, the essential factor is to keep the train moving, so as to be in a position to take on freight when the opportunity offers.

When men are enthusiastic about their work, their minds are alert, they are productive, prolific in ideas, original, creative, strong and effective. What hope of advancement is there for the man who can only answer, "I do not know"?

Fruitful Criticism.

One of the best ways of cultivating the creative thought, is to study the methods of the other fellow; not with the purpose of adopting his ideas, but to see wherein any particular principle may fit in with your own line of work, and at the same time become conversant with progressive and up-to-date equipment. Few workmen, however, have the opportunity of studying this development by actual observation, owing to the small circle in which their practical experience is confined.

Trade Journals Helpful

The one best method for the isolated mechanic to obtain the current trade progress, is to avail himself of this privilege through the medium of the trade paper, which reflects in print the latest improvements of that particular field of industry. The careful and conscientious study of these pages broaden and train the mind to think out original and effective ideas for individual and collective benefit. The circulation of ideas among different shops stimulates thought all along the line.

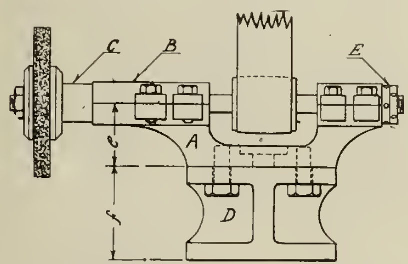
No man should be discouraged because his first attempt at original thought has not met the approval of his immediate superiors. Your proposal may even be resented, but do not get "cold feet," it is a weak man that cannot rise after being knocked down. The man that suggested floating iron boats was termed a fool; wireless telegraphy was laughed at when first spoken of; a railroad president had no time to waste with George Westinghouse when he wished to "stop a train with wind." So it has been with many new ideas that have afterwards proven beneficial to the human race.

Great achievements are possibly not open to everyone, but even the most insignificant improvement is often the first step towards higher and more important goals. Never before was there such a demand for the resourceful man; the man who can think, who can devise, and who can put his thoughts into execution.

ROUGH, BUT SERVICEABLE GRINDER

By R. James.

OCCASION often arises in small jobbing shops, where it is necessary to use a grinder to finish hardened work, and as many of such plants are not provided with electric grinders, the device used for the purpose is generally one of home-made construction. The sketch herewith shows a simple but serviceable grinder, used in a shop where sheet metal dies are made and repaired. The main casting A, which carries the shaft, is designed to secure good long bearings, the front one being extended to allow of operating on



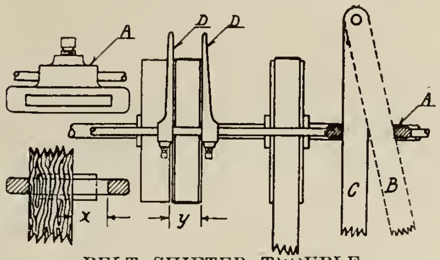
ROUGH BUT SERVICEABLE GRINDER.

internal surfaces. For bores of small diameter, shaft extensions are screwed to the main shaft. The height (e) is made to conform to that of the smallest lathe on which it may be used, while distance blocks D are provided for use on the larger machines, the height (f) being such as to raise the centre of the wheel to the level of the lathe spindle. Lateral play is eliminated by means of the adjusting nuts E.

BELT SHIFTER TROUBLE

By J. H. R.

MACHINE operators are often annoyed by the gradual starting or stopping of their machines, due to the creep of the belt from one position to another. This may be caused by faulty belting or shafting out of alignment. However, in many instances the trouble originates through the action of the shifter, especially where the wooden stick makes a great angle with the perpendicular, the weight



BELT SHIFTER TROUBLE.

being sufficient to overcome the friction of the various joints; thus the heavy stick seeks to return to a vertical position, with the result that the belt is forced over to the adjacent pulley. In an effort to remedy this trouble, a foreman in a small shop adopted the method shown in the sketch, where the belt shifter stick remains in a vertical position, after the machine has been started or stopped. Instead of the stick being pivoted to the shifter rod, it is allowed to swing freely in a slotted bracket A, which is fastened to the rod upon which the shifting forks D-D are secured. When hanging free, the stick is always perpendicular as shown at C; the position B (to the right or left) being so after shifting the belt. After the belt has been shifted, the stick will return to a vertical position, so that whether you are starting or stopping the machine, the belt stick will always be in the same position. The length of the slot will equal the width of the stick plus the distance (x); the latter being equal to the space (y), or the side movement of the belt in its passage from one pulley to the other.

RECOGNITION OF ABILITY

By R. Hamilton.

ONE of the agents that tend to destroy the spirit of loyalty, is the lack of appreciation accorded for work well done. In many instances this reasoning does not apply; but where it does, the seed of dissatisfaction once planted, may ultimately grow up and stunt the growth of the surrounding grain. It is generally recognized that the foreman is responsible for the efficiency of his department, and to maintain a high standard it is essential that the shop associations should be of such a nature, that the workmen can be relied upon to put forward their best efforts at all times.

Men Are Not Machines

Men should not be considered solely as units of a productive force, for unless an essence of goodwill permeates the whole plant, loyalty to the firm will gradually disappear, and the value of the men will deteriorate. Treat a workman as your slave, and you will get from him sullen service; and a half-hearted service means limited and inferior production. Consider him as a co-worker; one whose efforts are not only satisfactory, but appreciated, and an important part of your high efficiency problem will be solved, so far as output is concerned.

Need for Personal Judgment

It is the workman's privilege to improve his opportunities, and his superior's duty to see that he gets them. Men should be encouraged to use their own judgment in many of the minor details of their work. Profitable results are very often obtained by men "thinking" of their work in addition to doing it.

Although the foreman is nominally in charge of the shop, and ordinarily supposed to answer "shop" questions, it behooves all men to practice the analyzing of detail problems, the simpleness of which often try the patience of the best of foremen. And then again, there are men in authority who are so self-conscious of their own limited accomplishments, that they are reluctant to accept suggestions from the men under them. However, the world—at least the mechanical world—is making such rapid strides that no one man's past or present experience is so broad that he can lay claim to a monopoly of original thoughts or ideas.

Ridicule Kills

Do not despise or ridicule the well-meant suggestion of an interested shop man. Nothing will "kill" a man quicker than to ignore his proferred aid in the solution of a shop problem. Ideas are sometimes advanced by the men in the shop for the improvement of certain tools or devices, which the foremen reject at the time, and afterwards use with some small alterations; but the "powers that be" are under the impression that the saving is the work of the foreman and not the man.

A Steal

A case is recalled where the foreman actually "takes" the credit at the very moment the suggestion is offered. A thoughtful planer hand seeing where he could save considerable time by the use of a certain fixture, explained in detail his idea to the foreman. Just as the latter was convinced of the advantage to be gained, the manager comes along and is advised by the foreman that, "'I' have just thought out a plan where we can make a saving of 25 per cent. on this operation." The device was designed and constructed, but it was the means of "killing" the real author, with subsequent loss to the firm. While cases similar to that just stated may be exceptions to the general rule, it is often these same exceptions that prove the undoing of some enterprising concern, "blessed" with a poor executive.

Ability Seeks Recognition

Men who are keen to recognize their own ability, wish to have it appreciated, and if it is not, these men will invariably seek a position where it is.

Every worker in an organization whose aim is his own advancement and the welfare of the firm, is justly entitled to at least the moral recognition for any suggestion whereby the efficiency of the plant may be increased. To stimulate thought and promote the suggestive idea, every shop should have some organized system to induce the workmen to take an active interest in the economic handling of product and equipment. Money talks, and a small cash consideration for an adopted idea, is nearly always an incentive for future developments of an original nature.

WORKING WITH A PURPOSE

By P. H.

SEARCHING for a job that entails the minimum expenditure of physical labor, for the greatest cash returns, is a trait common to a large number of present-day workmen; in fact, many of those who are now occupying such "coveted" positions spend much of their time in abusing the privileges with which they are surrounded. There is something demoralizing in trying to get through life without a struggle.

Helping Others Helps Oneself.

To achieve success in any field of activity, the employee must realize, that while he is working for another, he is nevertheless in business for himself. Every bit of work he does heartily, honestly and thoroughly, is developing his own capacity, making him a bigger, broader, more capable man. Remember that cash remuneration is not the only returns you are receiving for your labors.

Future Assets.

The knowledge that you acquire in the course of your daily "grind," is to be one of the chief assets of the future; therefore, the value that is placed upon your services in after years, will not be, what you have done for your previous boss, but rather what you have learned and can apply profitably to the subsequent positions you are called upon to fill.

The seriousness of life should be impressed upon every young man during the early period of his career. No man should expect to journey through this life without having accomplished, during the passage, something worth while.

Luck Versus Ambition.

That man is destitute of ambition who is content to drift along, passively indifferent to those qualities that make for success. These men, as a rule, will look at the other fellow's advancement as a matter of "luck," never realizing that this good fortune is invariably the result of earnest application and eagerness to excel.

Luck is the tide, nothing more. The strong man rows with it, if it makes toward his goal; he pulls against it if it flows the other way. A man waited for 20 years for an opportunity to come along; becoming weary, he decided to take a nap, and while asleep the opportunity passed him by. A receptive mind, and an alert and creative brain, are the two goal posts through which opportunity scores a goal.

Industrious Idlers.

Idleness, in any form, is not only the key to beggary, but it is cowardly; inasmuch as the portion of life's activity that one person endeavors to avoid must be taken by another. It may be alright to cry aloud that the world owes us a living, but let none of us appease our conscience by letting someone else pay the debt. While idleness is generally supposed to allude to an anti-work habit, this non-productive trait may be exercised during the periods of useful effort in the daily routine of the average man. Some men, knowing they have accomplished a certain job in extra good time, will spend the "saved" time in telling their shopmates about it. These men are not only losing the respect of their superiors but what is probably worse, they are putting sand into the foundation of their future character, the stability of which should be one of the first duties of every young man, as his best strength depends upon the materials used in its construction.

Genius Discounts Itself.

A man of genius, one that is truly loyal to his self interest, invariably feels that what he has performed does not do credit to his aim or purpose; while on the other hand, the braggart is content to waste his own and his employer's time by trying to convince others of his own importance.

"Some people, in their lives and in
their labors,
Seem larger to themselves than to
their neighbors."

No man should be satisfied with doing just what he is told to do and no more. He should strive to overcome the tendency of getting in a rut, out of which it is often very difficult to emerge. Men cannot remain stationary; in whatever sphere they are engaged, they must either advance or retrogress. If a man's fund of experience does not increase his skill and production improve, he must stand idly to one side while others pass him by. Every day should see something added to his store of knowledge, and likewise profit to himself and his employer.

Control Effort.

The cause of many failures is not so much in the lack of effort as in the waste of it. A large amount of energy is often non-productive, where the same amount of inherent power properly expended might accomplish marvelous results.

Have courage to go forward. Don't be afraid to try, even if you fail; remember that a worm is about the only thing that can't fall down. Every earnest determination to remedy a failure or overcome an obstacle, makes the next trial just a little easier. If you cannot surmount a difficulty, take positive hold of it and make it serve you.

ONTARIO'S NICKEL PRODUCTION

PRODUCTION of nickel and copper ore in Ontario during the past ten years, shown below, has yielded about three per cent. nickel, and over one and one-half per cent. copper. This is exceptionally high-grade ore. Under present conditions it might be treated profitably for its copper content alone.

In addition to nickel and copper the Sudbury ores contain small quantities of the precious metals, gold, silver, platinum and palladium. The actual quantities are not reported. According to the International Nickel Company there was no production of these metals from Canadian ores at their works in 1912 and 1914.

	Tons Ore Raised.	Tons Nickel in Matte.	Tons Copper in Matte.
1906	343,814	10,776	5,260
1907	351,916	10,602	7,003
1908	409,551	9,563	7,501
1909	451,892	13,141	7,873
1910	652,392	18,636	9,630
1911	612,511	17,049	8,966
1912	737,656	22,421	11.116
1913	784,697	24,838	12,938
1914	1,000,364	22,759	14,448
1915	1,325,974	34,039	91,608
Total....	6,670,766	182,824	104,343

Previous to 1906, 2,700,000 tons of ore were raised, 2,100,000 tons were smelted of which 48,000 tons were nickel in matte and 36,000 tons were copper in matte.

Mimico, Ont.—The Dominion Abrasive Wheel Co. are building a factory here.

Newfoundland has copper ores, some running from 4 to 30 per cent. copper, with which little was done until after the war broke out. The production in 1915 was about 15,000 tons, or which 12,150 tons, worth $151,372, went to the United States, and the remainder to England, as against about 2,000 tons as the 1914 output, valued at $15,000, and all taken by the United States.

Papers Presented at the 1916 Foundrymen's Convention--I.

The subject matter of the papers selected for reproduction here cover a wide field of foundry and allied industrial activity. The demonstration of research by the various authors and the progress and development arising therefrom are such as to claim the special attention of all whose desire is to keep in close touch with up-to-date metallurgical practice.

ELECTRIC FURNACE PRACTICE IN STEEL CASTINGS MANUFACTURE*.

By T. S. Quinn**

THE ever increasing demand for a higher grade of small steel castings, influenced the Lebanon Steel Foundry to consider the electric furnace to supplant the crucible furnaces, which up to that time constituted the melting equipment. Having decided on a basic furnace as being the most economical from the standpoint of the local scrap market, the conclusion was reached that the Heroult furance best answered the purpose. In March, 1915, a furnace of this type, of 1-ton capacity, was installed. It was provided with Thury regulators, steel non-water cooled holders, and Gray tilting device. The furnace is of the 3-phase type. The bottom and side walls of this furnace are magnesite up to the slag line, the side walls above the latter, and the roof, being silica brick.

Three weeks after the first heat was poured, the stack of the crucible furnaces themselves were dismantled. This provided space for another electric furnace, should the normal expansion of business warrant it. In July, 1916, a second unit was installed of the same type, but of two tons capacity, and proportionately higher power. The 1-ton furnace has a transformer capacity of 225 kilovolt-ampers, while the 2-ton size has 600 kilovolt-amperes capacity. The product of both furnaces is small steel castings, averaging 5 to 10 pounds each in weight. The castings are made for automobile, motor truck and general machinery purposes.

Data Cover One-Ton Furnace.

In submitting some data in connection with the operation of electric furnaces, I shall confine my remarks to the 1-ton unit above mentioned. I do not feel warranted at this time to make any statement regarding the 2-ton unit, as the length of time that it has been in operation is too short from which to draw intelligent conclusions.

Up until Aug. 1, the 1-ton furnace made more than 2,000 heats on the original basic bottom. In that time it has not been out of service except for relining, which it was customary to do on a Saturday or Sunday. The magnesite bottom, which was set in layers of 1-inch to $1\frac{1}{2}$ inches, is still in the furnace. In setting a bottom in this fashion a monolithic mass is obtained that cannot be equalled by a bottom rammed in with magnesite, tar and pitch. The life of a lining varies from 100 to 125 heats, and the life of a roof from 125 to 150 heats.

Electrode Feature

Amorphous-carbon electrodes are used, the consumption averaging about 25 pounds per net ton of steel in the ladle. This low electrode consumption for a small furnace of the 3-phase type is probably due to the fact that shortly after the furnace went into operation, the solid copper type electrode holders were abandoned, and low carbon steel holders substituted. Each holder has two hinges, and the bus-bars are continued on out past each hinge, to prevent heating at this point. The advantages of this holder include the absence of any water cooling, also freedom from breakage, due to torsional stresses. The ease with which an electrode can be slipped is also a decided advantage.

The operation of the furnace for the past year has been on a 24-hour schedule, and while lack of transformer capacity was a serious handicap to maximum production, the furnace made an average of six to seven heats in 24-hours. A 1-ton furnace built to-day would have more transformer capacity, and, with say 450 kilovolt-amperes, as many heats could undoubtedly be made in 12 hours, at the same time effecting economy in power consumption.

Power Consumption Moderate

The power consumption has averaged 950 kilowatt-hours per net ton of steel in the ladle, which is about what might be expected of a 1-ton furnace with insufficient power back of it. Even in the short length of time in which the 2-ton furnace has been in operation, it has been demonstrated satisfactorily that steel can be put into the ladle at the same temperature for the same purpose, with a kilowatt-hour consumption not exceeding 750 per net ton, and undoubtedly the power consumption on 3-ton and 6-ton furnaces is considerably less than this. Every effort is made to minimize the length of time between heats, and it not infrequently happens that bottom is made, and the charge is in the furnace, and the current on by the time the previous heat is poured, a matter of some eight or 10 minutes.

Melting Data

The practice on this furnace has been to patch the banks with dolomite as soon as the heat is out, the charge is then introduced, consisting generally of what is known as heavy melting steel scrap. This scrap may have practically any analysis, as long as it is of chargeable size, and the carbon not too high. Coke is next placed under the electrodes on top of the scrap, then the electrodes are lowered and the current turned on to the full capacity of the transformers in summer time, although in winter the furnace is often operated with a constant overload on the transformers of 25 per cent.

In about 20 minutes a puddle of molten metal is formed under each electrode, and the surges of current become violent as the electrodes are on the metal. Lime is now added with spar and sand, and the furnace again settles down and works steadily ,and in about $1\frac{3}{4}$ hours the charge is completely melted, at which stage of the operation the phosphorus has gone into the slag, where it is retained as phosphate of lime. Generally this reaction is sufficiently complete without the aid of any oxidizing agent other than the rust that is on most scrap. At this juncture the melter pours a test bar, breaks it, and by examination ascertains whether his carbon is high or low, and either ores down or pigs up, until this element is in order. If much ore is required, of course more lime must be added to maintain sufficient basicity in the slag to take care of the phosphorus.

The furnace is tilted slightly and the slag is pulled off by means of a rake, an operation that takes, in skilled hands, about three minutes. The furnace is put back into place, and the second slag is made with lime, spar and sand; at this stage of the heat the deoxidizing and desulphurizing period begins. As soon as the slag is melted, and is of the proper consistency, powdered coke is added, and in about 20 minutes under the intense heat of the arcs, the slag becomes reduced, calcium carbide forms, and the sulphur goes into the slag, where it is retained as calcium sulphide. This reaction is very complete. However, the mere fact that a calcium carbide slag has been formed, is no indica-

*American Foundrymen's Association Paper.
**Lebanon Steel Foundry, Lebanon, Pa.

tion that the steel under it is thoroughly deoxidized, and it is necessary to hold the metal under this slag at least 20 to 30 minutes to completely kill it. Manganese and silicon are next added, and the atmosphere of the furnace, and the condition of the slag at this stage of the heat is such that if for any reason it should be desirable to do so, the heat could be held in the furnace for an indefinite length of time, without any appreciable loss in the manganese or silicon content in the steel, providing the slag is carefully watched and protected from any possible oxidation from the doors, etc.

Deoxidizing Possibilities

To be able to introduce into a furnace a given amount of manganese, silicon, chrome, vanadium, etc., and hold it in the metal for an indefinite period, theoretically getting in the steel just what was introduced, is proof of the almost perfect deoxidizing possibilities of the electric furnace and of the condition of the steel as it comes from the furnace, the advantages of which must be apparent to operators of converter and open hearth—who are obliged to finish their metal in the ladle, resulting in an inferior product.

Were the whole heat to be put into a big ladle, and bottom-poured direct into the molds, there would be no necessity for the use of any aluminum, but as the practice necessitates the pouring of the metal from the furnace into a big ladle, and again pouring it into shanks, and from the shanks into the molds, it must be plain that this practice is very severe on the metal. No matter how thoroughly the steel might be deoxidized in the furnace, the tendency of the metal when it is handled so many times, and at a temperature sufficiently high to pour very light work, is to absorb some oxygen, and a small addition of aluminum is made in each shank as a preservative rather than a cure. There have been periods, however, when no aluminum was added even in the shanks for weeks at a time, but this practice taxes the skill of the melters to the utmost, and is not to be recommended, when shanking steel in small quantities at high temperatures.

The finishing of a heat in the electric furnace requires very nice judgement on the part of the operator, and as the process is comparatively a new one, a scarcity of experienced melters is probably often the cause of much steel being put out in the market as Electric Steel which is not worthy of the name.

Too much cannot be said of the physical properties of electric steel, when properly made. With a view to ascertaining what electric steel would pull in comparison with steel from the converter and open hearth, some 20 test bars were taken from as many consecutive heats. Their average analysis was as follows:

	Per Cent.
Carbon	0.23
Silicon	0.23
Manganese	0.62
Phosphorus	0.018
Sulphur	0.028

The physical properties were as follows:

Elastic limit, lbs. per sq. inch	43,417
Ultimate tensile strength, lbs. per sq. inch	71,417
Elongation, per cent. in 2 inches	31.60
Reduction of area, per cent.	51.00

It will be noted that the average elastic ratio was 61 per cent. of the ultimate tensile strength. The only heat treatment that the test bars received was a slow anneal at about 1,600 degrees Fahr. Of the same analysis and with the same simple heat treatment, no tests from the converter, or open hearth have come to the author's attention approaching these figures.

Information on the cost of steel in the ladle for casting purposes, governed as it is by local conditions, is of little use for purposes of comparison, unless all the variable factors entering into it are known. Therefore, the author refrains from touching on this phase of the manufacture of steel in the electric furnace

One Hundred Furnaces Operating

The fact that there are in the United States and Canada about 100 electric furnaces in operation is sufficient evidence that the electric furnace is commercially able to make its way, and from observation and experience it would seem logical to draw the following conclusions:

First, there is a steadily increasing demand for better steel as evidenced by the fact that the open hearth and converter steel manufacturers have been all the while called upon to improve their methods, with the result that they have standardized their practice to a point which owing to the inherent disadvantages of the very nature of the processes themselves, can hardly be materially improved upon.

Second, the electric furnace is the only known available medium which promises through its almost unlimited refining possibilities and its further development to satisfy this demand.

Third, the eagerness with which manufacturers of steel products have embraced the electric furnace as a means to an end would indicate that this process will not only make its way in a new field, but will diplace to some extent for some purposes the open hearth, converter and crucible. Especially is this apt to be the case in the steel foundry, where a high-grade, hot metal is wanted at regular intervals, in comparatively small quantities.

To-day the development of the electric furnace is hampered, if not threatened, by instances of dissatisfaction with the product, probably because it is the trend of the times to commercialize any important discovery on a large scale, and it is possible that the exploitation and installation of electric furnaces has been so rapid that the development of metallurgical and operative skill has not been in proportion. Certainly the electric furnace does not call for any better operative talent than the open hearth, and it is only reasonable to assume that when electric furnace practice is established and standardized as has been the case with the open hearth, it will come into its own.

NOTES OF THE INSPECTION OF BRONZE AND BRASS*

By Ernest Jonson.**

BRASS and bronze castings are subject to various defects which are difficult to discover by surface inspection, or even by hydrostatic testing, when such a test is practicable. The defect which most commonly occurs results from the inclusion of oxide in the metal of the casting. This occurs in two ways: either the molten metal contains an admixture of oxides, owing to insufficient protection of the molten metal from the air, or the dross from the surface of the crucible or furnace charge gets into the mold and is caught at some point where the flow is slight, and is thus prevented from coming to the surface in the risers.

In the former case the entire casting is bad, and the best way to discover this defect is to make tensile tests on specimens cut from a coupon cast from the same melt. The admixture of oxide is indicated most distinctly by the greatly reduced elongation, but also by low ultimate strength. The tensile test should, therefore, be specified for all important brass and bronze castings, no matter whether a certain strength and elongation are of mechanical value or not. The metal in every important brass or bronze casting should have the strength and elongation typical of the mixture of which it is made as an evidence that the metal in the casting is clean. If a tensile test is impracticable, oxidation in the metal may be discovered by making a bending test on a machined specimen. The presence of oxide will then be indicated by a number of small cracks which open on the outside of the bend, and if the oxida-

*American Institute of Metals paper.

**Engineerr Inspector, New York Board of Water Supply.

tion is extreme, also by the abnormal color of the surface of the fracture.

Oxidation in Crucible

The writer's experience indicates that oxidation of metal in the crucible is a very common defect, especially of the mixtures of high percentage of copper, that is, of the bronzes. It is the writer's belief that in foundries where tensile or hydrostatic tests are not made, the metal is generally allowed to become considerably, and in many cases seriously oxidized in the crucible, because this defect in the metal does not show on the surface of the casting. To specify bronze castings merely by the mixture is therefore useless. Unless the metal is tested after it has been poured, one is not justified in assuming that it consists of a clean, uniform mixture of the ingredients put into the crucible, or even that the proportions of the mixtures are the same as originally made, for the proportion of one or two of the ingredients may have been decreased by oxidation. A bronze casting may be made of the correct fixture and may show no surface indications of defects, and still it may be nothing but a honeycomb of metal, the cells of which are filled with oxides.

The presence of included dross is more difficult to discover. If a hydrostatic test cannot be made, it is practically impossible to find such defects unless they happen to come to the surface of the casting, and even a hydrostatic test does not always discover such defects, because there may be considerable thickness of good metal along one or both of the surfaces of the casting. The best insurance against this kind of defects is correct molding, a thing, which, strange to say, is very unusual. This fault, however, cannot be charged entirely to the foundryman. The designer is often equally at fault. The molding of a casting should be planned while the casting is being designed, and before its final shape is determined.

Casting Design

Every brass or bronze casting should be designed with reference to a given position in the mold. The position being determined, the various parts of the casting should be so arranged that they are connected by a rising channel of increasing cross-section and with a minimum of offsets with one of the risers, which, of course, should be of much greater diameter than the thickest part of the casting. The chief reason for this rule is evident. The thinner the metal the sooner it solidifies; hence if a portion of the casting is separated from the riser by another part of the casting which is of less thickness, the metal in the heavier part of the casting would be fed by the riser only to the point at which the thinner connecting portion of the casing solidifies. After that the shrinkage will result in the formation of cavities in the heavy part of the casting. Chills may to some extent be used as a substitute for this arrangement, but only when a channel of increasing dimensions is impracticable, and then only to a limited extent.

When a casting is thus correctly designed with reference to molding, it is evident that there is much less likelihood of dross being caught in the mold, and that instead it will flow up into the risers. The foregoing presupposes, of course, that the pouring gate enters the mold at its lowest point.

Pouring Castings

Whenever practicable, castings should be poured from the bottom. There are certain castings which cannot be poured from the bottom, but it is a question whether castings poured from the top are ever quite free from dross. Hence, very important castings should be designed that they can be poured from the bottom. Doing this will sometimes involve considerable expense, as the castings may have to be made much thicker than they need be, and perhaps, also, much machine work may be required to bring them down to the required thinness.

In determining the position of the casting in the mold, extensive flat upper surfaces should be avoided, as dross may accumulate by being caught under the flat surfaces of the mold or core. When a flange forms the upper surface of the casting, it should be expected to contain some dross and an adequate amount of finish should be allowed, so that this dross will be entirely removed in machining.

Another source of trouble is insufficient risers. A casting may be made in full accordance with the drawings and specifications, and yet contain deposits of dross which may cause it to fail under ordinary working conditions, and still these defects may be such that they would not be discovered by the most careful inspection, and even by a hydrostatic test. It is therefore unwise to leave the decision as to the number and size of risers to the foundryman who may be prejudiced by consideration of economy in favor of fewer and smaller risers than is consistent with the highest quality of casting. It would seem, therefore, that in specifying brass or bronze castings the total cross-section of the risers should be given in per cent. of the greatest horizontal cross-section of the casting.

Leaking Castings Treatment

Brass and bronze castings are expensive to make, and it is therefore undesirable to reject such castings on account of defects which can be remedied. Minor leaks in hydraulic casting may be stopped by peening, but the fact that the casting leaked at a certain point generally indicates that the metal was defective at this point. It is commonly believed that certain brass and bronze mixtures are normally porous and permit water to pass through them under high pressure. This belief, however, is erroneous, at least up to a pressure of 1,000 lbs. per square inch. If water comes through the walls of a casting even in very minute quantities under pressures which do not exceed 1,000 lbs., this is an indication that the metal is not clean, or that the casting is porous from some other accidental condition. Peening is therefore a questionable method of treating defective spots in brass or bronze castings. If the defect is small and other circumstances permit, a hole may be drilled and a plug of the same metal as the casting may be screwed in. If plugging is not practicable or permissible, defective spots should be cut out by chipping or drilling so that all the defective metal is removed. It is difficult to determine just how much cutting should be done, because any cutting tool that may be used will cause the metal to flow sufficiently to cover up minor defects and make it appear solid. Etching with a mixture of ferric chloride and hydrochloric acid would probably reveal poor metal thus hidden by the rubbing of the tool. The cavity may then be filled by melting metal into it from a rod by means of o gas flame, or by pouring metal into it from a rrucible. In either case this must, of course, be done in such a way that the entire surface of the cavity is melted and thus consolidated with the added metal. If a gas flame is used there is some danger of the filling not being solid, but if it is poured from a crucible with reasonable care, there can be no doubt about the soundness of the metal in the weld.

Welding Defective Parts

Brass or bronze, when stressed above the initial elastic limit, and the full stress is maintained for a considerable length of time, will fail by cracking, as soon as oxidation takes place on the surface, which is bound to happen sooner or later. This property of the copper alloys was described by the writer in a paper read before the American Society for Testing Materials, in 1915. When a defective spot in a casting is welded, the cooling of the metal in the weld will be accompanied by contraction which will put a tensile stress in the metal of the weld as well as in the old metal which surrounds it. If the metal of the weld is the same as that of the casting its elastic limit may be appreciably higher than that of the rest of the casting, because the metal in the weld solidifies much more rapidly than that in the rest of the casting. The permanent deformation resulting from the shrinkage of the weld will, therefore, take place in the surrounding metal, and this metal will therefore remain in a state of tension greater than its initial elastic limit, and after a while cracks will appear.

If the casting is of small lateral dimension, and the ends are not constrained, and the break extends all the way across it, the stress set up in the old metal by the shrinkage of the weld is compressive, and therefore there is no danger of cracking. In all other cases shrinkage stress must be prevented by keeping the casting heated to a very high temperature while the weld is being made and until it has solidified. The elastic limit of the surrounding metal will thus be temporarily lowered and the flow will take place under a stress much lower than the initial elastic limit of the cold metal, so that there will be no danger of cracking after the metal has cooled. Another way to prevent cracking is to anneal the casting immediately after the weld has been made. There is no reason to believe that the metal surrounding the weld is injured by the shrinkage stress until corrosion occurs on its surface. Therefore, if the elastic limit of the metal surrounding the weld is lowered by heating the entire casting to a sufficiently high temperature, additional flow will occur, and the cooling stress thus gradually reduced to a very small minimum according to the length of time the annealing is continued. The annealing temperature should be maintained for several hours so as to give the metal time to flow. Repairs of this kind should, of course, be made before any machining has been done, because the dimension of the casting may be appreciably affected by the shrinkage in the weld as well as by the annealing. Castings which are subject to hydrostatic test should therefore be given a preliminary test before any machining is done. A pressure of 100 lbs.. or even less, will generally be sufficient to reveal defects.

Shrinkage Allowance

In machining brass and bronze castings trouble frequently arises from the fact that the pattern-maker did not make proper allowance for minimum shrinkage. When a brass or bronze casting is constrained, shrinkage in the constrained direction is generally very much less than normal shrinkage. Core or other inside dimensions, which are tied up with outside machining dimensions, should therefore not be laid out on the pattern with a shrinkage rule, but with a normal rule. The designer can aid in preventing errors of this kind by marking over-all machining dimensions of castings "must be exact," when it is really necessary that they should be exact. This practice would result in an economy of metal, in so far as extra thickness would not have to be added to flanges except when thus marked on the drawing. Where not marked to be exact, the common practice would naturally be followed, which is to lay out the faces of flanges from the back of the flange whenever a deficiency of thickness of flange would result by tying up the dimension to the face of the flange with the main lines of the layout.

Season Cracking

When a rod, bar, tube, or shape or brass is pulled through a die, the permanent reduction of its dimensions is proportionately greater at and near the surface than in the interior. This is proven by the fact that the diameter of a drawn bar may be increased by squeezing it, and thus causing the metal in the surface layer to stretch, so as to allow the elastically compressed interior to expand. The stress thus set up in the surface of drawn brass frequently exceeds the initial elastic limit, and cracking may therefore be expected, after some time when corrosion takes place. This is the reason why such defect is called "season crackng."

Drawn material should therefore not be allowed to retain its initial stress for any considerable length of time, but should be immediately treated in some way to relieve the stress. Initial stress may be relieved in two ways: either by stretching the metal near the surface by mechanical work, or by temporarily reducing its elastic limit by heating, and thus allowing it to be stretched by the compressive stress in the interior metal. The mechanical working used for this purpose is either squeezing between the rolls of a straightening machine or bending the bar successively in four directions called "springing."

Annealing

Annealing is also used to some extent to eliminate initial stress by lowering the elastic limit. An important fact with regard to annealing drawn brass was brought out by Merica and Woodward in the paper which they read before the Institute at its meeting in 1915. This fact is that if sufficient time is allowed for annealing, so that the metal is given ample opportunity to flow, the temperature need not be as high as it would have to be in order to eliminate initial stress by a quick annealing. It is therefore possible to eliminate initial stress by slow annealing at a low temperature without appreciably lowering the elastic limit given the material by the drawing. The work done by Merica and Woodward in connection with the study of initial stress and season cracking will be published in full detail in a paper now being prepared by the Bureau of Standards.

The presence of initial stress in wrought brass may be detected most quickly by cutting a longitudinal slit into the end of the piece. If the initial stress is of sufficient magnitude to be objectionable, the two halves of the piece will curve out to a measurable degree, that is, to a degree sufficient to be detected by means of an ordinary micrometer, and if the stress is great the curvature may be visible. Extruded brass rods are sometimes subject to a hidden defect, namely, piping. Such rods are generally cut to length by sawing, and if the pipe is small it will be hidden by the rubbing of the saw. The presence of this defect may be discovered by nicking the end of the rod and breaking it off.

Brass Bolts

Another important practical application of the principle that brass must not be kept under stress greater than its initial elastic limit and equal to its acquired elastic limit for any considerable length of time, is with regard to bolts. It is evidently very difficult, one might even say practically impossible, to fit and tighten a bolt in such a manner that one is sure not to stress it above the initial elastic limit, if not all through the section, at least on one side. All bolts used in flanged connections are stressed more on one side than on the other side, because of the deflection of the flanges, and even under the most favorable conditions when the connected parts are so stiff that the deflection is insignificant, brass bolts may easily be drawn up so tight that the entire cross section at the root of the thread is stressed above the initial elastic limit.

Workmen get their experience with bolts mainly from handling steel bolts which may be drawn up much above the initial elastic limit without injury, and therefore they are apt to handle brass bolts in a way which will cause failure. Brass and bronze are therefore metals which should be regarded as generally unsuitable for bolts and studs, and which may be used for these purposes only under special favorable conditions, when there is no chance of eccentric stress or excessive tightening. A good rule to be followed in drawing up brass bolts is to draw up a little tighter than is necessary and then relieve the stress on it by turning the nut back a fraction of a turn. In this way the permanent stress in the bolt will be less than the elastic limit.

Heat Treatment Defects

Another source of defects in brass work lies in the heat treatment by work-

(Continued on page 174)

NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

FLEXIBLE SHAFT APPLICATIONS

THE economies to be effected by the use of flexible shafting on suitable work are now so widely recognized that its position as a standard item of machine shop equipment is thoroughly assured. Recent improvements in their product characterize the Strand Flexible Shaft, which is marketed by R. E. T. Pringle, Toronto.

Two types of this apparatus are illustrated, Fig. 1 showing an outfit for light grinding, polishing or drilling. It is built with either a 1-10 or a 1/4 horsepower motor, which drives a 4 in. x 3/8 in. and 5 in. x 1/2 in. wheel respectively, the former weighing 60 lbs. and the latter 75 lbs. A three-speed countershaft is incorporated in the design, the one-piece leather belt acting as a safety drive to prevent overloading of the motor. By removing the detachable handle and wheel, the drill chuck can be attached in a convenient manner.

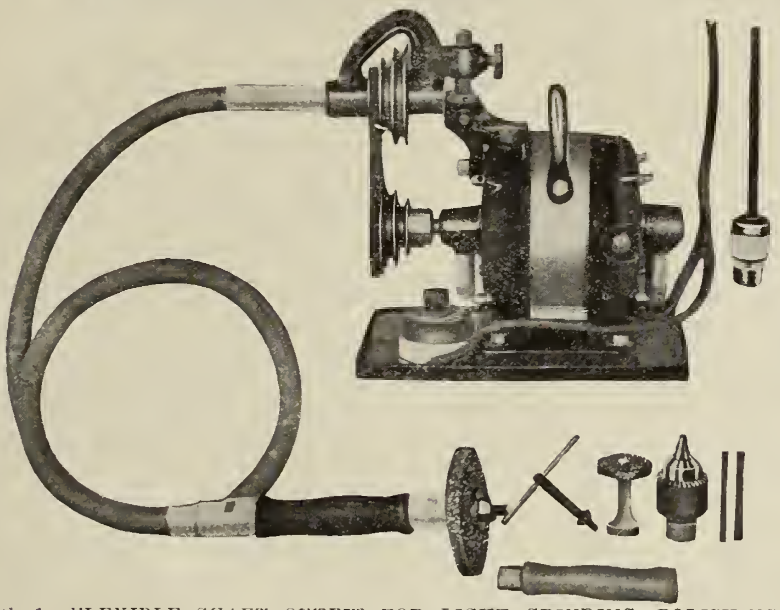


FIG. 1. FLEXIBLE SHAFT OUTFIT FOR LIGHT GRINDING, POLISHING AND DRILLING.

A similar equipment, designed for use in tool posts of various machines, is shown in Fig. 2. This outfit is also arranged to give change of speed for different size grinding wheels, and is adapted for internal as well as external grinding. Two sizes of this equipment are offered. The smaller has a 1/4 horsepower motor driving a 7-16 in. shaft at 3,500-5,000-6,000 revs. per min., external work being done with a 6 in. x 1/2 in. wheel, and internal work with a 1 in. x 1/4 in. wheel, the outfit weighing 75 lbs. The larger size has a 1/2 horse-power motor driving 1/2 in. shaft at 900-1,800-3,600 revs. per min., with wheels 8 in. x 3/4 in. and 2 in. x 3/8 in. for external and internal work respectively. The sleeve which is held in the tool post is adjustable for different depths, and in the case of the larger outfit it is possible to grind the full depth of an 8 in. cylinder with a diameter as small as 2 in. For lesser diameters the small internal attachment is provided.

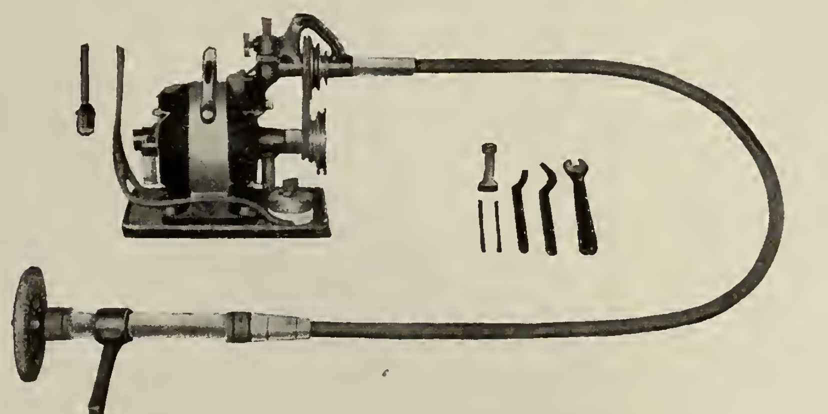


FIG. 2. MOTOR-DRIVEN TOOL POST EQUIPMENT FOR INTERNAL AND EXTERNAL GRINDING.

All shafts supplied with these outfits are made with an improved metal casing, which eliminates much of the trouble usually experienced with flexible shafts. It is so constructed as to be freely flexible to a certain radius, where it automatically forms a stop, thus preventing accidental short bends.

ELECTRIC REVERSING MILLS

ON Oct. 3, Wilfred Sykes, general engineer of the Westinghouse Electric & Mfg. Co., East Pittsburgh, read a paper entitled "Electrically Driven Reversing Rolling Mills," before the mechanical section of the Engineers' Society of Western Pennsylvania. Mr. Sykes said in part:

The first successful installation of a reversing electric blooming mill was that of the Steel Company of Canada, at Hamilton, Ont. This installation consists of a double reversing motor capable of developing about 10,000 hp. maximum, and is supplied with power from a flywheel motor-generator set with two generators. This mill has been in operation for over three years with very satisfactory results. It is at present working at a rate considerably in excess of the capacity specified when it was installed. The following are particulars of the mill and driving equipment:

Size of ingot	15 by 17 in.
Weight	4,000 lbs.
Finished material	4 by 4 in.
Elongation	16
Number of passes	19
Capacity, tons per hour	60
Roll diameter	30 in.
Pinion diameter	34 in.
Speed, full motor field	70 r.p.m.
Speed, weakened motor field	100 r.p.m.
Driven from motor	Direct
Number of motors	2
Voltage across each armature	600
Maximum operating torque	900,000 ft. lb.
Maximum motor horse power	10,000
Number of generators	2
Rated power of driving motor of set	1800 h.p.
Weight of flywheel	100,000 lb.
Speed of flywheel set	500 r.p.m.

The largest installation at present in operation is that of the Bethlehem Steel Co. which drives the 35-in. blooming mill at the Lehigh plant.

The following is a list of electrically

driven reversing rolling mills installed or building in the United States and Canada, 18 in all:

ever annealing may be necessary. Large rivets must be driven hot, but flanging and other kinds of bending should be

Mill.	Horse-power	Started Operation
30-in. universal plate mill, Illinois Steel Company	8,000	1907
35-in. blooming mill, Algoma Steel Company	8,000	1913
34-in blooming mill, Steel Company of Canada	10,000	1913
35-in. blooming mill, Bethlehem Steel Company	12,000	1915
34-in. blooming mill, Central Steel Company	8,000	1915
35-in. blooming mill, United Steel Company	12,000	Installed
40-in. blooming mill, Inland Steel Company	15,000	Building
32-in. blooming mill, Inland Steel Company	8,000	Building
28-in. structural mill, Inland Steel Company	8,000	Building
40-in. blooming mill, National Tube Company	15,000	Building
40-in. blooming mill, Illinois Steel Company	15,000	Building
35-in. blooming mill, Mark Mfg. Company	15,000	Building
27-in. universal plate mill, Mark Mfg. Company	8,000	Building
24-in. billet mill. Mark Mfg. Company	5,000	Building
24-in. flat mill. American Steel & Wire Company	3,000	Building
34-in. blooming mill, Ashland Steel Company	8,000	Building
34-in. blooming mill, Keystone Steel & Wire Company	8,000	Building
34-in. blooming mill, Chattanooga Steel Company	8,000	Building

The question of maintenance is of great importance, and the figures given by Mr. Jefferies of the Steel Company of Canada, in a discussion at the convention of the American Institute of Electrical Engineers, showing the results obtained in their mill over a period of three years, are of interest. The figures for power consumption are also notable as they were obtained with the mill working much below its normal capacity.

done cold: and even so it is important that this work be done by experienced men and in shops equipped with the necessary appliances; for instance, the flanging of circular heads should be done by pressing between dies, and in several stages, each being followed by annealing. One should not attempt to do such work on brass by hammering over a form, as is done with copper.

Item.	1913.	1914.	1915.
Operating	9 months	8 months	12 months
Tonnage	119,282	92,622	174,460
Kilowatt hours per ton	23.9	22.8	21.5
Repairs and maintenance	$924	$837	$700
Miscellaneous supplies	$420	$465	$525
Labor in operation	$1,680	$1,488	$2,275

NOTES ON INSPECTION OF BRONZ AND BRASS

(Continued from page 72)

men unfamiliar with the properties of brass. Occasions for heat treatment arise when brass is bent hot, forged, or rivets are to be driven hot. Men accustomed to do such work on iron and steel are very liable to ruin the brass by over-heating. This over-heating produces an interior oxidation, probably by opening fissures between the grains, and thus the strength of the material is greatly reduced and the ductility reduced almost to zero.

Defects of this kind are apt to be very troublesome because they are difficult to discover by surface inspection, and, of course, tests cannot be made on finished material. The best insurance against trouble of this kind is to allow no brass forging of any kind to be done by men who are not experienced in this kind of work. Specifications for such work should provide that no hot working of brass should be done by a concern not regularly engaged in such work, and when this precaution has been taken, hot working should be avoided as much as possible. Brass being very ductile may be formed into any shape by cold working accompanied by what-

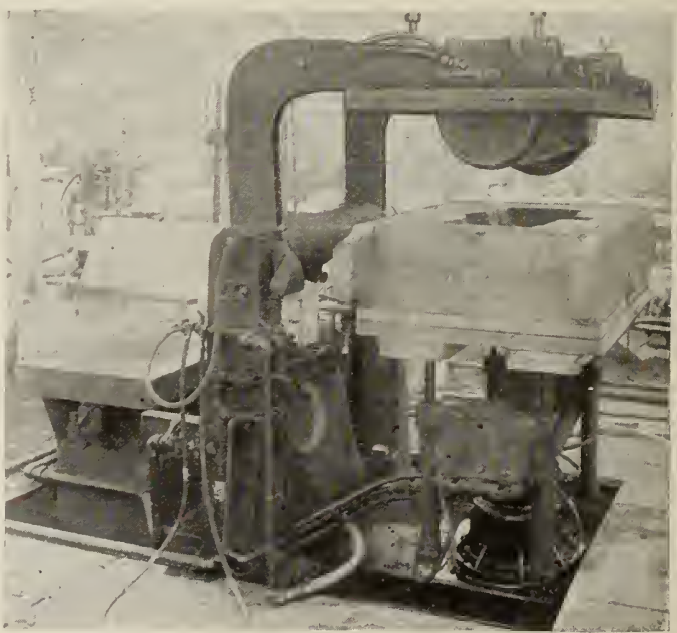
NEW JOLT ROLL-OVER DRAW MOULDING MACHINE

THE accompanying illustration shows a new jolt roll-over draw moulding machine which was exhibited at the recent convention of the American Foundrymen's Association in Cleveland, by the builders, the E. H. Mumford Co., Elizabeth, N.J. A large range of work can be performed in the machine which can take a 37 x 48 in. flask and has a 16-in. draw. The machine is operated in the following manner:—

The pattern board is placed directly on the jolt rammer table by means of a positive spring locking device, thus doing away with the usual floating plate arrangement. After the flash is filled it is rammed up by the jolt machine which is a standard Mumford machine having 10-in cylinder, and capacity to ram half moulds weighing 3,700 lbs. at 80 lbs. air pressure. When the ramming process is complete the mould is clamped to the pattern board, and the rock-over valve is opened. As soon as the arms start upward in the rolling over operation, they are automatically locked to the pattern board by means of sliding pins. This takes place as soon as the arms move upward 1/4 in., so all danger of the pattern board slipping is absolutely eliminated. The rolling over operation is accomplished by means of a 16 in. air cylinder acting in both directions on a crank.

When the mould is rolled over it hangs suspended by the arms over the levelling and pattern drawing device. This device consists of the Mumford fluid pressure plunger, an apparatus which has been thoroughly tested out in the Mumford Split Pattern Machines where it is also used for drawing the pattern. In operation the draw plunger raises up the leveling device to a height of 16 in., the maximum draft, when a stud opens a pop valve reelasing four leveling pins which rise independently of each other until they strike the bottom board of the flask. As they are independent of each other any inequality in the surface of the board is automatically taken up, and the pins being 22 in. in length, no adjustment is necessary for shallow or deep flasks; considerable saving of time is also effected where work of varied depths is being run. When the pins have come to rest under the bottom board they are locked by means of an air clamp from the operating position. This clamp exerts a pressure of three tons on each separate pin, thus assuring a rigid rest for the flask. Hand levers for locking the pattern board to the arms,

(Continued on page 32.)



JOLT ROLL-OVER DRAW MACHINE.

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COST AND VALUE OF TRADE AND TECHNICAL PAPERS

ONE effect of munitions manufacture by Canadian metal-working plants that daily comes under our notice is the intelligent interest being taken by operators—yes, and by executives, in the outputs of kindred establishments, and the methods, devices and scheduled routine by which specific results are being achieved. In no direction is the interest more apparent than in that relating to the subscription personnel—numerical and otherwise of this journal. A higher cost of knowledge of one's trade or profession has, like the high cost of living, thrust itself to the front, due of course like the latter to a combination of circumstances, avoidable and perhaps not.

Sources of knowledge are not circumscribed, neither are its demands, in consequence centralization of the former for distribution becomes necessary, and printer's ink and paper are the mediums of accomplishment. Each of these commodities has been caught in the swirl of the universally prevailing abnormally high prices, cost of knowledge distribution having in consequence to follow suit. Whether in pre-war days the low cost at which up-to-date information in a trade and technical journal was assessed at its true value, by subscribers or otherwise, has become of little moment, because of the greater appreciation, due to the enlarged outlook, now being displayed; the relatively determining evidence being that of the alertness with which increased subscription rates have been responded to by those concerned. The cost of developing one's intelligence and aptness to pursue successfully a chosen trade or business career is still well removed from such a classification as "high."

ENEMY SAMPLES EXHIBITION

WHILE the British Board of Trade and Sir George Foster, Canadian Minister of Trade and Commerce, who was instrumental in having the exhibit of enemy samples brought to Canada, deserve credit for giving our manufacturers an opportunity of inspecting certain lines of German goods that have been sold in numerous markets of the world, the commercial value of the undertaking as we see it is a doubtful quantity. The exhibit is interesting in that it reveals the technical and practical ability of the German artisans to utilize raw materials to the fullest possible advantage as well as their aptitude for supplying the special kind of articles which certain markets call for. In this respect the exhibit is an object lesson. As far as Canada is concerned, however, it looks as if little thought had been given to conditions which prevail within her borders.

It would, we think, be practically impossible to manufacture ninety-five per cent. of the articles in Canada because the production cost is prohibitive; there is therefore precluded the possibility of competing in markets where these cheap goods have been sold. The cost in Canada of raw materials alone, even in normal times, is such that the class of goods shown could not be produced profitably at a competing price. It has to be remembered that the standard of living in Germany is considerably lower than in Canada, wages being correspondingly on a much lower scale, reducing thereby manufacturing cost. Germany in normal times has direct steamer connections with the markets represented by her wares, which we have not, and cannot have until we have our own merchant marine, or at least until reciprocal trade within the Empire, at least, has developed considerably more than at present.

As an initial effort, put forth with the best intentions and anticipatory of more or less satisfactory results, we may not be too critical. To those concerned, the present exhibit in the matter of the interest displayed—aside altogether from ultimate results, should be an inspiration to further development, and that along the lines of not only a better class enemy goods exhibit as regards value, but relative also to such basic industries as agriculture, mining, mechanical and electrical engineering and allied spheres.

THE DECIMAL SYSTEM IN CURRENCY, WEIGHTS AND MEASURES

THE present-day tendency, aside from the war effects, is towards standardization, it being clearly evident that the latter makes for efficiency; notwithstanding, to the war and the trade relationships which will prevail as its result will the most pronounced progress towards standardization be traceable. In a word, there are practically certain to be created universally accepted decimal systems of currecy, weghts and measures in business transactions. Even in Great Britain, where exists the triple antithesis to the decimal system, and where the propriety of adopting the new methods of reckoning has been many times discussed and as often flouted, public opinion is being stirred to action and ripened to the point of ultimate adoption. What is Britain's concern in this matter is also that of Canada, for while we boast a decimal currency we are like her involved in the weights and measures feature. Again, the good and substantial reasons why Britain's manufacturing and commercial interests judge a change to be essential are applicable in every respect to us.

It is contended that we have reached the parting of the ways, in a word the time has come when the decimal system in its entirety must be adopted if we would both secure a footing and maintain it when the anticipated trade war follows the bloody struggle in Europe. Little heed, if any, has been given to the decimal system need in our projected capture of a share of world markets, judging at least from public pronouncements on the subject. We are of opinion, however, that our business interests will not only find it advantageous to follow Britain's lead in the matter, but will unhesitatingly and unanimously lend active support in establishing in its entirety a decimal system of Empire trading.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

ROTATING PLATING MACHINES. II.

By Abe Winters

WHEN purchasing or building a plating apparatus, the simplest design should be selected, and the various parts should be such as to facilitate easy removal when worn out and replacements being quickly assembled. Partially submerged cylinders require slightly less power to rotate than the completely submerged type, but the power cost is not increased in proportion to increase of output when the latter type is operated. Nearly all plating machines sold through supply houses are weak in driving mechanism, and many platers are satisfied to adjust the load to suit the power of the machine as furnished them. Inexpensive alterations will usually correct this fault and permit greater quantities of pieces to be treated.

If the average load which is to be plated, weighs approximately seventy-five pounds and a completely submerged cylinder is to be used, it will be necessary to discard the two-inch belt and improve the driving power by either a chain, or larger pulley and wider belt. The speeds which are permissible with the average purchased plating machine are very slow, usually ranging from four revolutions per minute to ten revolutions per minute.

If a double sulphate nickel solution is used as the electrolyte, these speeds will not produce a high lustre to the metallic surfaces being plated, unless the articles are very small and comparatively smooth and uniform. If a single sulphate bath is employed with these slow speeds, a greater lustre is obtained, but owing to the fact that a conducting salt is usually necessary in the single sulphate solution, and the action of effective conducting salts upon all metal portions of the apparatus being extremely destructive, the single salt solution is by no means an economical electrolyte for mechanical plating and higher speeds, together with the double sulphate solution are eventually adopted, the driving mechanism being altered to suit conditions.

Wooden Frame Cylinders With Canvas Panels

Cylinders which consist of a wooden frame with canvas panels have been advocated; in fact, such cylinders are on the market. The idea appears commendable to many, but experience proves that canvas panels are not desirable. Canvas panels do not permit a constant change of solution within the cylinder. If sufficiently coarse-meshed to permit the free circulation of solution then the canvas becomes loose and is not strong enough to retain the load. If the solution is of proper metallic strength the canvas becomes heavily charged with crystals during the week-end stops unless rinsed in water after use on Saturday. Frequent renewals of canvas are required and the operator becomes careless because of extra work needed to keep the machine in working condition. Mahogany frames and celluloid panels make an excellent cylinder. Perforate the panels with holes as large as possible, the size of the smallest piece to be plated in the cylinder will determine the size of hole.

Alternating-Rotating Plating Machine

It is now possible to obtain an alternating-rotating plating machine, the driving mechanism of which is cleverly insulated from the electrical circuit. The reciprocal rotation of this plating cylinder is said to greatly increase the output of the machine, effecting more uniform and heavier deposits than the ordinary rotating cylinder. During operation of the old style rotating cylinder the contents are kept rolling at one side of the cylinder interior; in the reciprocal-rotating cylinder the load is shifted from one side to the other every eight revolutions of the cylinder. It is obvious that this action should cause a more uniform wear on the anodes than is the case during operation of the simple rotating cylinder. The driving mechanism of this new machine is necessarily more complicated than that of the old style, but as it is entirely removed from contact with the plating solution or electrical circuit, it should endure for a longer period than the average plating machine drive.

Plating machines, such as have hereinto been described, are best adapted to quantities of work ranging from six quarts to two bushels of small parts, or for treatment of a lesser quantity of large articles, such as pipe fittings, stove fixtures and cheap hardware, but if very small quantities of small articles are to be plated by rotating machine, the oblique cylinder is preferable, especially when brass goods are desired at short notice. The oblique cylinder is really the whole machine, with the exception of the pedestal and driving gear. A small anode is arranged within the cylinder, and during the operation the anode is maintained in a horizontal position just beneath the surface of the solution. The contents may be frequently examined without stopping the machine and the discharge is quickly facilitated.

A very efficient machine of this type for small "rush" orders may be cheaply constructed by using a common large-mouthed stoneware crock set loosely in a metal frame and held in an oblique position while rotating. Strips of copper or brass chain form the contacts, and are fastened permanently to the electrical circuit, though insulated from the frame which supports the stoneware crock. With the aid of two small gears a very neat and inexpensive apparatus can be easily constructed, which will produce excellent results and prevent small orders from interfering with the regular output of the plating department.

Mechanical Plating Machine Operation

In the operation of any mechanical plating machine which completely encloses the articles being plated, and in which the metal liberated from the anode must travel through a perforated cylinder to reach the cathode, it is essential to employ at least five volts at the machine, depending on the nature of the metal being deposited and the character of the electrolyte. Six quarts of iron or steel articles will require approximately one hundred amperes, and a run of not less than three hours, to deposit a sufficient amount of nickel to form a good protection for commercial purposes. Brass and copper may be deposited in less time, the actual duration of run depending greatly upon the speed at which the cylinder revolves and the finish required on the article being plated.

It will be well for the plater to remember that nickel solutions used with mechanical plating machines should not contain chlorides. If conducting salts

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PLACE AND DATES OF MEETING.

The Occident Hall, corner of Queen and Bathurst Streets. Fourth Thursday of each month, at 8 p.m.

are required, they should be in the form of sulphates and as mild as possible, magnesium sulphate being one of the best.

Brass and copper solutions should contain more metal per gallon than is permissable with cold solutions operated in still condition, and a higher voltage is allowable. Ten to twelve volts are often used for alkaline brass and copper solutious in mechanical plating machines.

Slow speeds produce white, heavy soft coatings with little or no lustre. Rapid rotation produces hard, thin coatings of considerable lustre, which have a tendency to chip or flake if the deposition is too prolonged. The references made here regarding speed are of particular significance when nickel solutions are operated. Small quantities of boric acid dissolved in water and added to the double sulphate nickel solution aids in preventing or removing the grenish slime which sometimes forms on the surface of the solution, and also increases the lustre of the metallic coating. Boric acid is especially valuable as an addition to mechanical plating machine solutions used principally for treating brass articles.

Questions and Answers

Question.—What is the best method for neutralizing free acid in nickel plating solutions?

Answer.—Use carbonate of nickel. The carbonic is taken up by the free acid and the bath is enriched in metal. Ammonia is not to be advised as a neutralizing chemical in nickel baths. Nickel from a bath made alkaline with ammonia will invariably be quite dark and liable to flake or peel. If a strong current is employed the deposit often curls up in the solution. Keep the nickel solution either neutral or slightly acid for adherent white nickel deposits.

* * *

Question.—In nickeling steel parts for wire sulky wheels we first copper the steel, then run in a double sulphate nickel solution for three hours, using 2 to 2½ volts, the solution stands 5½ by hydrometer test and is only slightly acid to litmus. The deposit is greyish white. We want a bright deposit but do not wish to interfere with the present quality of the plate.

For bright dipping brass castings we use 2 parts nitric acid and 1 part sulphuric acid and about a gill of hydrofluoric acid. This does not seem to act properly. Can you give us a correct formula for an acid dip?

Answer.—We are of the opinion that it would be a very bad policy for you to make any change in the running of your nickel solution for the purpose now employed. You are using the proper voltage, the right density of solution, and in doing so you put on a heavy deposit of nickel which is tough and tenacious. If you were to brighten the deposit you would make a brittle hard coating, which would chip and flake and be very unsatisfactory.

Referring to your acid dip.—You are using entirely wrong proportions and the dip would naturally be unfit for the purpose intended for. Prepare a dip of the same quantity by using 1 part nitric acid, and 3 parts sulphuric acid, for ordinary or medium bright brass. Should your brass be of a heavy texture, we would advise making the dip of one-half nitric acid and one-half sulphuric acid. Do not use hydrofluoric acid in a brass dip at any time.

* * *

Question.—I have a quantity of polished iron pipe which has a lead flange attached to each piece. During the process of cleaning these pipe for plating, the entire surface of pipe became coated with lead; polishing does not entirely remove the lead and I have no success plating them. How can I clean the pipe for plating?

Answer.—Immerse the lead coated pipe in a 50% solution of muriatic acid. Allow the pipe to remain in the acid until the lead is dissolved. Remove the pipe, rinse in cold water, then dry and run over a grease wheel. Clean in a solution of mineral cleaner of very mild alkali. Caustics will attack the lead very quickly, and if employed, it would be wise to clean each pipe separately with a brush. If the pipe is copper plated before nickeling, it will be easy to detect imperfections in the cleaning process before proceeding far enough to require much labor to correct the touble.

* * *

Question.—I have a silver tea service which consists of six pieces, the material is Britannia metal. The entire set was seriously damaged recently by being thrown from an eight story window during a fire, some of the pieces were blackened by the flames. Is it possible to reconstruct these pieces so they will be useful, I should like to keep them as they are heirlooms.

Answer.—Send the various parts to a first class silver smith and instruct him to rebuild the set, adhering to the original design as far as possible. He will copy the relief and cast necessary portions, then restore the bruised and indented places to their former shape and resilver them. You will be surprised at the results. Such propositions confront the expert silversmith daily.

* * *

Question.—We have a consignment of electrical fixtures which are required in "Japanese Bronze". As we are not familiar with the finish, will you kindly inform us of the method by which it is produced.

Answer.—Japanese bronze is a very simple and cheap finish for a great variety of brass goods. To obtain very satisfactory results proceed as directed herein.

Clean the articles as is usual for plating, run through the cyanide copper to obtain a flash sufficient to allow immersion in acid copper bat for about 20 or 30 minutes. Rinse, and immerse in a cold solution consisting of water 1 gallon, liver of sulphur substitute ½ oz. As soon as first oxidation takes place, remove from the solution, rinse in cold water and transfer the articles to a bath composed of 10 quarts of water and one quart of hydrochloric acid. The color obtained will become fixed and the articles are next scratch-brushed dry to produce the desired reddish tone. Should the color be too light, the process may be repeated from the oxidizing immersion. If the discoloring of the surface is not allowed to proceed too far, the finish is very quickly and easily obtained. A weak oxidizing solution will assist greatly in obtaining the finish at first trial. Strong sulphurette solution requires very rapid manipulation in order to avoid too deep tones. Lacquer with good grade transparent lacquer.

* * *

Question.—During the operation of our electro-galvanizing baths a dark coating becomes so dense that it separates from the anodes and falls to the bottom of the tank forming a thickly accumulated mass. What is the nature of this substance and why does it accumulate on the anode? Can we prevent it?

Answer.—You are evidently using very inferior zinc as anode metal. The substance mentioned indicates a rather high percentage of impurities in the zinc, and no doubt it is lead. During the operation of the bath the zinc in the anode is dissolved while the lead is left upon the surface in the form of black metallic lead. As the lead increases in thickness upon the surface, it falls to the bottom of the tank, because of its weight. If the slime is left upon the surface of the anode the current is impeded and therefore it should be removed by brushing at frequent intervals. As all commercial zinc contains at least small quantities of lead, the only means of avoiding this difficulty is to use the best refined zinc obtainable; even then you will probably have to resort to cleaning the anodes occasionally. If you can cast your own zinc anodes you may be able to get better satisfaction than from the best grade supplied to the trade.

* * *

Question.—I have repeatedly tried to silver plate an old wooden sabre handle which I cherish as a relic of early struggles in England. The silver will not adhere uniformly. Can you advise me how to prepare the handle and coat it evenly with silver.

Answer.—Clean the handle and apply one or two coats of very thin shellac, then after a thorough drying apply another coat. When this is tacky, blow fine bronze jeweler over it and brush smooth with a soft brush. Immerse in a bath consisting of copper sulphate 1¾ lbs., sulphuric acid 4 fluid oz., and water 1 gallon. Use a tension of not more than 1½ volts and deposit a shell upon the handle sufficiently thick to permit cutting down slightly with tripoli. When the copper shell is finished, smooth off and proceed to silver. In metallizing non-conducting surfaces a shell of copper is first obtained before giving the surface the finishing deposit.

* * *

Lacquer for Brass Plates and Pails.—I have a lot of brass plates and rails outside the building in which I am engineer, and find it impossible to keep them clean during the winter months. I want to know of a suitable lacquer also information as to its application, so that the weather effects be minimised or eliminated.—C.H.

There is no lacquer, varnish or other transparent coating which may be applied to the brass plates and rails while in their present position which would effect more than a temporary protection, as the application would necessarily have to be made by simple air drying method. If the plates and rails could be removed to a lacquering chamber and receive two or three applications of first grade celluloid lacquer or copal varnish baked hard in an oven, the results would be more satisfactory. The elements will eventually tarnish the brass in either case, and you will find the expense and trouble required to protect the brass does not warrant giving preference to the protective method rather than the usual procedure, such as cleaning at regular intervals with a fast cutting metal polish and subsequent application of a small amount of 3 in 1 oil. This oil acts as a protective and permits the brass to be quickly and easily polished the brass will remain bright for a longer period and does not become spotted as would be the case if lacquered. We advise the judicious use of 3 in 1 oil rather than the application of any lacquer of varnish.

INCREASE IN ONTARIO METALS OUTPUT

RETURNS of production for the first six months of 1916, made to the Ontario Bureau of Mines by the metalliferous mines and works of the province, are summarized in the accompanying table, which also gives comparative quantities and values for the corresponding period of 1915.

The production for the six months ending June 30, 1916, shows a material increase in value of all metals over that for the first six months of 1915, with the single exception of iron ore.

Gold

If the present rate of production is maintained, Ontario should reach the $10,000,000 mark for 1916, as compared with $8,500,000 for 1915. Of the total yield the Porcupine camp contributed all with the exception of $545,434, produced by the Croesus, in Munro township, the Rognon, near Dryden, the Tough-Oakes at Kirkland Lake, and the Canadian Exploration Company at Long Lake, near Sudbury. The Hollinger Consolidated and Dome Mines are the big producers of the Porcupine camp. Before the year is out Boston Creek will probably be contributed to Ontario's gold production. Development is proceeding on some of the more promising claims at Kowkash, situated east of Lake Nipigon, on the Transcontinental Railway.

Silver

Since the beginning of 1916 the price of silver has advanced considerably, the average being 62½c per ounce, low 56¼ and high 77¼c. As a result, production has been stimulated, and the value as compared with 1915 figures shows a considerable increase. Although the ounces sold were less than for the corresponding six months' period of 1915, the total production was greater, over 1,000,000 ounces remaining to be marketed. Undoubtedly the life of the Cobalt camp will be prolonged as a result of introducing flotation treatment for handling low-grade dumps and slimes. Nipissing still leads in output with a valuation of $1,766,561. The Mining Corporation of Canada (Cobalt Lake and Townsite City) is the next large producer followed by Kerr Lake, Coniagas, McKinley-Darragh-Savage, Seneca-Superior, etc., in the order named.

Cobalt

With the outbreak of war the European market for Cobalt oxide was suddenly cut off. However, new markets and new uses for metallic cobalt have improved the situation. High-grade steels are now produced from cobalt alloys. Metallic cobalt production is greatly in excess of last year.

Nickel

Metallic nickel from cobalt ores is produced at the refining works of the Deloro Smelting and Reduction Company, Limited, formerly known as the Deloro Mining and Reduction Company. The output shows an increase over the 1915 production, which was not marketed during the six months' period.

Copper

Apart from the nickel-copper deposits of Sudbury, there has been a revival of copper ore mining in Ontario, partly due to the high price of the metal. The old Tip-Top mine and other properties near Mine Centre, in the district of Rainy River, are now producing. The Rand Syndicate is operating near Timagami. The Sable River Copper Company, at Massey has erected a mill and is using the flotation process for the treatment of copper ore.

Nickel-Copper Matte

The smelters of the Canadian Copper Company, at Copper Cliff, and the Mond Nickel Company, at Coniston, are turning out nickel-copper matte at an unprecedented rate. The production, as compared with the first six months of 1915, shows an increase of nearly 40 per cent. The valuation of the metallic contents of the matte has been made on a basis of 10 cents per pound for copper and 25 cents for nickel. The figures given for metallic copper and nickel separately show that the prices were over 18 and 42 cents per pound, respectively.

In addition to the above-mentioned companies, the Alexo mine, near Porquis Junction, produces a small amount of nickel-copper ore, which is treated at the Coniston smelter.

Molybdenite

This mineral occurs widely in Ontario, but is mined chiefly in Renfrew county. It is wanted at the present time for use in the manufacture of high-speed tool steel, and for this purpose molybdenum will probably replace tungsten to some extent. The demand for molybdenum steel, to be used in munition factories, comes largely from the allied nations, Britain, France, and Russia. Molybdenite concentrates, containing 85 per cent. for more of Mo. S. 2, are worth about one dollar per pound. Ferro-molybdenum is now (September) being manufactured for the first time in Canada by the Orillia Molybdenum Company, at Orillia, and the Tivani Electric Steel Company at Belleville.

Iron Ore and Pig Iron

The only shipments of iron ore were from the Magpie mine, operated by the Algoma Steel Corporation of Sault Ste. Marie. Although iron ore production shows a decrease as compared with the same period in 1915, that of pig iron shows a material increase, both in tonnage and value.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

	Montreal	Toronto
Grey Forge, Pittsburg	$20 95	
Lake Superiar, charcoal, Chicago	20 25	
Standard low phos., Philadelphia	41 00	
Bessemer, Pittsburgh	24 95	
Bosic, Valley, furnace	20 00	
Middlesboro No. 3	$24 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	26 00	.....
Victoria	30 25	29 00
Hamilton	30 25	29 00

FINISHED IRON AND STEEL

Per Pound to Large Buyers.	Cents
Iron bars, base	3.25
Steel bars, base	3.50
Steel bars, 2 in. and larger, base	5.25
Small shapes, base	3.85

METALS.

Aluminum	$ .68
Antimony	.18
Cobalt 97% pure	1.50
Copper lake	31 00
Copper, electrolytic	31 00
Copper, casting	30 00
Lead	.9
Mercury	100.00
Nickel	50.00
Silver, per oz.	.75
Tin	.46
Zinc	.14

Prices Per Lb.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal	Toronto
Copper, light	$19 00	$19 50
Copper, crucible	23 00	23 00
Copper, heavy	23 00	23 00
Copper, wire	23 00	23 00
No. 1 machine compos'n	18 50	18 50
No. 1 compos'n turnings	15 00	15 00
No. 1 wrought iron	11 00	11 00
Heavy melting steel	10 00	12 00
No. 1 machin'y cast iron	13 50	13 50
New brass clippings	15 00	15 00
New brass turnings	15 00	15 00
Heavy lead	6 50	7 50
Tea lead	5 00	5 25
Scrap zinc	7 50	7 75
Aluminum	35 00	30 00

COKE AND COAL.

Solvay foundry coke, on application	
Connellsville foundry coke	$7.02
Yough steam lump coal	....
Pittsburgh steam lump coal	4.30
Best slack	3.87

Net ton f.o.b. Toronto.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$50 00
Open-hearth billets, Pittsburgh	50 00
Forging billets, Pittsburgh	73 00
Wire rods, Pittsburgh	55 00

PROOF COIL CHAIN.

1/4 inch	$9.45
5-16 inch	9.10
3/8 inch	8.35
7-16	7.15
1/2 inch	6.95
9-16 inch	6.95
5/8 inch	6.80
3/4 inch	6.70
7/8 inch	6.55
1 inch	6.40

Above quotations are per 100 lbs.

MISCELLANEOUS.

Solder, guaranteed	0.29½
Babbitt metals	.11 to .60
Putty, 100-lb. drums	3.00
Red dry lead, 100-lb. kegs, p.cwt.	13.87
Glue, French medal, per lb.	0.20
Motor gasoline, single bbls.. gal.	0.31
Benzine, single bbls, per gal.	0.30½
Pure turpentine, single bbls.	0.71
Linseed oil, boiled, single bbls.	1.03
Linseed oil, boiled, single bbls.	0.87
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	8.00
Lead wool, per lb.	0.12
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½
Lard oil, per gal.	1.35

SHEETS.

	Montreal	Toronto
Sheets, black No. 10	4 15	4 80
Sheets, black No. 28	5 25	4 80
Canada plates, dull, 52 sheets	4 75	4 75
Canada plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized)	6 75	6 75
Queen's Head, 28, B.W.G.	7 75	7 75
Fleur-de-Lis, 28, B.W.G.	7 35	7 35
Gorbal's best, No. 28	7 50	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	6 25	6 15
Premier, 10¾ oz.	6 50	6 40

ELECTRIC WELD COIL CHAIN B.B.

3-16 in.	$11.70
1/4 in.	8.40
5-16 in.	7.40
3/8 in.	6.35
7-16.	6.35
1/2 in.	6.35
5/8 in.	6.35
3/4 in.	6.35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60; headers, 60; flanged unions, 55; malleable bushings, 60; nipples 72½; malleable, lipped union, 60.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.10
Causitc soda	.07
Copper carbonate, anhy.	.35
Copper, sulphate	.77
Cobalt, sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver nitrate (per oz.)	.55
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130 per cent.	.41
Sodium cyanide, 98-100 per cent.	.32
Sodium hydrate	.05
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.48 to .52
Cobalt	1.75 to 2.00
Copper	.39 to .41
Tin	.49 to .56
Silver, per oz.	.78 to .80
Zinc	.18 to .20

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt, lb.	2.25
Polishing wheels, bullneck.	1.35
Emery composition	.12 to .14
Pumice, ground	.04
Emery composition	.08 to .09
Tripoli composition	.04 to .06
Crocus composition	.07 to .08
Rouge powder	.30 to .35
Rouge, silver	.35 to .50

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Toronto, Ont., Nov. 1.—Trade continues active and the country is remarkably prosperous. The full benefit however is not being obtained owing to somewhat restricted production due to scarcity of raw materials and shortage of labour. Prices are also very high, but this does not seem to be affecting the volume of busuiness to any marked degree. The demand for goods generally is not being fully met owing to the difficulty that is being experienced in obtaining deliveries from manufacturers. Export trade is steadily growing and is extending in scope as more industries develop their sphere of action. The Dominion Government returns up to the end of September prove conclusively the remarkable expansion that has taken place in our exports during the past twelve months. For the month of September alone, manufactures headed the list, being valued at thirty-eight million dollars as against nine million for the corresponding month of 1915. The statement recently issued covering the period mentioned is extremely gratifying.

Steel.

The situation in the trade is getting tighter all the time and the scarcity of steel is steadily getting more acute. With a large proportion of the production of the mills reserved for munitions, a comparatively small tonnage is available for other purposes. The mills have been some time operating at capacity, and, notwithstanding extensive additions to their plants, deliveries are getting more backward than ever. The demand for steel is so insistent and the need so urgent that the steel companies are doing their best to cope with the situation, but cannot, and the situation is thus getting steadily worse. Indications point to a continuance of these conditions for an indefinite period as the mills are now sold up for practically twelve months. Prices are still withdrawn and orders are only taken on the understanding that delivery will be made at mill convenience. Prices on steel bars are entirely nominal and an advance may be looked for any time. Owing to the scarcity of steel some consumers are substituting iron bars for steel in order to secure deliveries. For domestic business, practically the only orders being taken by the mills are with contract customers of long standing and with no delivery dates specified. Small angles, channels and tees have again advanced, being now quoted at \$3.85 per 100 lbs. Plates have also advanced and are now quoted at \$4.75 for ¼ in. and larger, \$5.00 for tank plates 3-16 in. and smaller. These prices are however for delivery at mill convenience which would not be inside twelve months. For delivery in from two to four months' prices range around 5c at mill. A considerable tonnage of plates is being used by shipbuilders and premiums are being paid for comparatively quick delivery. Tubes are very firm, and higher prices are looked for, while an advance in wrought pipe is expected in the near future due to the recent advance in skelp, this material being also very scarce. Higher prices on bolts, rivets and pressed spikes are also anticipated.

Black sheets No. 28 gauge have again advanced and are now quoted at \$4.25 per 100 pounds, while an advance in "blue annealed" is probable. Sheet bars are now quoted at \$50 Pittsburgh, and are getting scarce owing to the heavy demand. It is possible that a famine in steel sheets will exist during the first six months of next year so great is the scarcity of raw material. Higher prices on galvanized sheets are assured on account of the steady advance in black sheets and increase in cost of production.

An advance of nearly 100 per cent. in the price of coke has created a serious situation in the Pittsburgh district. The market continues very firm and prices of all steel products have an upward tendency. The export demand for steel is at a rate far in excess of the unsold capacity of the mills to accept and a lively competition is expected between export and domestic buyers which will result in higher prices. The U.S. Steel Corporation has announced advances in the leading tonnage materials for forward delivery, or to 2.70c for bars, 2.85c for shapes and 3.75c for plates. Higher prices on semi-finished steel have been announced representing an advance of \$5 per ton. Bessemer and open-hearth billets are now quoted at \$50, open-hearth sheet-bars \$50, and forging billets \$73.00 per ton, Pittsburgh. The scarcity of steel in the States is acute and higher prices are inevitable, notwithstanding the present record levels.

Pig Iron

Prices of pig iron after several months of quietness are now advancing rapidly. This is due largely to the enormous demand for steel, but the sharp advance in coke and possible higher prices on iron ore next January are also affecting the situation. The activity in the U.S. pig iron market is also affecting the trade locally and the market is very strong. Domestic pig irons have advanced \$2.50, Hamilton and Victoria being now quoted at \$29.00 per ton. Practically all brands of U.S. pig iron have advanced, the following prices now being quoted. Grey forge Pittsburgh, \$20.95, and Bessemer, Pittsburgh \$24.95.

Scrap

The market is very firm all along the line and advances have to be noted in some grades of scrap copper, affecting crucible, heavy, copper wire, and machine composition. Heavy melting steel continues in good demand with a shortage of supplies. Steel turnings are in good supply, but there is very little market for this material.

Machine Tools

The machine tool market has been more active recently, following the placing of further contracts for shells and fuses. For making the latter, a number of orders have been received by a local machinery house for screw machines, high speed bench drills, and bench milling machines. Inquiries have also been received for machine tools for shrapnel plants. Tool room equipment is in good demand but deliveries on this class of tools are slow and restricting business. There is still a steady demand for heavy duty lathes. in many cases for single tools. Prices on machine tools generally are still very high and there is no sign of a decline. Shapers, grinders and milling machines will probably advance. Canadian machine tool builders are still very busy. New types of tools for shell plants are continually being placed on the market with satisfactory results.

Supplies

The situation as regards machine shop supplies continues satisfactory, good business generally being reported. Prices are very firm and advances in many lines may be expected any time although there are no changes of particular importance to note this month. With raw materials, particularly steel, advancing at the present rate, many lines of supplies will naturally be affected such as taps, dies, cutters, files, etc.

Metals

The metal markets at this writing are unusually steady with quotations generally well maintained. The situation locally continues favorable with a satisfactory volume of business. Copper although unchanged is still strong, largely due to an enquiry from Russia, France, and Italy for 100,000,000 pounds of metal for delivery during the next

six months. Spelter is in fair demand, but tin and lead are dull and unchanged. Antimony is also dull, but aluminum is fairly active. The Presidental Election in the States is tending to keep the market quiet there.

Copper.—The market continues strong but quiet as domestic consumers appear to be covered for the rest of the year and producers are practically sold up until February. It is reported from New York, that Russia, France, and Italy are enquiring for 100,000,000 pounds of copper, but, as delivery cannot be made before February, the business may not be closed. Domestic buying is good and very little copper available for delivery over the next few months is unsold. Local prices are firm and unchanged, lake and electrolytic being quoted at 31c and casting at 30c per pound.

Tin.—The London market is easier but New York is unchanged. The New York market will probably become firmer as some difficulty is now being experienced in getting permits to ship tin from London owing to the heavy stocks in the U.S. The local situation is unchanged and quotations are firm at 46c per pound.

Spelter.—Producers appear to be looking for higher prices as they are not over anxious to do business. There is a fair demand for spelter principally from galvanizers, and export business continues heavy. Local price is firm at 14c per pound.

Lead.—There is no essential change in the situation, the market being dull and business quiet. The leading interest is still quoting 7c New York. Local quotation 9c per pound.

Antimony. — Quotations are nominal and the market quiet. Antimony is quoted at 18c per pound locally.

Aluminum. — Demand has shown slight improvement and the market is steady with quotations unchanged at 68c per pound.

Foundry Supplies and Chemicals

Prices on all lines of foundry supplies and chemicals are very firm, and the upward trend is still very much in evidence, notwithstanding the high levels that have already been reached. With regard to supplies high cost, the reason may be found in the shortage of raw materials and scarcity of suitable labor, both conditions affecting the trade to an unusual degree. Materials coming from foreign countries are very scarce, and in some cases practically unobtainable, thus seriously affecting the situation, especially as regards polishing compositions and similar materials. Cotton, leather and wool are very high, prices of all lines of polishing wheels are, therefore, very firm. The steady increase in cost of iron, steel and other metals used in the manufacture of foundry and plating supplies has naturally resulted in high prices for these products. Chemicals continue high, and in some cases are still scarce. A local house reports having recently received a large consignment of sodium cyanide, thereby relieving materially the situation as regards that commodity. The market for chemicals is very firm, and prices have an upward tendency. Recent advances include caustic soda, copper sulphate, nickel ammonium sulphate, nickel sulphate, silver, nitrate and sodium cyanide. Copper anodes have advanced, and tin anodes are firmer.

NEW JOLT ROLL-OVER DRAW MOULDING MACHINE

(Continued from page 174.)

and also for locking the leveling device, have been entirely done away with. The operator need not move from the valve position to complete every operation.

When the flask has been leveled by the above means, the pattern is then drawn through oil by means of the fluid pressure plunger before mentioned. This device insures a steady even draft under all conditions, as the oil in the cylinder has to pass through a very small hole in order to let the plunger down. The machine is operated by means of only five valves in all, and these are placed in consecutive order so that passing from one operation to the next is easily indicated by their position.

Trade Gossip

St. Catharines, Ont.—The St. Catharines Brass Works will build a foundry here.

The Pacific Steel Co., of Vancouver, B.C., has been incorporated with a capital of $100,000.

Canadian Metals & Equipment Co., of Vancouver has been incorporated with a capital of $25,000.

Renfrew, Ont.—Imbleau & Sons propose building a foundry and machine shop, which will cost about $3,000.

Robert Hastwell, superintendent of the International Malleable Iron Works at Guelph, Ont., passed away recently following a short illness.

H. J. Roast, of the James Robertson Co., of Montreal, was recently elected one of the three vice-presidents of the American Institute of Metals at its annual convention.

Toronto, Ont.—A building permit has been issued to the Canada Metal Co. for the construction of a factory extension on Fraser Avenue, to cost $20,000. Work on the foundation has already started.

London, Ont.—Contracts have been let by the McClary Mfg. Co. for the erection of a galvanizing plant.

Will H. Baltzell has been appointed chief engineer of the Canadian Steel Coropration, Ltd., with offices at Ojibway, Ont. This is the Canadian branch of the United States Steel Corporation.

Hugh Girvan, 120 Cannon Street, London, E.C., has been appointed sole agent in Great Britain by the Dominion Sheet Metal Co., Hamilton, Ont., for the sale of their galvanized corrugated and flat sheets.

J. Edward Dailey, formerly with the Algoma Steel Co., Sault Ste. Marie, Ont. has been appointed general superintendent of the open-hearth steel plant of the Youngstown Iron & Steel Co., Youngstown, Ohio.

Lieut. C. A. Page, sales manager for the Canadian Hart Wheels, Ltd., Hamilton, Ont., has received an appointment with the 164th Battalion C.E.F., and expects to go overseas shortly.

Windsor, Ont.—Engineering plans for preliminary construction of the steel plant at Ojibway are nearing completion, although it is unlikely that actual building of mills will be started yet.

Port Moody, B.C.—The Port Moody Steel Works, Ltd., is now making merchant bars, and proposes to install larger mills after the two open-hearth furnaces now under construction are in operation.

Thos. L. Morrissey, for 44 years mechanical superintendent for Robert Mitchell & Co., Montreal, died on Oct. 22, aged 72, at his home, 596 St. Antoine Street. He retired a short time ago on account of ill-health.

Hamilton Brass Ltd., has taken over the business of the Hamilton Brass Mfg. Co., and will manufacture bib cocks, hose nozzles, couplings, etc. N. L. Bailey, formerly with the Tallman Brass & Metal Co., will be superintendent.

J. N. McQuaig of the sales staff of the A. C. Leslie Co., Montreal has resigned his position to enlist in the 245th Battalion, C.E.F. He has been appointed Quarter-Master Sergeant. **J. Grimble** for some time assistant to Mr. McQuaig will assume his position during his absence.

Amherstburg, Ont. — A Canadian branch of the Solvay Process Co. of Syracuse, N.Y., is about to be established at Amherstburg. The plant, it is said, will be erected near the Limestone quarries, Anderson Township, to supply all Canadian territory in soda ash. Reports from Syracuse state that an issue of $300,000 of stock has been made to provide funds for building and equipping the new plant.

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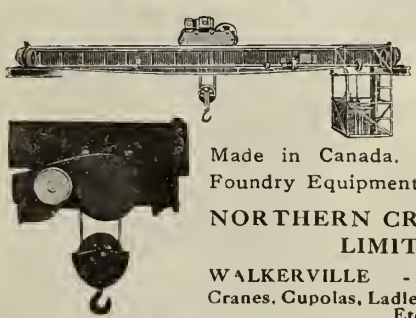

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J. E. Dailey, formerly with the Brier Hill Steel Co., and more recently with the Algoma Steel Co. at its Sault Ste. Marie works, has just been appointed superintendent of the Youngstown Iron & Steel Co.'s open-hearth plant, vice Archibald Smith, resigned. The change will become effective about October 1.

Port Colborne, Ont.—Contracts have been let to the Foundation Co., of New York and Montreal, for the International Nickel Co. plant to be located here on the east side of the lake front. The complete plans call for an expenditure of about $3,000,000 but the initial expenditure will be considerably less than that amount.

Hamilton, Ont.—The Hamilton Steel will be managing director of the new erect a plant, costing $200,000, for making steel wheels, which product was formerly furnished by Germany and the United States. This industry will give employment to about two hundred men, and will turn out about seventy-five tons of steel wheels per day. C. W. Sherman, of the Dominion Steel Foundry Co., Wheel Co. has purchased a site, and will concern.

R. F. Randolph, a steel expert who has been in the employ of the Bethlehem Steel Co. for the past seven years and was recently appointed general superintendent in charge of the steel plant by the Dominion Steel Corporation, has arrived in Sidney, N.S. and will immediately take up his new duties. Mr. Randolph is recognized as being one of the leading steel experts in America. Mr. Martin whom Mr. Randolph replaces, has resigned and it is understood, is leaving Canada.

Catalogues

Sand Blast.—A leaflet illustrating and describing a sand blast machine by the Gray Manufacturing and Machine Co., Toronto.

A Model Foundry, is the title of a catalogue, No. 124, issued by the Whiting Foundry Equipment Co., Harvey, Ill., giving in a general way the methods followed by the company during its long experience in designing, equipping, and conducting initial operation of foundry plants for making all kinds of castings. A large number of half-tones show the different types of foundry equipment installed, including some typical crane installations and interior views of steel casting and foundry plants. A partial list of foundry plants equipped by the company in the United States and Canada is included.

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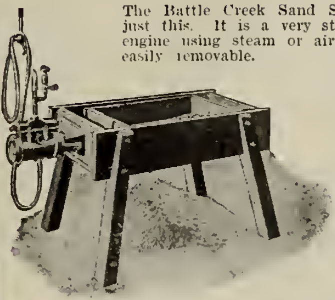

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Joseph Dixon Crucible Co., Jersey City, N.J.
Jonathan Bartley Crucible Co., Trenton, N.J.
Woodison, E. J., Co., Toronto, Ont.

RIDDLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

RESIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

ROUGE
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

SAND BLAST MACHINERY
Brown Specialty Machy. Co., Chicago, Ill.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Ltd., Hamilton, Ont.
New Haven Sand Blast Co., New Haven, Conn.
J. W. Paxson, Philadelphia, Pa.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

SAND BLAST SAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
E. J. Woodison Co., Toronto.

SAND CONVEYING MACHINERY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Standard Sand & Mach. Co., Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

SAND BLAST MACHINERY, BARRELS, ETC.
Can. Hanson & Van Winkle Co., Toronto, Ont.
New Haven Sand Blast Co., New Haven, Conn.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Standard Sand & Mach. Co., Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

SAND MOLDING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
J. W. Paxson, Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

SAND MIXING MACHINERY
Wadsworth Core Mach. & Equip. Co., Akron, Ohio

SAND SIFTERS
Battle Creek Sand Sifter Co., Battle Creek, Mich.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

SIEVES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SILICA WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
Woodison, E. J., Co., Toronto, Ont.

SILICA ROCK, GROUND AND PULVERIZED
Can. Hanson & Van Winkle Co., Toronto, Ont.
Wm. Penn Silica Works, Wm. Penn Po., Pa.
Woodison, E. J., Co., Toronto, Ont.

SKIMMERS, GRAPHITE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

SMALL ANGLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

SOAPSTONE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

SPELTER BOWLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, Pa.
Woodison, E. J., Co., Toronto, Ont.

SPIT PATTERN MACHINES
Mumford, E. H., Co., Elizabeth, N.J.

SPRUE CUTTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SQUEEZER MOLDING MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
E. H. Mumford Co., Elizabeth, N.J.
Mumford Molding Mach. Co., Chicago, Ill.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

SQUEEZERS, POWER AND HAND
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Mumford, E. H, Co., Elizabeth, N.J.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

STEEL GRIT
Can. Hanson & Van Winkle Co., Toronto, Ont.
Wm. McGregor, Scottish Steel Grit Works, Airdire, Scotland.
Woodison, E. J., Co., Toronto, Ont.

STEEL RAILS
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Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

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Dom. Iron & Steel Co., Sydney, N.S.
Northern Crane Works, Walkerville.
J. W. Paxson Co., Philadelphia, Pa.
Steel Co. of Canada, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

STIRRERS, GRAPHITE
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Joseph Dixon Crucible Co., Jersey City, N.J.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hart Wheels, Hamilton, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
E. J. Woodison Co., Toronto.
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Woodison, E. J., Co., Toronto, Ont.

TEEMING CRUCIBLES AND FUNNELS
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McCulloch-Dalzell Crucible Company, Pittsburg

TRIPOLI
Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

TRACK, OVERHEAD

TROLLEYS AND TROLLEY SYSTEMS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

TRUCKS, DRYER AND FACTORY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

TURNTABLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Northern Crane Works, Walkerville.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

VENT WAX
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

VIBRATORS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Mumford, E. H. Co., Elizabeth, N.J.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

WALL CHANNELS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

WHEELS, GRINDING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Hart Wheels, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

WHEELS, POLISHING, ABRASIVE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
United Compound Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

WIRE WHEELS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
W. W. Wells, Toronto.
Woodison, E. J., Co., Toronto, Ont.

WIRE, WIRE RODS AND NAILS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Steel Co. of Canada, Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

CANADIAN FOUNDRYMAN

AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields.

Vol. VII. TORONTO, NOVEMBER, 1916 No. 11

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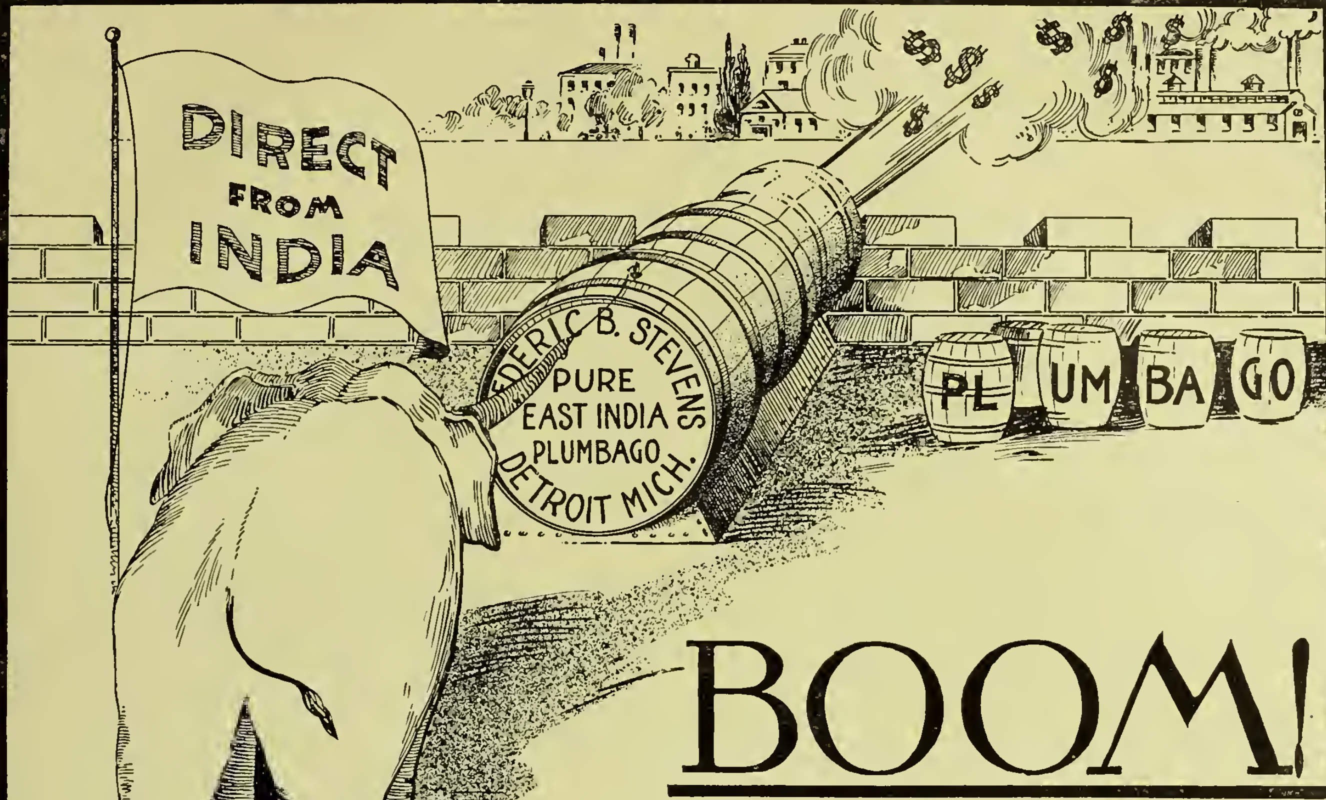
DIRECT FROM INDIA
FREDERIC B. STEVENS
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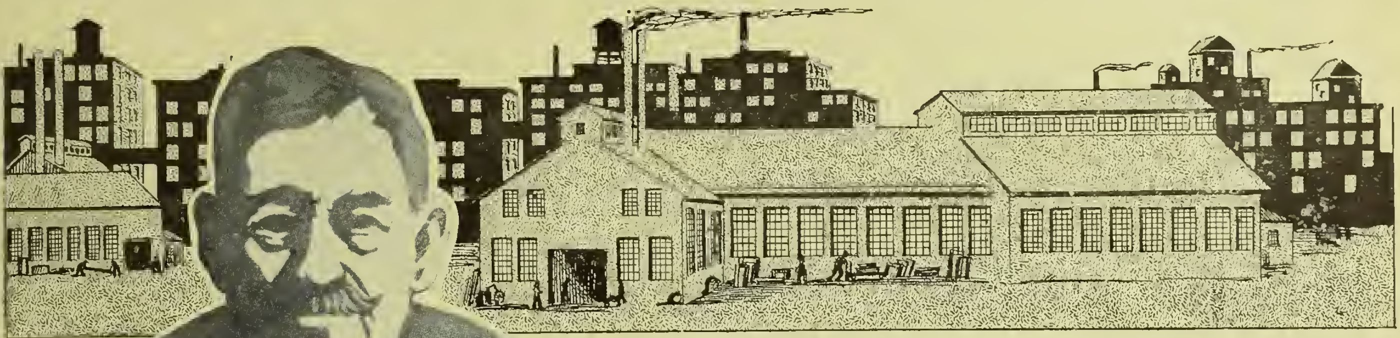
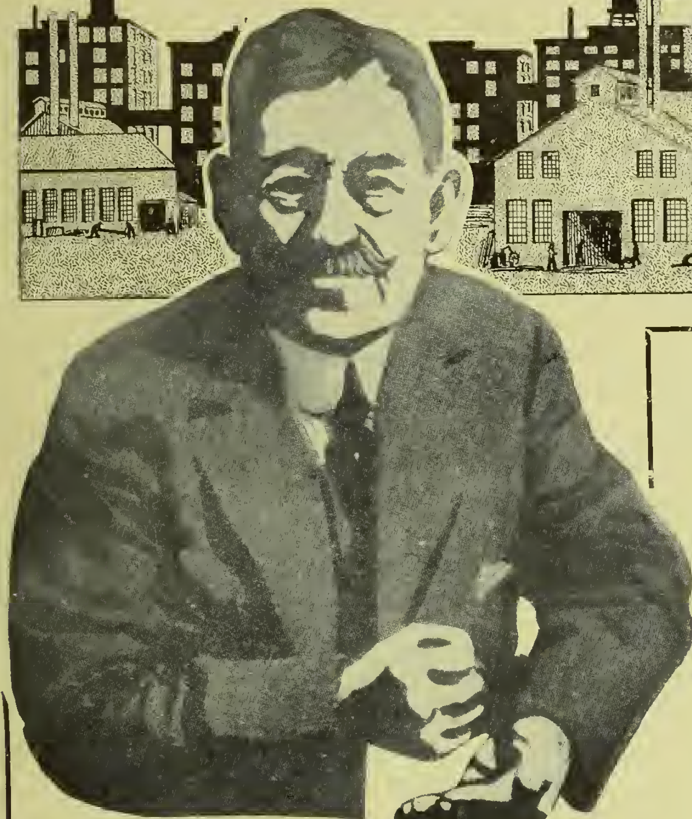
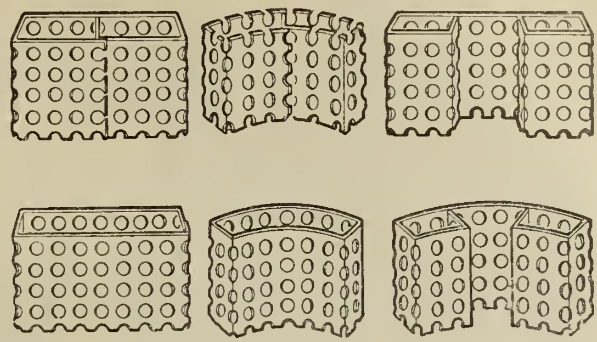
CANADIAN FOUNDRYMAN AND METAL INDUSTRY NEWS

A Monthly Newspaper Devoted to the Foundry, Patternmaking, Plating and Polishing Fields. Published by The MacLean Publishing Company Limited, Toronto, Montreal, Winnipeg, and London, England

VOL. VII. PUBLICATION OFFICE, TORONTO, DECEMBER, 1916 No. 12







Why Not Use Perforated Chaplets?

They are easily adapted to many kinds of work. They have strength, are light in weight, and can be made in almost any shape.

A heavy button or stem chaplet oftentimes will not amalgamate readily with the molten metal, with the result that leaks are caused.

Our perforated chaplets will not do that because they fuse readily, yet have enough strength to hold up the core during the process of amalgamation.

We manufacture them in our own factory from special perforated tin plate made up to our specifications.

We have capable and experienced men in our employ who are turning them out by the thousands all ready for your order.

When sending for Woodison Perfect Perforated Chaplets, be sure to specify (1) the thickness of metal desired, (2) the length of the chaplet, (3) the width, (4) if curved, the radius of core chaplet is to support.

Send for Price List and order some right away!

VENT YOUR CORES WITH
WOODISON "QUALITY" VENT WAX

Manufactured in our factory from waxes that make the finished product hard but pliable.

"Quality" Vent Wax is far better than Beeswax or Paraffin in that it will not soften the core but will act as a binder for it. Every foundryman realizes the value of such a vent.

It will not run together or stick at ordinary temperatures, and that a perfect vent is assured. "Blowing" of cores, due to poor venting, is thus entirely eliminated.

We make round vent wax from 1-32" to ½", and can furnish flat oval wax in four sizes, 1-16" x 3-16", 3-32" x ¼", ⅛" x ⅜", and 3-16" x ½".

Also furnished in 5-lb. cakes. Samples will be sent on request. May we have your order now?

The E. J. Woodison Company, Limited

Montreal **TORONTO. ONT.** **Windsor**

Foundry Facings, Fire Brick, Woodseed Liquid Core Compound, Polishers' and Platers' Supplies, Compounds and Equipment, Cupola-Blocks, Foundry Supplies and Equipment

The Publisher's Page

TORONTO December, 1916

Selling the Buyer

(No. 2 of a Series of Short Articles)

Advertising Reduces Selling Expense

SINCE selling consists in great part of educating the buyer and since the process can be accomplished through advertising, it is reasonable to consider advertising a potent factor in your sales organization. Advertising can be made to reduce the time required by a salesman to make a sale. It is intended to supplement the personal salesman, not supplant him. It can be made to perform the very necessary work of education which otherwise would be tedious and expensive. It insures more respectful attention for personal letters, for catalogues and for other literature, as well as for salesmen.

INFLUENCING THE SILENT VOTE

There is an important phase to the usefulness of the technical journal, one which should be carefully considered, i.e., its influence upon the apparently silent, though nevertheless important, vote.

In every plant there are men whose advice is sought by the men who have the actual buying power. Upon their recommendations a sale is frequently made or denied. The salesman may be told to call again a little later or to wait while the buyer consults "someone" else. This is the crucial time for the salesman, but the man who represents a well-advertised house and line, can afford to await results more confidently than the man whose line has not been heralded for months in advance.

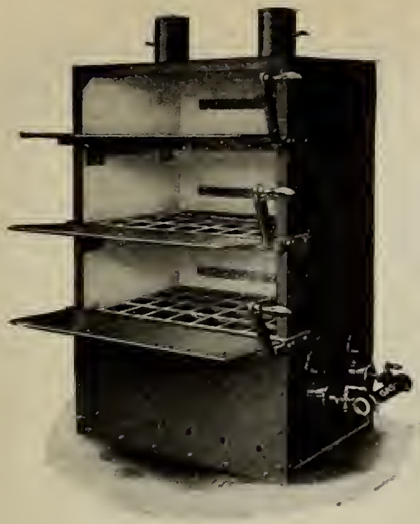
The value and importance of reaching and lining up the silent vote cannot be over-estimated. He is indeed a wise manufacturer who will endeavor to reach the greatest possible number of buyers, and buying influences.

When thousands of dollars have been expended in plant and equipment, when a reliable product is being manufactured and when an expensive sales force is being employed, then everything possible should be done to insure maximum results.

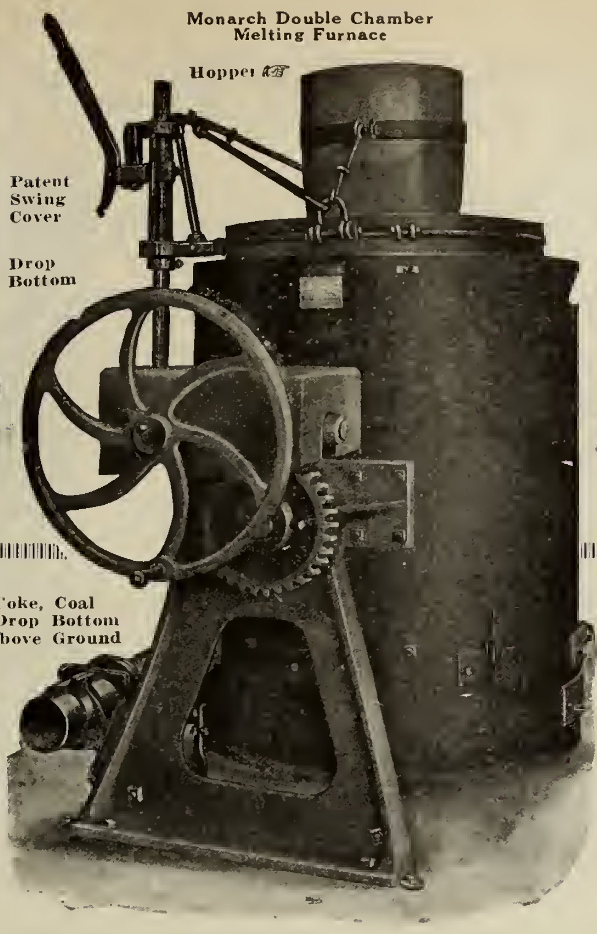
Canadian Foundryman and Metal Industry News

143-153 UNIVERSITY AVENUE - - - TORONTO, CANADA

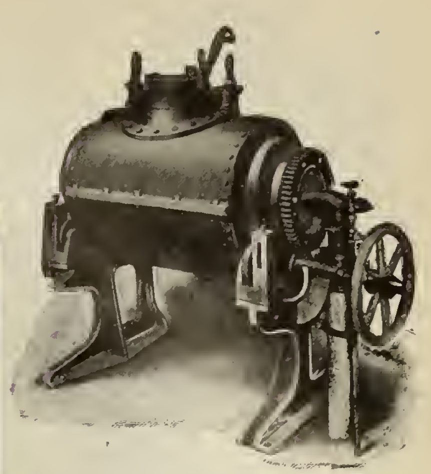
Also at Montreal, Winnipeg, New York, Chicago, Boston, Cleveland and London


Drop Front Core Oven

Monarch Double Chamber Melting Furnace



Simplex Furnace—No Crucibles


Single Chamber Furnace

For Melting:
Gold
Silver
Brass
Copper

For Melting:
Bronze
Gray Iron
Semi-Steel
Aluminum

Canadian Foundrymen Munition Manufacturers are Proving by Their Orders that

Monarch Will Solve Foundry Troubles

Is your trouble too high a production cost? Is it faulty action of your equipment? It is in such places as these that the Monarch family get in their best work. Three of the Monarch family are illustrated above, and it is only through years of experimenting and trial that we were able to bring this equipment up to its present stage of perfection.

The Monarch Double Chamber Melting Furnace (oil or gas) allows metal to be heated in one chamber to almost melting point and melted in the other chamber. This is done at no additional cost as one furnace does both actions. The flame is not directed against the metal; therefore, no oxidation.

The Monarch-Rockwell Single Chamber Furnace—"Simplex"—produces metal in greater quantities, in less time, at less cost in fuel and labor, with less preparation than by the crucible method. It also eliminates expensive crucibles. From 300 to 6,000 lbs. per heat (oil or gas).

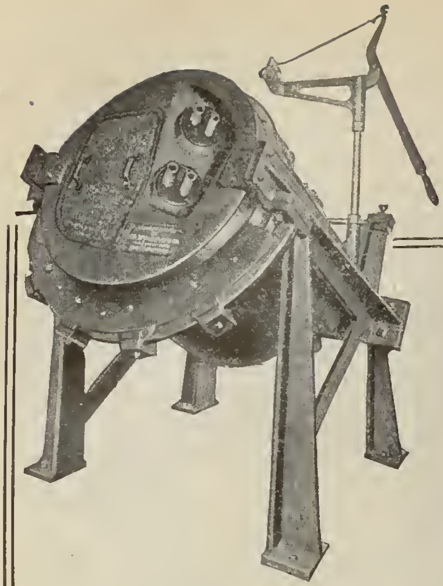
The Monarch Arundel Core Ovens, asbestos insulated, drop front. An ideal oven.

Others in the Family—Cupola Lighters, Portable Heaters, Mold Dryers, Blowers, Pumps, Motors, etc.

Write now for catalogue C.F. and full information regarding your troubles.

The Monarch Engineering & Mfg. Company

1206 American Building, Baltimore, Md., U.S.A. **Shops: Curtis Bay**



Superiority—Mill and Nozzle

OUR claim for superiority is based on actual results and a knowledge of the real value of this machine.

You take that nozzle, for instance. Don't you experience an increase in compressed air consumption steadily? That is because of an inferior nozzle. We have eliminated the air wastage by making the nozzle of the non-wearable kind.

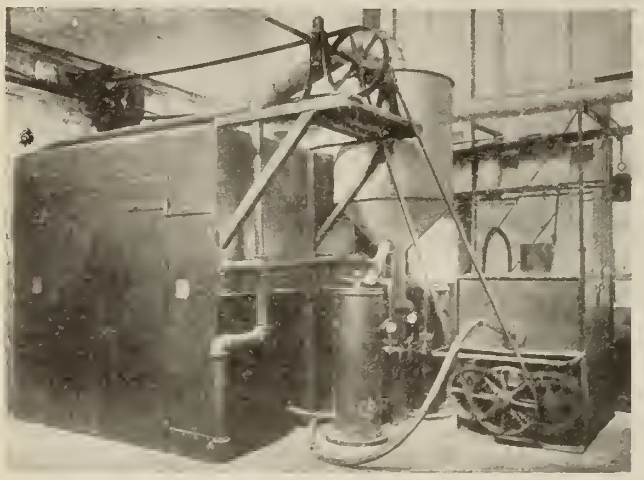
Then take the mill itself. It only requires 3 h.p. to completely operate the mill, it is thoroughly balanced and equipped with adjusting rollers to compensate for any wear.

Sly and Superiority are associated words. Write for our booklet. It tells you everything about it. Complete Sand Blast Rooms and Equipment a specialty.

We are properly prepared with a consulting engineer, and an efficient engineering department, to make plans and specifications, not only for complete foundry equipment, but also for the building itself from the foundation up. Our years of building construction experience assures you one of the most modern well equipped foundries in the country and a saving of considerable time and money.

The W. W. Sly Manufacturing Co.

CLEVELAND, OHIO



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FOR EVERY PURPOSE

Get our estimates before buying and save 33 1-3% of operation costs.

We make special machines for special work.

We handle sand blast hose, nozzles, gloves, helmets, respirators and goggles.

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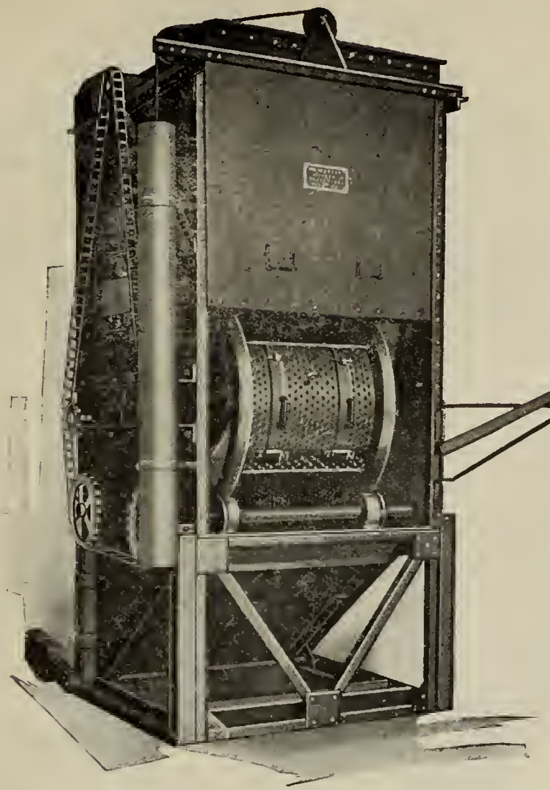
For lining and patching the Cupola or Open-Hearth Furnace, Lining Ladles, Clay Wash, etc.

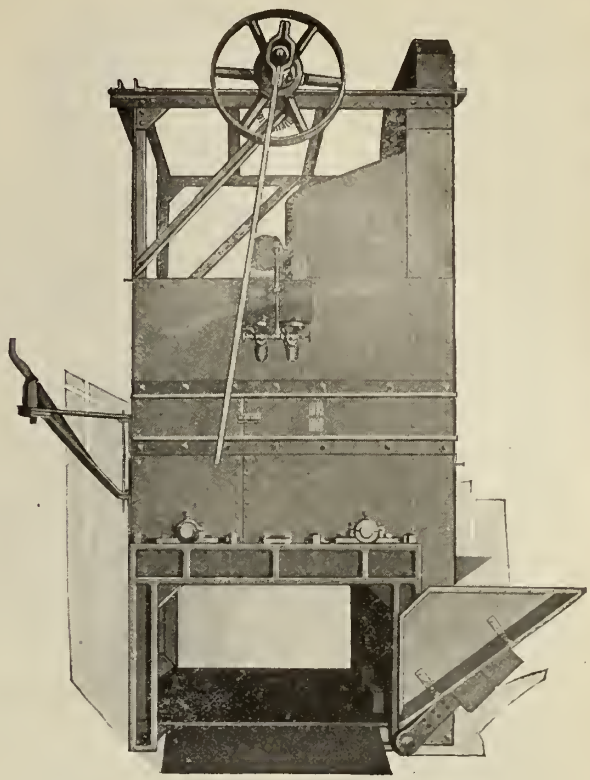
It will save your fire brick and the time of your men.

Whitehead Bros. Co.

Providence
New York
Buffalo



Front View With Sliding Door Raised

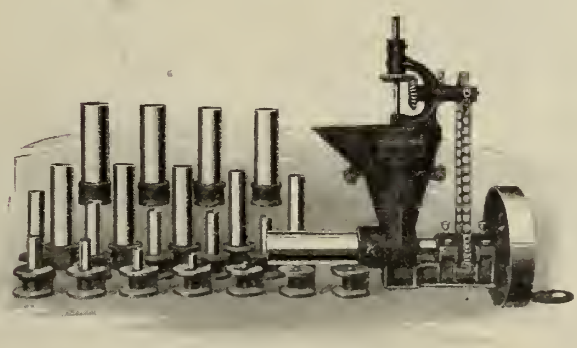


Side View. Truck is Run Underneath Barrel

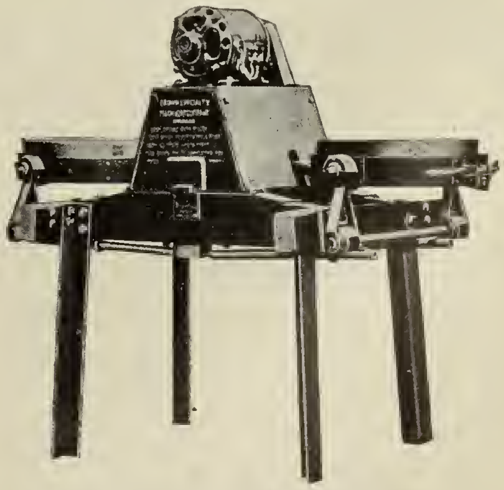
No. 3 Revolving Barrel Sandblast Machine

showing front and side views. Truck is run directly underneath the barrel and load is automatically dumped when the barrel revolves.

We will gladly refer you to malleable steel and iron manufacturers who are operating one or more of these barrels. Many of them have competing makes and can give comparative results. Learn from the operators what results they are getting.



Style A Hammer Core Machine
Other styles to make up to 7" round cores



Electric Duplex Shaker
The fastest, most substantial shaker built

Send for Catalogues

Brown Specialty Machinery Company

2424 West 22nd Street, Chicago

YOU CAN'T STOP THE INCREASING COST OF MATERIALS, BUT WE CAN SHOW YOU HOW TO MAKE BIG SAVINGS IN USING THEM.

Pig iron is up 25%—coke and scrap still more, but customers want castings at the same old prices. They will pay some advance perhaps, but not all. So look out—you may be getting a little more for your work, but its costing you a great deal more than it ever did before, to produce it. You are **wasting money,** although you may be taking down a profit.

What are you going to do about it? There is only one thing you can do — YOU MUST SAVE AND IMPROVE WHERE YOU HAVE NEVER BEEN ABLE TO SAVE AND IMPROVE BEFORE.

McLain's System
will show you the way

We make every ton of coke last longer —every carload of pig iron produces more castings.

INVESTIGATE. Send for the proof and send for it to-day. Others are reaping the advantages of doing business by our methods—why not you? No cost to know all about it. Just tear off coupon below now and send without delay.

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McLain's System

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Address.......................................

Firm..

Position......................................

11-16

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To do this simply give us an outline of your grinding operation and we will furnish the **best possible wheel** for the purpose.

Gresolite
for Grey and Chilled Iron.

Emery
for Steel Foundry and General Purpose.

Corundum and Rexite
for Precision and Fine Tool Grinding.

Write for booklet "Safety as Applied to Grinding Wheels."

Canadian Hart Wheels
LIMITED
Manufacturers Grinding Wheels and Machinery
456 Barton Street East
HAMILTON, CANADA

GLUTRIN.
REG. U. S. PAT. OFF

Glutrin is used in large quantities for all of the purposes for which molasses is used in foundry work, at a great saving on the present price of molasses.

Let us send you a barrel on approval so that you can prove this for yourself.

ROBESON PROCESS COMPANY
GRAND MERE, P.Q.

Selling Agents:
The Dominion Foundry Supply Co., Limited
Montreal, P.Q., and Toronto, Ontario.

Sheldons Ltd. Galt, Ont. Plant AND Product

GENERAL VIEW SHOWING TWO FACES OF PLANT EXTERIOR, GENERAL OFFICES ON CORNER.

Staff Article

The subjects of heating and ventilating are so closely associated as to be considered inseparable when putting into practice any scheme whereby either may have been deemed an installation necessity. The need for both is a large factor in our civilization, and in recent years it has come to be recognized as such to a greater extent. The steady growth of the plant described and illustrated indicates that Canada is fully alive to the benefits accruing from heating and ventilation progress. Kindred in large degree to both is the sphere of steam engineering, with respect to which it is only natural to find boiler and engine room specialties included in the otherwise scope of the Company's manufacturing enterprise.

ABOUT twenty years ago the McEachren Heating & Ventilating Co., established a plant at Galt, Ont., for making ventilating fans. Five years later the Sheldons, who were interested in and also active members of the concern, took over the entire control and changed the firm name to Sheldons Ltd. In the earlier years the business, being a new development in Canada, was of comparatively small proportions, but has grown steadily until now it is one of the most important in Galt, and perhaps the leading business of its kind in Canada. The officials of the company are: W. D. Sheldon, president; S. R. Sheldon, vice-president, and J. P. Stuart, sec.-treasurer. The directors include W. D. and S. R. Sheldon, A. K. Spotton, Alfred Taylor and J. M. Smith, the last named being superintendent of the plant. The company maintain a branch sales office in Toronto, and have agencies in Montreal, Winnipeg, Calgary, Edmonton and Vancouver.

At the time of the reorganization fifteen years ago, a grey iron foundry was built making the plant self-contained. During the succeeding years, the business developed both in size and variety of product, a larger foundry became necessary, so in 1913 a large and modern foundry was constructed on the north side of the plant. This additional facility made it possible for the company to still further extend the scope of their business. They are now able to make all the castings, iron or brass required in the manufacture of their various products, and also to make all kinds of iron castings for other concerns. In this connection it may be interesting to note that the company have for some time been making castings for firms in the United States. This in itself is a somewhat unusual but at the same time gratifying development.

UPPER MACHINE SHOP, SHOWING FAN CASE ASSEMBLY SECTION.

As already stated, the foundry lies along the north side of the property, while along the south side is the main building and offices. At the west side is a railroad track with a spur running into the yard, and on part of the east side is a storage. Other separate buildings on the property include pattern storage and a finished product storage, while pig iron and scrap piles are situated in the yard near the foundry. To return to the main building, on the ground floor at the east end is the employees entrance, tool room and machine shop, a section of the latter being utilized for assembling and testing heating coils. The offices are at the south east corner of the plant and are of course entirely separate from the machine shop. The middle section of the ground floor is a continuation of the machine shop, while at the west end is the fan erecting shop which includes a bar storage and store room for shop supplies. On the floor above at the west end is the fan housing erecting shop, the central section being the sheet iron department; at the east end is the pattern shop. Returning again to the ground floor, adjoining the machine shop on the north side are the power house, forge shop and heat treating plant.

Plant Products

The product of the plant may be summarized to consist of various types of ventilating fans, blowers and exhausters, heaters, and the Eclipse air washer; steam specialties, including exhaust heads, steam traps, relief valves, oil separators, etc., together with grey iron castings of all kinds. The mechanical draft section of the business is the most important, and covers a wide range. Of the various types of fan made, the Keith multivane fan stands first, the chief merit of this type of fan being its ability to handle large volumes of air at a uniform pressure at a high speed. The patent rights to manufacture in Canada have been purchased. A number of Keith fans are now being built to be installed on board war ships. For this service the requirements are very exacting. This feature constitutes an important development in the company's fan business. Other types of fan include steel plate fans, steel and cast iron blowers and exhausters, fans for forced and induced draught, planing mill exhausters for handling wood and other materials, disc and propeller fans, etc. In connection with this branch of the business, the company make vertical and horizontal fan engines, heater coils, and the Eclipse air washer.

In addition to the steam specialties already mentioned, other products made at this plant include elevator spouting, all kinds of sheet metal work fabricated from galvanized as well as black sheets. Under this category are included ducts for ventilating and shavings exhaust systems, and dust collectors. Blast gates, ball and socket joints, ore and mine cars, special dryers for leather, wool, hair, casein, etc. are also manufactured. In the new foundry all kinds of grey iron castings are made up to the limit of the 10 ton crane installed, although provision has been made for installing a 20 ton unit. Brass and aluminum castings are also made in the foundry, one section being set apart for these specialties.

INTERIOR VIEW OF MACHINE SHOP, SHOWING FAN ERECTING FLOOR.

UPPER MACHINE SHOP, SHOWING GALVANIZED IRON WORK SECTION.

Machine Tool Equipment

In the manufacture of mechanical draft equipment—fan wheels, housings engines, bearings, etc., a variety of machinery is required. The bulk of it is installed in the machine shop but a considerable number of tools are to be found on the floor above these consisting principally of punching machines, shears, breaks, etc. The following list includes machine shop tool equipment not mentioned specifically in connection with any particular product:—

Lathes by the R. McDougall Co., Galt, the Canada Machinery Corporation Galt; Stevens Co., Galt; McGregor, Gourlay Co., Galt; Walcott and Le Blond.

Radial drills by the American Bickford Tool Co., Cincinnati, Ohio, and the Dresses Machine Tool Co., Cincinnati.

Shapers and planing machine by the McGregor, Gourlay Co.; Stevens miller, Bertram horizontal boring machine; Landis grinder and pipe threading machines; Bertram shafting lathe, etc. A special machine is installed in the heater department for cutting heater pipes to length.

At the west end of this shop which is the fan erecting department are some large machines for plate work. These include a heavy double punch and shear for handling small structural shapes and heavy gauge plates; a Barnes drill; and Bawden lathe; 12 ft. plate shear; a set of plate rolls built on the plant for bending plates for fan housings, etc.; and two power hack saw machines. In this department the fans are assembled and some of the large size housings built up. The fan wheels are also made in this section of the plant. The shop supplies store room is located here. A well equipped tool room is situated at the east end of the shop. The tools in the machine shop are all motor driven, the number and capacities of the latter being as follows:—One 40 h.p.; two 20 h.p.; five 35 h.p.; one 30 h.p.; and two 5 h.p.; all a.c. machines. A band operated travelling crane runs the full length of the shop and an Otis freight elevator is also installed for transportation purposes between the main and first floors. For supplying power to a hydraulic press, a triplex 1½ in. x 4 in. belt driven pump, built by the Deane Steam Pump Co., Holyoke, Mass, is installed in the machine shop.

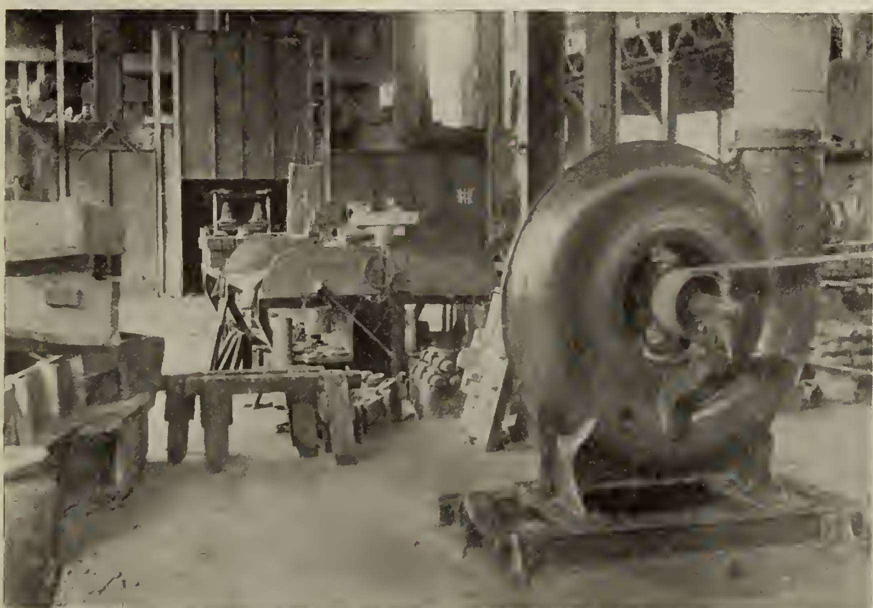
Fan Housing Department

On the first floor at the west end, the fan housings are marked off, sheared, drilled, punched and erected. A large variety of plate work is also done in this department. The equipment installed here includes a London Machine Tool Co. punch, also a shear by the same firm; a 10 ft. plate shear, a rotary shear, a 10 ft. brake and two drill presses by McGregor, Gourlay Co. exhaust heads, dust cleaners, and separators. The Eclipse air washer is also built in this department. The equipment is similar to that installed in the aforementioned department but for handling lighter gauge sheets. There are several

PART FOUNDRY EXTERIOR AND STORAGE YARD.

bench power punches for workng on small angles, bars, etc.; a set of light plate rolls; a Barnes drill press; one 10 ft. and two 4 ft. Dress & Crump brakes; one Quickwork rotary shear, and a Toledo electric welding machine.

At the east end of this floor is the pattern shop which is equipped with a shavings exhaust system. The principal machines installed include a Cowan jointer, a pony planer by the Preston Woodworking Machine Co.; a sand



CORE ROOM AND OVENS, SHOWING BLOWER IN FOREGROUND.

The middle section of this shop is devoted to the manufacture of all kinds of galvanized sheet work such as ducts, papering machine, column drills, wood turning lathe, tool grinder and hand saw.

Grey Iron Foundry

The grey iron foundry is of modern construction and unusually bright and well ventilated. The building is of steel frame and hollow tile construction with steel columns and roof trusses, the roof being of 2 in. matched boarding covered with Barrett roofing. Windows extend the full length and breadth of the building, also on the monitor roof above the centre bay. The foundry is 190 ft. long by 110 ft. wide, and is divided into three bays, the centre bay being 40 ft. wide, with a clearance height of 34 ft. The floor of the centre bay is used entirely for moulding, while in the South bay are installed a heating and ventilating plant, core room and ovens, cupola, brass foundry and cleaning department. On the North side are a number of moulding machines to which reference will be made later. Over the centre bay and operating throughout its full length is a 10 ton Northern electric traveling crane. The various movements of the crane are operated by three direct current motors of 15, 10, and 5 h.p. respectively. The crane runway and column were designed for a 20 ton crane which will be installed when necessity arises. A hand operated traveling crane is installed over the core room, and is equipped with a 1 ton Sprague electric hoist.

Heating and Ventilating Plant

A heating and air-washing system is installed in the foundry. The plant is located at the east end of the shop and consists of a Sheldon heater, Eclipse air washer and a No. 50 Keith fan driven by a 25 h.p. Sheldon, vertical high speed, enclosed steam engine. This outfit has a capacity of 50,000 cubic feet, and delivers air through concrete tunnels, one on each side of the main bay, extending the full length. Galvanized iron ducts are connected to the tunnels at each column, each duct being fitted with a damper. Above the heating plant is a wash room equipped with showers, lockers, lavatories, etc., for the convenience of the work men. In this section of the foundry is installed a No. 9 blower driven by a 25 h.p. vertical steam engine, the entire unit being built by the company. The blower supplies air at 12 oz. pressure to the cupola. Provision has been made for another blower when a second cupola becomes necessary.

A tunnel of reinforced concrete 4 ft. x 3 ft. by 150 ft. long has been constructed between the boiler room and foundry. Through this tunnel are carried steam, air and water pipes. The steam pipe is 6 ins. in diameter, and supplies steam to the fan and blower engines. The air pipe is 4 ins. in diameter and conveys air from the compressor in the power house to the various parts of the foundry where required. The water pipe is $2\frac{1}{2}$ ins. in diameter, and conveys water from a spring on the property for drinking and general purposes. The air and water pipes are carried overhead and down each column where suitable connections are made.

CLEARING ROOM AT WEST END OF IRON FOUNDRY, SHOWING TUMBLING MILLS, ETC.

Cupola Features

The cupola is 36 ins. inside diameter, has a capacity of 5 tons per hour and was built at the plant. The charging floor is 35 ft. x 48 ft., and materials are carried to it by means of an Otis-Fensom electric elevator 7 ft. x 4 ft. having a capacity of 2000 lbs. The elevator is operated by a $7\frac{1}{2}$ h.p. 550 volt C.G.E. motor. A Fairbanks scale is installed on the charging floor for weighing the materials for the cupola, while draft for the latter is supplied by the blower already described.,

Core Room and Ovens

The core room and ovens occupy a space 48 ft. x 35 ft. There are three ovens, 8 ft. x 14 ft., 6 ft. x 14 ft. and 4 ft. x 14 ft., and one drawer oven 4 ft. x 12 ft. The first three mentioned ovens are equipped with tracks, while all four are heated with individual coke stoves, fired from the back, the gases being carried away to a stack outside the foundry. The core room is equipped with the usual facilities for making cores and there is also installed a sand

CENTRE BAY OF IRON FOUNDRY LOOKING EAST.

mixer supplied by the Hamilton Facing Mill Co.

Cleaning Room

The cleaning room is located at the West end of the foundry, the principal equipment installed in same consisting of four tumbling mills, some grinders, and a sand sifter. The tumbling mills were supplied by the W.W. Sly Mfg. Co., Cleveland, and are as follows:—48 ins. x 48 ins. x 72 ins. long; 24 ins. x 44 ins. x 48 ins. long; 24 ins. diameter x 48 ins. long, and 18 ins. diameter x 48 ins. long respectively. Adjoining the cleaning room is the brass foundry where are installed three brass melting furnaces heated by natural gas.

EAST END OF IRON FOUNDRY, SHOWING CUPOLA AND CORE OVENS.

Moulding Equipment

The greater number of the moulding machines are arranged along the wall on the North side of the foundry. The principal equipment installed consists of three roll-over and one squeezer machines by the Tabor Mfg. Co., Philadelphia, Pa., one roll-over and squeezer by the Davenport Machine & Foundry Co., Davenport, Iowa; one roll-over and squeezer by the Arcade Mfg. Co., Freeport, Ill.; and two Grimes roll-over and jarring machines. In addition to the above mentioned are two pulley moulding machines by the E. A. Delano Co., Chicago, one for moulding pulleys 8 ins. to 16 ins. in diameter, and the other for pulleys from 17 ins. to 30 ins. in diameter. There is also one stripper by the Killen Mfg Co.

Lighting System

The artificial lighting of the foundry is most efficient. The centre bay has six 2000 c.p., 200 volt, arc lamps, and each of the side bays have eleven, 250 watt tungsten lamps of 110 volts. In addition to the above, a number of 110 volt incandescent lamps have been installed at various individual machines.

Power Plant

In the boiler room are installed two 130 h.p., 72 ins. by 18 ft. return tubular boilers, built by Goldie & McCulloch Co., Galt. These boilers supply steam for the various steam engine units around the plant and also for heating purposes. The power house adjoining, contains a 100 h.p. Wheelock Corliss engine, which drives direct one of the line shafts in the machine shop. This unit takes care of a considerable part of the power required in the machine shop, electric motors driving the remainder. A 75 h.p. Sheldon horizontal high speed engine direct-connected to a Canadian Westinghouse generator running at 300 r.p.m. is also installed. This unit is really an auxiliary as the company employ hydro power for the shop motors to the extent of approximately 350 h.p. There is also installed a C.G.E. motor generator 3-wire 110-220 volt set. For supplying compressed air to the foundry and other parts of the plant, there is installed in the power house a steam driven air compressor built by the Canadian Ingersoll Rand Co. This machine is of horizontal type and has a capacity of 400 cubic feet of free air at a pressure of 100 lbs. per square inch. A switchboard in connection with the auxiliary generator and motor-generator sets is installed in the plant power house.

NORTH BAY OF IRON FOUNDRY UTILIZED FOR SMALL CASTINGS.

CAST IRON SHELL

IT would seem as if the continued consumption of shells on a vast scale by the belligerent powers would ultimately demand a radical change in methods of manufacture, and the fact that efforts in this direction are being made

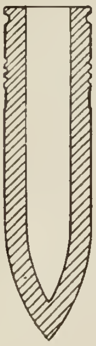


FIG. 1.

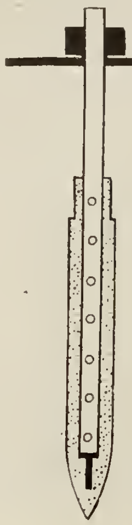


FIG. 2.

in some quarters is evidenced by frequent references to, and articles on the production of, cast iron shells. According to a writer in the *Practical Engineer*, cast iron is used in some of the smaller shells, made for penetrative work, and in order to give them additional penetrative power, the noses or points are rather deeply chilled—a feature which to some extent removes the job from the ordinary run of moulding work. In the first place, the flasks must be specially made for the work, special chills of considerable thickness must be used, and the cores must be of special construction, while, in the second place, the working must be exact to the 64th of an inch, or there will be too many rejections to make the job pay.

Roughly, the shells are as shown in Fig. 1 in section, it not being necessary to give exact dimensions, and unless the shells are turned inside as well as out the walls must be of equal thickness, or when fired the shell will gyrate too much, instead of spinning regularly on its flight from the gun. Usually, however, the shells are turned and bored, the hardened points being ground, as they are too hard to machine with an ordinary tool, this making it necessary that the shell be cast axially true to save over grinding on any side of the axis. An entirely soft shell could be more or less rectified in turning, but a well cast article is best.

Core Feature

The cores should be struck up on a hollow perforated barrel, the general construction of which is as shown in Fig. 2 in section, together with the fittings used to secure rigidity when in place in the mould. Being quite enclosed, the cores have to be rigidly held from the cope, and a proper print must be on the pattern to ensure that the exact position is held during pouring.

The chills must be thick to be effective, or they will not carry off heat fast enough, and in regard to this we consider that both flasks and chills should be specially made for the work on some standardized interchangeable plan, and where machine moulding is adopted, this can be carried so far that cost of production can be reduced to the lowest possible point. The possibilities of machine moulding are such as few persons can foresee, but, like almost everything connected with the iron foundry, very little attention is really paid to this class of work, and hand moulding is generally used owing to its causing little trouble to initiate.

Single or Group Castings

According to size the castings may be made singly or in groups, and the flask in section would appear very much as shown in Fig. 3, and if poured with clean iron the castings would come out well without segregation. The cores should be well blacked to prevent the inner part of the casting being gritty and bad to cut, plumbago being the best blacking to use for this kind of work. The metal must be poured hot and fluid, while the castings may be poured singly or in groups, this being dependent on the practice of each foundry.

The grooves should not be cast in, but machined, as this tends to more rapid production, the saving of time in moulding more than compensating for the time taken in cutting the grooves.

Of course it is possible to cast shells on the side, but, owing to the liability of the cores to float, there is no great certainty of the castings being true enough to pass inspection, and in any case they are unequal in weight as between the upper and lower sides in the mould, this being rather a serious matter in regard to their accuracy when fired, there being

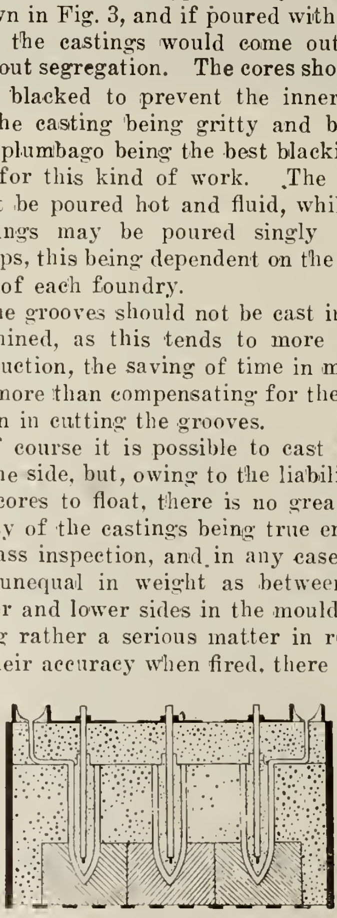


FIG. 3.

a tendency to gyrate when the weight is not balanced radially in the body of the shell, a point which tells somewhat against their increased use.

Unchilled Shells in Permanent Molds

Unchilled shells can very well be cast in permanent moulds, should such shells be needed, and in regard to this they could be produced ready for use if we except the bare skimming over the outer surface. With a sufficiency of moulds, and a trained body of men exclusively employed on this work, the output would be continuous and large, but of course every item of the process must be methodically arranged, the melting of the metal being continuous from start to finish. A double set of moulds would be advantageous, as it is desirable that the moulding surfaces should be kept

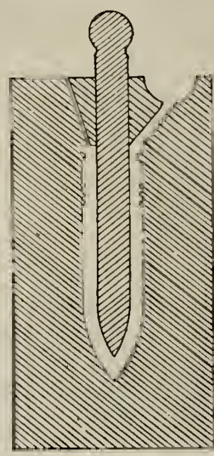


FIG. 4.

polished with plumbago, while an abundance of iron cores should be provided to secure replacements where one or more gets fast in the casting. The cores also should be kept well coated with plumbago, this acting as a lubricant, and also leaving a smooth surface on the interior of the shells, which is a large advantage. A section of a shell mould is shown in Fig. 4, with the core in position.

Casting Procedure

In casting, the mould would be closed and locked with the cores held tightly in position, then poured, and as soon as the metal is set, but before the contraction sets in, the core withdrawn with a spiral motion, and a few moments later the mould would be opened and the shell thrown out while still bright red-hot. It must always be remembered in this kind of work that contraction does not commence for an appreciable time after the metal solidifies, and in this stationary period there is ample time to remove metal cores, but, of course, the exact point of removal can only be found out in practice by the workers. In no case is the metal chilled when cast in permanent moulds, where the castings are thrown out hot, but the texture of the metal is different to that cast in sand moulds. For shell work permanent moulds offer possibilities, but, of course, chilled work is out of the question with these.

THE alloys in the aluminum zinc series containing more than 40 per cent. appear to be of no practical value. The alloys comparatively high in aluminum are very light and strong. Those containing up to 15 per cent. of zinc are soft enough to be rolled or drawn, while beyond this amount the alloys are hard and more suitable for castings, as they are easily worked.

Papers Presented at the 1916 Foundrymen's Convention--II.

The subject matter of the papers selected for reproduction here cover a wide field of foundry and allied industrial activity. The demonstration of research by the various authors and the progress and development arising therefrom are such as to claim the special attention of all whose desire is to keep in close touch with up-to-date metallurgical practice.

ALLOYS TO WITHSTAND INTERNAL AIR PRESSURE*

by S. D. Sleeth**

BRASS and bronzes have as a rule been recognized as metals adapted especially to withstand internal air pressure and this paper is, therefore, confined to the use of such alloys. Density and strength are the two qualities that go to make up a metal suitable for the retention of air or other gases under pressure and while strength may be secured through proper design, density is that elusive will-o-the-wisp which we chase for a while in one direction and think we have captured, only to find that it has eluded us and we must look for it elsewhere.

This leads to the conclusion that there can be no hard and fast rule whereby this desirable quality of density can always be obtained, probably because of the fact that there are so many variables that enter into the process and that they cannot always be under our control. To enumerate some of these variables, we have the design of the article to be cast, the design of the pattern with reference to its position in the flask, composition of the alloy, the treatment of the metal in the furnaces, and the temperature of the metal when being poured.

Design of Product

The design of the article to be cast has a very important bearing upon the ultimate success of the casting. The designer should bear in mind the desirability of having all cross sections of approximately equal thickness in order to prevent draws at heavy portions. If this is not possible, access to all large sections should be allowed for the application of chills. If the cored cavities are large the cores will, themselves, act as chills. Fillets should be as small as possible in order that great masses of metal shall not be concentrated at one point.

In laying out patterns, the patternmaker must be governed by several things. He must know what chills are to be used so that large chilled surfaces may be placed in a vertical position in order to prevent the metal kicking off these surfaces. He must know what parts are to be clean, such as valve seats, etc., and to what parts loose sand may be allowed to flow if any be found in the mould. Such unimportant parts should be placed high in the cope and the loose sand will flow to them on top of the metal. A clean mould, however, is absolutely essential to good tight castings. An exceptionally clean casting may be obtained by gating it from another casting which will itself take all the dirt.

Use of Chills

On the use of chills, I might state an almost universal law: Use chills on all enlarged sections in close proximity to smaller sections and connected thereto. If the sections are exceptionally large, use a sinking head on top of the large sections. Gate your moulds with a heavy upright pouring gate as near to the pattern as possible. The gate leading from the pouring gate to the pattern should be made large at the pouring gate and then reduced sharply into the pattern. If it is large where it joins the pattern, in all probability it will show a draw, in the casting at the gate. As a rule, it is better to gate in a light part of the casting than in a heavy portion. If a sinking head be used it should be placed on the heavy part.

As regards the alloy to be used, the following compositions have been tried and found satisfactory for the purpose intended:

Metals	No. 1 Alloy %	No. 2 Alloy %	No. 3 Alloy %
Copper	72.50	82.00	83.00
Tin	1.75	7.50	11.50
Zinc	19.25	4.75	4.00
Lead	6.50	5.75	1.50
Total	100.00	100.00	100.00

No. 1 alloy is used for ordinary castings, such as cocks, pistons, bushings, etc. This alloy is easily machined, but is not intended for use with very high pressures. Nos. 2 and 3 alloys are intended for use with high pressures and are harder to machine in proportion.

As might be expected, the treatment of the metal in the furnaces is of vital importance. If proper allowance for oxidation of zinc, etc., is not made, the alloy intended will not be produced. Furthermore, the metal must be taken from the furnace as soon as it reaches the proper heat, for if allowed to soak in the furnace, it will take up gases and the castings made from it may be porous. In certain packing ring mixtures, we consider this item so important that we use an alarm clock to insure the metal being poured off at exactly the proper moment.

The temperature at which the metal should be poured into the moulds is important and no doubt many castings are lost due to carelessness in this matter. If poured too cold it is almost impossible to obtain solid castings, especially at the gate. On the other hand, if poured too hot, the castings may be porous throughout. Great care must be taken to see that no aluminum gets into the mixture, as a very small percentage of it will cause the castings to leak. Antimony and iron will do the same, but not to so great an extent. Aluminum has a very peculiar action on the metal. The castings will look solid and will not show a draw, but when put under pressure will leak all over. It is one of the most dangerous metals around the brass foundry. Antimony does not act as quickly as aluminum, but has about the same effect if used long enough in the mixture. You may start out with a small percentage and it seems to do no harm, but if used until it is mixed with all returned materials, such as turnings, gates, etc., the castings will become porous.

In conclusion, let me say that solid castings of a density to withstand air pressure can be obtained only by the exercise of the greatest care from the design of the article to the pouring of the metal into the mould. Even then failures will sometimes happen, and final success can be obtained only through experiment and the adaptation of the various methods to the article under consideration.

*American Institute of Metals Paper.
**Superintendent of Foundries, Westinghouse Air Brake Co.

USE OF BORINGS IN CUPOLA OPERATIONS*

By James A. Murphy**

THE melting of iron borings and even steel chips in the cupola for the double purpose of reducing mixture costs and bettering quality is not by any means a new theme for foundrymen to discuss, for in one form or another they have been successfully melted for many years, some methods being more successful and more economical than others. About 30 years ago a patent was granted to Asa Whitney,

*American Foundrymen's Association paper.
**Hooven, Owens & Rentschler Co., Hamilton, Ohio.

of Philadelphia, covering a method of melting borings in wood boxes. This method is in use at the present day by some leading foundries and the results from a quality point of view seem to warrant its continuance. Many other methods are employed, some of which have been subjects of exploitation, and several patents of doubtful value have been granted. A number of the methods indicate an ignorance of the principles involved, while others are freakish, and not a few are pure fakes.

Melting Loose Chips Unsatisfactory

The melting of chips loose in the cupola has been tried both alone and in combination with regular mixtures with very indifferent results. When melted alone, the necessary heat will not penetrate the mass, the under and outer edges of the charge only being melted to varying depths depending on the quality of the fuel, the blast pressure and the thickness of the charge. When chips are charged promiscuously with the pig and scrap, the pyrotechnical display at the door and top of the cupola stack indicates the destruction of the elements of which they are composed. It is needless to say that both of these methods have long been abandoned. A few foundrymen, however, lay a thin bed of borings on the cupola bottom. The melting iron coming down on the borings melts and absorbs them, but this is done at the expense of heat that may be badly needed by the iron. I consider this method for either chips or other small particles hazardous in the extreme where particular castings are made.

In the middle eighties, a foundryman in Scranton, Pa., conceived the idea of filling old powder cans with these borings and charging them into the cupola the same as pig and scrap. The method was said to be very successful and was continued as long as the supply of old cans held out. For years, nothing was found for a substitute except wooden boxes.

Container Disovered by Accident

Along about 1904 Stanton Griffith, foundry superintendent of the Fairbanks-Morse Co., Beloit, Wis., was experimenting with the melting of borings in various kinds of containers, none of which were as satisfactory as Mr. Griffith desired. As Newton's discovery of the law of gravitation was accidental, so the method that I am going to describe was accidental to Mr. Griffith through the obstreperousness of a tomato can that found its way into the household furnace where it remained inert for some time, a decided obstacle to good and thorough combustion. Its remarkable state of preservation after going through the fierce fire necessary to keep a Beloit home warm and comfortable certainly classed it as an ideal container for melting borings, but, as its size was against it, a similar but larger can was made from regular lengths of stovepipe, crimping the can in at each end when full. This method proved so successful that I was attracted by it, and from the results of several tests made, I concluded there was nothing better. I am still of the same opinion, for long ago and after much investigation, I concluded that no other method gives as good, as economical or as reliable results.

Ten-Ton Heats Show Small Losses

These stovepipe lengths will hold about 50 pounds. It is preferable to use either a wood, iron or steel disk for the top or bottom of the cartridge. The containers can be filled at the machines by machinists' helpers at very little if any cost as the borings must be taken away anyway. The cost of preparation for the cupola is about $2.50 per ton. On three different occasions I melted 10 tons of these canned borings alone, using a blast pressure of from 9 to 10 ounces, our regular blast being from 14 to 16 ounces. All three of these heats showed a loss of less than 2 per cent., which seems remarkable. The charges were carefully weighed under my own supervision. A 10-ton ladle was weighed on a crane scales and then placed under the cupola spout, and when the contents of the cupola were run into it, it was weighed again with the results above mentioned.

The iron in each case was white and in no way fit for commercial machinery castings. It showed no tendency to stick to the ladle but was hot and fluid. A 6 x 6-inch section poured from the ladle was white all through, not a trace of graphitic carbon being visible near the center. The melting of borings in cans or cartridges is being practised by a large number of foundries engaged in both light and heavy work. There is no patent on the process and anyone is free to use it. It is beyond question a thoroughly successful method.

In 1908 a patent was granted to Walter F. Price for melting borings in a vertical tube or casing having a higher melting point than the chips. The method at first was open to many serious objections, some of which have since been removed. Borings can be successfully melted by this method but it lacks what might be called mobility, as all the borings are only in one part of the cupola in a vertical column, with fuel only part surrounding it, whereas with the cartridges, they can be distributed among the charge, giving a better mixture and insuring more even melting.

Briquetting Is Not an Economical Method

The briquetting of borings by the German method, that is, subjecting them in suitable molds to great pressure, is a successful method but the cost is high and there is a considerable melting loss. It is said that the breaking or spalling of the corners and edges of the briquettes represents a great loss. The briquetting of borings through the use of cement, canna pitch or any other wet binder is without question a great failure. The rapid generation of oxygen when moisture comes in contact with the borings soon leaves only a lump of rust to put in the cupola and when used in this way is productive of bad castings, as pin holes and so-called blow holes are prevalent. The melting loss by this method I found by experiment to reach as high as 60 per cent, while the resultant metal was bad. Castings poured with it for experimental purposes were very unsound and literally honeycombed with holes, while on the other hand castings poured from similar metal, taken from a ladle that was filled from the cartridges was sound all the way through and showed no signs of pin holes or any other unsoundness.

Summary

At a practical proposition, the use of borings in binder bound briquettes is a failure. The briquettes made under enormous pressure are satisfactory, but the cost and melting loss is much higher than when melted in cans or cartridges. The tube method introduced by Mr. Price has very narrow limitations as to the amount used, this being governed by the size of the tube which of necessity must be comparatively small. If a multiplicity of tubes is used, I think there is great danger of oxidation, as no fuel is underneath them. They can only be placed in one position in the cupola and that a specially prepared one on the side with a special door cut for the purpose. The attendant labor and waste of filling close to terrific heat is another objection.

Canning of Borings

With the cans or cartridges, no extra labor is involved on the charging floor and the given amount to be put on any charge can be as evenly distributed throughout the charge as any component part of it. The cost of canning the borings exclusive of the labor of filling them is about $2.50 per ton. This filling labor should hardly be counted under most circumstances as the borings must be taken away from the machines and the helper may as well fill the cans as to use any other receptacles. Borings melted by this method are a decided strengthener of castings and tend to give a closer grain. I have used them in various percentages in all kinds of work from the heaviest parts of high class machinery down to light automobile castings with unvarying beneficent results. The cost of wooden boxes is also about $2.50 per ton and the cost of tubes very little less. The cost of briquettes varies greatly. So many variables have to be taken into account and the method is so unreliable that it is not worth pursuing.

DIVERSITY OF PRODUCT IN A FOUNDRY

IN his presidential address to the Birmingham Branch of the British Foundrymen's Association, a few weeks ago, J. Shaw (Dudley) said the first thing that struck an American in visiting shops in Great Britain was the large diversity of work done in the same foundry, and while this practice produced better moulders, it added to the cost of production compared with the costs in shops which confined themselves to fewer lines. Both American and German practice tended to specialization in a few types of castings at a minimum cost, utilizing every possible labor-saving device. In Britain, as pioneers in the iron and steel trade, they labored under the disadvantage of old and often obsolete plants. Of the 170 foundries in the Birmingham district, very few were new and built on modern lines. Of the 36 machine and erecting shops in Birmingham, only about 5 per cent. had railway sidings. Many were dark, badly ventilated, and deficient in crane power. Whether it was practicable to build fresh works in suitable places on modern lines was one of the questions employers would have to face. While many new machine shops had been built to meet the demands made by the war, very few foundries had been erected; the old ones had been adapted, and he was afraid the end of the war would find their trade in a position little better than it was before.

NOTES ON EFFECT OF BLAST-FURNACE GASES ON WROUGHT IRON*

By Dr. J. E. Stead, F.R.S.

THE object of this note is to describe the effect of blast-furnace gases on wrought iron at temperatures between 400 deg. and 500 deg. Cent. The phenomena were observed quite incidentally when experimenting on the magnetic properties of manganese steels with the object of ascertaining the effect of very prolonged heating at relatively low temperatures. Bars of steels were placed inside a wrought iron tube or case, and the case with contents was placed in the middle of a gas flue, where the temperature ranged between 400 deg. and 500 deg. Cent., and was allowed to remain there for nearly two years; the case and the bars were however removed and examined at intervals.

After exposure for a year the wrought iron tubes were found to be blistered in many places, and at certain points layers of the iron had been torn away from the places where the screwing terminated and were beginning to curl over. As one had the opportunity of examining the outside of the case at intervals, the gradual and progressive tearing action was being followed. From the first it was clear that carbon was being deposited from the gas, and was responsible for causing the disruption. On screwing off the cap to get at the bars, a considerable quantity of fine, dense, black powder fell out with the bars, and the lower part of the upper tube contained much of the same substance loosely adhering to its sides. In physical appearance the powder resembled lampblack. All the blisters on the tubes were filled with this black powder, and some had deposited on the inside walls of the thicker tube as well as the walls of the thin tube.

Originally these walls, as well as the exterior surfaces, were coated with a thin layer of blue scale, as is usual with all such hot rolled material. Carbon seems to have deposited over the whole interior surfaces, but none at all on the exterior portions, excepting at the parts which had been cold distorted at the screwed portions beyond the terminations of the caps. The larger amount of manganese in the deposit found in the case itself suggests that a portion of it had come from the surfaces of the manganese steel bars. As the caps were screwed tightly on to the ends of the case, it was supposed the latter was quite gastight, and if it was, one is forced to the tentative conclusion that carbonic oxide passed through the solid iron. That it is capable of penetrating iron to a depth of about a quarter of an inch at 600 deg. to 650 deg. Cent. has been proved by previous experiment, but that it should penetrate right through the iron and deposit carbon on the inside walls of the iron tubes at under 500 deg. Cent., if true, is very remarkable. and further trials are being conducted to confirm or negative these observations.

On testing the black deposits for carbon by color, only traces were found in the deposit from the upper tube, but 0.21 per cent. in that from the lower tube; a portion of this may have come from the manganese steels, which contained up to 2 per cent. carbon. Incidentally, it may be remarked that at high temperatures spongy iron reduced from iron ore is rapidly carburized, and it is justifiable to believe that as ore is reduced and descends down the shaft of a blast-furnace it becomes highly carburized before it reaches the melting zone, and not, as is usually assumed, that it remains as spongy iron till it begins to melt. It is more than probable that before the reduced iron is half way down to the hearth it will have combined with at least 2 per cent. carbon.

In reviewing the result of the observations and experiment given in this note, it would appear:—(1)—That even hard and refractory iron scale and the magnetic cinder enclosed in wrought iron are capable of reacting with carbonic oxide at temperatures between 400 deg. and 500 deg. Cent. (2)—That wrought iron containing free oxides is capable of being partially broken up by the action of carbonic oxide gas on the enclosed oxides or cinder. (3) That under the conditions named even initially non-oxidized steel acts on carbonic oxide gas, inducing carbon to be deposited on the surface.

*Iron and Steel Institute contribution

NICKEL COMMISSION PREPARING REPORT

THE report of the Ontario Nickel Commission will, it is expected, be submitted to the Legislature at the next session. The members of the commission have practically completed their investigations and are now engaged in the preparation of the report.

While the labors of the commission are associated in the public mind largely in connection with means of refining nickel in Ontario and controlling the export of the unrefined nickel, by no means the least important part of its work has had to do with the shaping up of a comprehensive policy of mining taxation applied to all Ontario's great mineral resources. If this part of the report is ready in time Hon. G. Howard Ferguson may be able to bring down the promised tax legislation at the coming session. Meanwhile the plant being established at Port Colborne on Lake Erie for the refining of Ontario nickel by the International Nickel Co., is under way.

Discipline.—Many of the accidents which now occur may be eliminated by discipline—not after the accident occurs nor as administered to an offender; but the kind of discipline which originates within the man, which he applies to himself. True discipline is an education, a development of faculties by instruction and exercise; it is a training to act habitually in accordance with established rules; it is a training to obey either a superior or one's own mind immediately and without question.

NEW AND IMPROVED EQUIPMENT

A Record of Machinery Development Tending Towards Higher Quality, Output and Efficiency in Foundry, Pattern and Metal Work Generally

MECHANICAL PLATING BARREL

A PLATING barrel possessing a minimum amount of mechanism with the maximum amount of convenience and efficiency is shown in the accompanying illustrations Figs. 1, 2 and 3, which show a mechanical plater recently brought out by the Connecticut

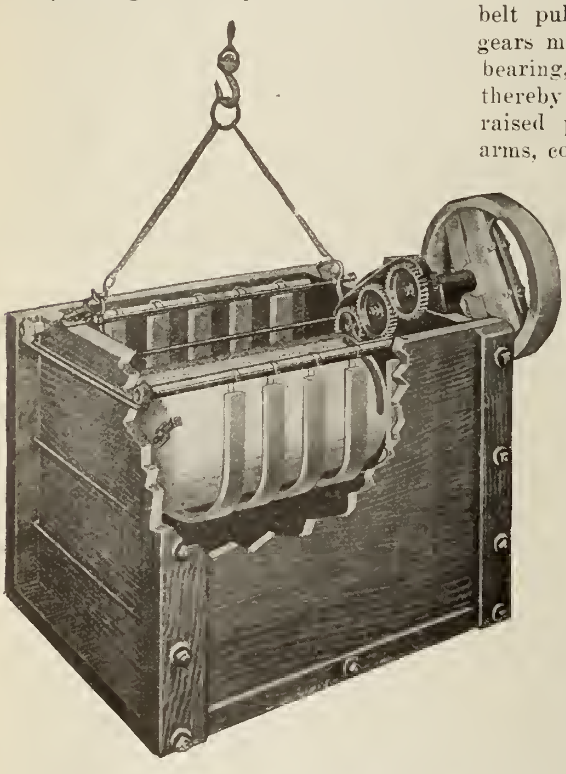


FIG. 1. SECTIONAL VIEW OF PLATING MACHINE SHOWING BARREL IN POSITION SURROUNDED BY ANODES.

Dynamo & Motor Co., Irvington, N.J. It is built in three sizes—82, 98 and 114 gals., with a barrel 14½ dia. x 24, 30 and 36 in. long respectively.

The apparatus as shown consists of a tank made of 2-in. Southern cypress, well bolted together and lined with a mixture of asphaltum and pitch. Two styles of barrels are made, that shown in Figs. 1 and 2 being built of a large number of 1 in. thick strips with perforations 3-16 in. square; this barrel is well adapted to the plating of large or medium-sized work and for heavy pieces that would break the panels of weaker barrels. It is obtainable in hexagonal as well as cylindrical form. Fig. 3 shows a hexagonal barrel with panels of Bakelite, a manufactured substance which is eminently suited for the work, being hard, strong, non-conductive, non-absorbing and chemically inert. Its nature is such that very small perforations may be used, enabling work to be plated which is too small to be done in a wooden barrel.

The barrel is revolved by means of a belt pulley driving through a train of gears mounted eccentrically to the main bearing, the gear train being thereby disengaged when in a raised position. Brass lifting arms, covered with hard rubber for insulating purposes are employed to lift the barrel from the solution as well as conveying current to the cathode, or work rod, which consists of a single brass rod which is supported at the bottom of the barrel to insure proper contact between the work and the rod.

The anode rods are of $1\frac{1}{4}$ in. brass tubing connected together and provided with terminal connections. Either curved or straight anodes may be used with equally good results.

The Rotoplater, as the machine is termed by the makers, has no stuffing boxes to leak, and two speeds of 6 and 11 revs. per min. are obtainable by simply shifting an arm. The barrel being entirely submerged in the solution, it may be filled two-thirds full of work at one charge. Although the barrel can be lifted free of

FIG. 2. BARREL RAISED CLEAR OF TANK FOR REMOVING WORK, GIVING ACCESS TO LIQUID.

the tank and the work conveyed in it to the washing tank and dryer, it is not removed from its bearings which are thereby properly seated at all times.

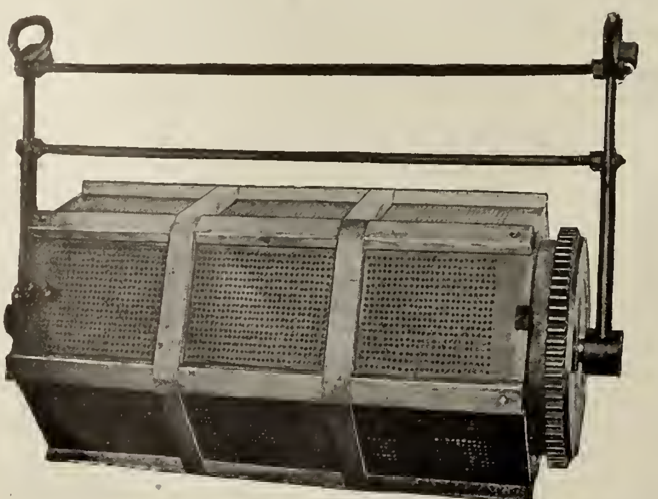
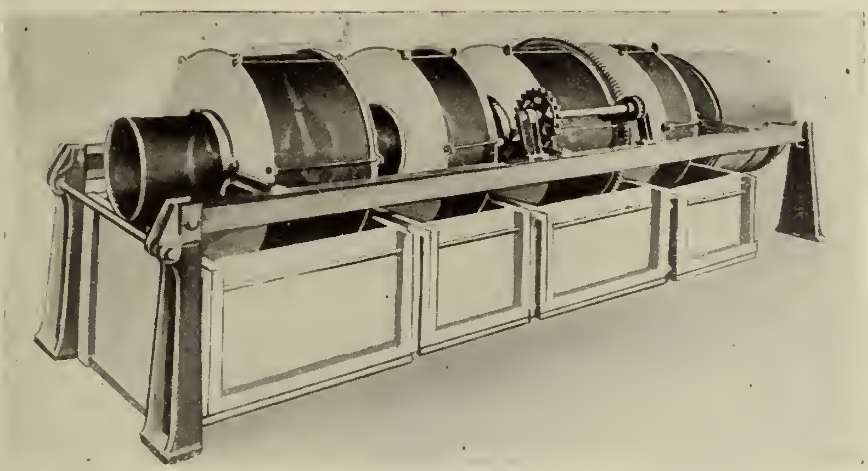


FIG 3. HEXAGONAL BARREL WITH BAKELITE PANELS

The complete outfit includes pulley, lifting chain, block and fall, and can also be supplied with a self-contained motor drive instead of belt pulley.

AUTOMATIC PICKLING AND CLEANING MACHINE

THE machine shown in the accompanying illustration represents a recent development in apparatus for automatically pickling, cleaning and drying all kinds of small articles of various materials and requiring a number of different solutions. The revolving member consists of a number of perforated drums dipping into tanks containing various solutions, the last drum being the drying section. A speed of 10 rev. per min. is imparted to the drums, which are inclined downward so that the material advances gradually from one end to the other. Pick-up pockets transfer the work from one drum to another, the material going through the machine and being delivered without interruption.



AUTOMATIC PICKLING AND CLEANING MACHINE.

The apparatus can be used for a variety of work, including the removal of scale from cartridge shells, electric light sockets, etc., leaving them clean and dry ready for the next operation; nails, screws and similar small material can likewise be treated in oil. Uniform and increased output is a feature of this apparatus, two men with a medium size machine having as large an output as ten men with a battery of tumbling mills.

The makers of this machine are the U.S. Electro Galvanizing Co., Brooklyn, N.Y.

ROTARY PUMPS FOR BY-PRODUCT PLANTS

THE pumps described are used to circulate the wash oil, which sometimes is termed straw oil due to its color, through the scrubbing equipment of by-product plants. The oil is pumped in at the top of these scrubbers, and as it passes down through the apparatus, it absorbs the by-products, such as benzol, tuluol, zyols, phenol and other hydro carbons. The oil ladened with the substances which have been absorbed from the gas, passes into a large tank or sump from which it is taken to apparatus which removes the products picked up while passing through the scrubbers, that is the benzol, tuluol, etc. After these have been removed, the oil is returned to the system and pumped through the apparatus again. The quantity of oil to be handled varies from 4,000 to about 40,000 gallons per hour, and the discharge head runs as high as 150 feet, but is usually around 125 feet. In some cases the discharge head has been as low as 50 feet. In some installations the oil flows by gravity to the ends of the pump while in others the suction lift runs as high as 8 ft. but it is usually around 5 ft. The wash oil or straw oil is handled at a temperature of about 120 degs. C.

The operating principle of those rotary pumps is remarkable for its simplicity. The moving parts consist of two parallel shafts with an impeller on each and having a gear keyed on the ends. They are assembed at 90 degs. one to the other and this relation is permanently maintained by means of the above mentioned gears. Fig. 1 shows a section through the pump. The impellers rotate in opposite directions, one clockwise, the other counterclockwise. The water from the suction pipe is enclosed between the impeller (as shown in vertical position), and the case, so that for an instant there is a body of water which is not open to either the suction or discharge sides. As the impeller continues to rotate, it immediately opens to the discharge side and the volume which was enclosed is forced into the discharge side. Since, owing to the shape of the impellers, there is at no time a possible return between the shafts, it is evident that a quantity of water equal to the enclosed volume is discharged at every half revolution of each impeller. For each revolution of the pump, therefore, four times this volume is discharged.

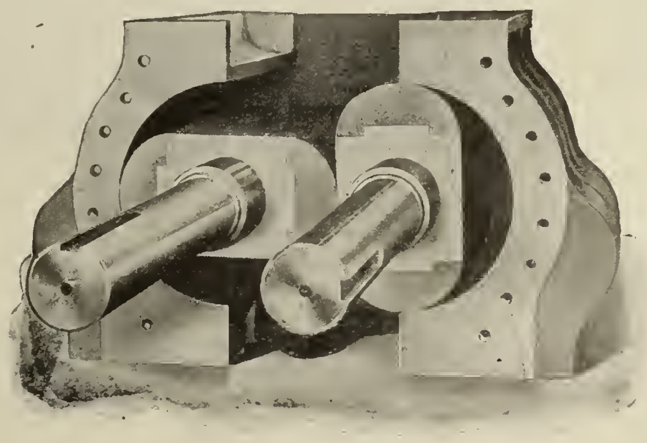


FIG. 1. GENERAL INTERIOR ARRANGEMENT.

Pump Case

The case is composed of two identical semi-circular castings and two identical headplates, all substantially ribbed to eliminate deflection. Suction air chambers are cast in the lower part of the case. The bearings are approximately three times the diameter of the shaft which, since the shaft is of ample proportions, gives a very low bearing pressure. This together with effective oiling maintained by oil chains or rings reduces wear to a minimum. Since practically all of the wear occurs vertically, the single wedge beneath the lower half box permits adjustment at any time, if necessary, while the pump is in operation. In the pumps of large capacity, the expense of a quarter box bearing is justified owing to the greater nicety of adjustment thus made possible, besides being of course necessary. The oil reservoirs beneath the bearings are of generous proportions, permitting continuous operation without attention. The main bearings are cast integral with the headplates, resulting in a quite compact and rigid design.

In the production of the gears, we understand that a special cutter is used for each size. The exceptionally wide face, about seven times the circular pitch, gives long life with a minimum wear. The involute tooth is used. For material, semi-steel has been found to have excellent wearing qualities. The pump is self-contained on a deep, well-ribbed bedplate, and each pump is shipped ready to be grouted into position. Local conditions and the purchaser's preference generally govern the choice of the drive. As these machines have their most common application for pumping water and non-corrosive liquids, cast iron and steel are commonly used, but in case the liquid to be handled is corrosive, suitable resisting metal is selected.

Designs have been gotten out for three ranges of pressures:—Low lift pumps for heads from 0 to 30 feet; medium lift pumps for heads from 30 to 80 feet, and high lift pumps for heads from 80 to 200 feet. The capacities vary from a displacement of 1-10 of a gallon per revolution up to 50,000 gallons per minute, the applications of the pumps being universal within the capacities and heads given above. Besides

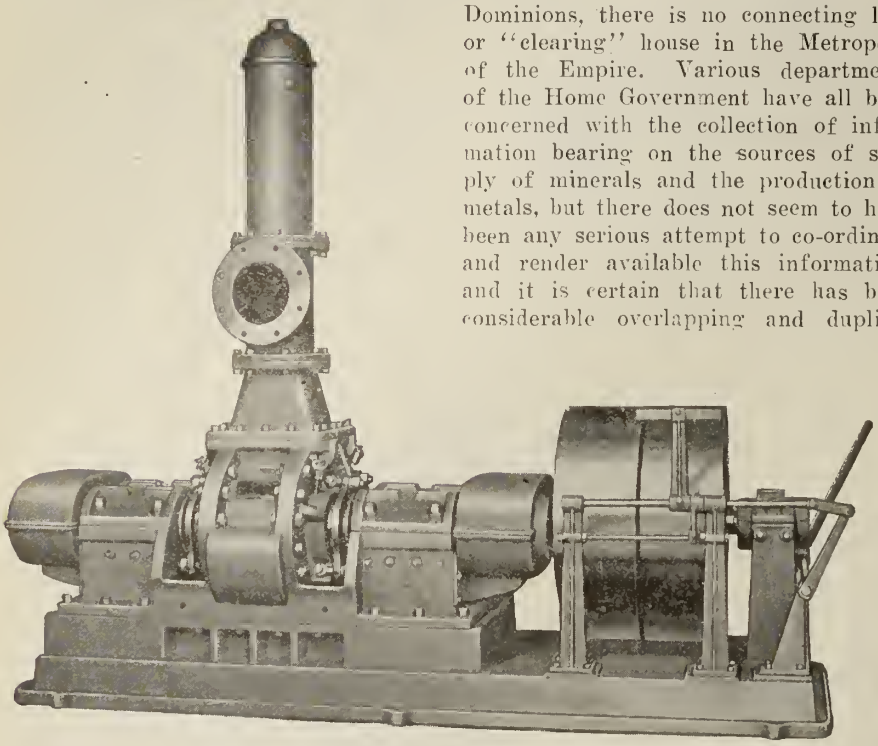


FIG. 2. ROTARY PUMP FOR CIRCULATING WASH OIL.

irrigation projects, reservoirs, condensers, cooling towers, and circulating systems, we understand that this type pump has become a feature in by-product coke oven service for handling wash oil, tar and ammoniacal liquor. Of primary consideration are the facts that it is a positive displacement pump and that it is valveless, thus combining merits of both the centrifugal and reciprocating pump. Priming is never necessary for starting, and the delivery is constant and independent of the head. The efficiencies claimed are noteworthy, varying from 75 to 85 per cent. of the power applied to the pump shaft. Low first cost, small repair and small maintenance charges, small floor space and long life, constitute claims made on behalf of this specialty. The P. H. and M. F. Roots Co., Connersville, Ind., are designers and manufacturers of these rotary pumps for by-products plants.

CENTRAL DEPARTMENT OF MINERALS AND METALS

THAT the department of minerals and metals maintained by some of the British Dominions are a feature worthy of adoption by the British Government was the opinion expressed by such leaders of industrial thought and action as Sir W. Beardmore, Geo. Beilby W. Thornycroft and Edgar Taylor, in a recent communication to the Chairman of the Advisory Council for Scientific and Industrial Research.

The argument put forward is that while there are similar well-organised departments in some of the British Dominions, there is no connecting link or "clearing" house in the Metropolis of the Empire. Various departments of the Home Government have all been concerned with the collection of information bearing on the sources of supply of minerals and the production of metals, but there does not seem to have been any serious attempt to co-ordinate and render available this information, and it is certain that there has been considerable overlapping and duplication of effort with corresponding waste and confusion. In the opinion of the Institutions represented by the signatories the organization of a central Department of Minerals and Metals is imperatively necessary in the public interest, and the work of organization, which will necessarily take much time to complete, should be begun at the earliest possible moment.

"It cannot be doubted," the letter proceeds, "that if a properly organized and efficiently conducted Department of Minerals and metals had been in existence, much valuable time, many lives and vast sums of money would have been saved to the nation in the conduct of the present war, and much of the cost and inconvenience to British industries depending largely for their raw materials on mineral products would have been saved, with corresponding advantages to the prosecution of the war and to many industries."

The following are given as among the duties of the suggested new Department:—

1. Arrangements for expediting the completion of mineral surveys of the United Kingdom and the Crown Colonies and other British Possessions.

2. The systematic collection and coordination of information bearing on the occurrence, uses and economic value of minerals and their products; special attention being devoted, to securing industrial applications for newly-discovered minerals or metallurgical products, and to finding mineral materials required for new metallurgical products or inventions.

3. The investigation of all questions and problems relating to the utilisation of the mineral or metallurgical resources of the Empire.

4. The co-ordination and dissemination of information.

5. A general review from time to time of the developed and undeveloped mineral resources and of the position of each mineral or metal, to ensure that the mineral wealth of the Empire is being exploited with due regard to Imperial interests.

6. Generally, to advise the Imperial Government on all questions bearing on the mining and metallurgical industries.

CANADA'S TRADE WITH UNITED STATES

THE *New York Commercial* in a recent issue says that our hold on Canada's trade is stronger than ever. Of her total imports last year, of $542,077,000, the United States furnished $398,693,000, as compared with $80,108,000 from Great Britain and Ireland. No other country sold more than ten million dollars' worth to the Dominion. We have not only held our own trade, but we have captured a large part of Germany's trade in Canada, and we have sold to Canada far more than we ever sold to Germany in any year. In spite of Canada's devotion to the Mother Country, as expressed in blood and treasure brought out in this war, and in the face of a heavy preferential tariff, our grip on Canada's trade has grown tighter and this condition is sure to remain unchanged after the war. It shows what American exporters can do when they try, and when they have proper banking facilities. Our hold on the trade of the rest of the Western Hemisphere should be equally strong. Our success in Canada is due to proximity, shipping facilities, banking connections, the production of the goods our customers want, and imports of $320,225,000 from Canada to offset our sales to her. Our bankers have lent money to Canada freely and our trade has followed our investments.

As a rule, phosphor-bronze castings do not contain much phosphorus, as after it has done its work, the phosphorus comes off as other combinations in the dirt and ash on top of the metal in the crucible. Some specifications ignore this fact, and their requirements border on the absurd.

INDUSTRIAL NOTABILITIES

RUPERT G. BRUCE, vice-president and general manager, Canadian Hanson & Van Winkle Co., Ltd., manufacturers of nickel and electro-plating machinery, chemicals and munitions, Morrow Avenue, Toronto, was born in Port Perry, Ont., May 27, 1881, son of Stewart and Isabella Bruce, of Port Perry. He was educated at Port Perry High School and Upper Canada College, Toronto, and began his business career as a clerk in the Construction Department of the C.P.R., Toronto, 1899-1901. He was connected with the Electrical Development Co. (now Toronto Power Co.) from the time of its organization in 1901 until 1907, when he became secretary of the Kennedy

RUPERT G. BRUCE.

Hardware Co., Toronto, 1907-1908. He established the business of Rupert G. Bruce & Co., for the manufacture of electro chemicals in Toronto, 1908-1910; amalgamating same with the Hanson & Van Winkle Co., under the name Canadian Hanson & Van Winkle Co., Ltd., in 1910, of which he is vice-president and general manager. Doctor Herbert Bruce, of the Canadian Overseas Force Hospitals Commission is a brother.

Mr. Bruce served as a private with the Q.O.R. (Upper Canada College), 1908, and went through the ranks until promoted to Captain, 1910, when he joined No. 2 District Staff under General Otter, on which he served for three years as District Signalling Officer. He married Terry Irving, daughter of the late Andrew Irving, March 21, 1908. His clubs are: Toronto, Albany, R.C.Y.C., Lambton Golf, Military Institute; his societies: A.F. & A.M., and recreations: golf and fishing. In politics he is Conservative, and in religion Anglican. His residence is 59 Foxbar Road, Toronto.

—Photo, courtesy British & Colonial Press.

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A Monthly Technical Journal devoted to the Foundry and Metal Industries.

PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

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PAPER STILL SKY-ROCKETING

JUDGING by the action of the International Paper Co. in the United States, which controls over 50 per cent. of the newsprint paper supply there, the cost peak to consumers is still tending towards higher levels. While a more or less substantial advance had been anticipated, effective with the opening of the New Year, publishers were scarcely prepared for an increase from $2.15 to $3.10 per hundred, f.o.b. mill on renewal contracts. In every branch of the publishing business the effects of paper shortage and paper cost are much in evidence, the outstanding features being fewer and smaller page issues and increased subscription rates. Just how much more the paper manufacturers' cost to consumer will affect space, quantity and cost to readers is somewhat problematical. It may be that a higher value appreciation of "printers' ink" will be cultivated and developed by and through those among whom its distribution has in the past appeared more or less commonplace.

PEACE TIME STEEL OUTLOOK

SOME time ago reference was made in our editorial columns to the probability of Great Britain being wholly independent of foreign steel by March, 1917. We now learn that both France and Germany are also so equipped as to ensure steel outputs largely in excess of their domestic requirements in the coming peace time, notwithstanding obviously necessary rebuilding and reconstruction demands by one at least of the two countries referred to. The fact that the former has already doubled her 1915 output, in spite of the past two year's occupation of much of her iron ore territory by Germany, is especially significant. Neglecting Belgium for the time being, as in her case the return to even her normal steel output is likely to be more or less delayed, we anticipate a merry scamper for post-war supremacy in the world's steel markets with Britain, France, the United States and Germany figuring as giant contestants.

A full appreciation of what such an eventuality will mean to Canada either with regard to projected export trade, or what is equally important, her domestic trade, has not as yet been fully, if at all realized. We are prone to assume that the belligerents have had their hands so full of fighting that, even with the provision of the wherewithal to prosecute same in satisfactory measure, their steel production capacity has not been developed to such an abnormal extent as to give them individually a hitherto unparalleled preponderance in peace-time. The capacity of Canadian steel plants as a result of war munitions requirements has very materially increased comparatively, and the same may be said with respect to the steel enterprise of the United States. In neither case, however, has the development been such as to promote a comforting peace-time prospect; rather the reverse, we should say, judging from diagnosis of the outlook by interested and competent authorities in the latter country which have come to our notice.

With the merry scramble in the world's markets—offence and defence, the price toboggan of steel and steel products will get off to a good start, and, so far as Canada is concerned, it is to the defence feature against the coming scramble that provision and effort should more than the other be directed. Already in the United States where steel strength is many times our peer, defense views are finding expression, and little harm will be done but an immense service will be rendered to our not-distant future commerce and industry, if earnest and timely cognizance be taken of the sure possibility of our being steel engulfed, unless definite action be planned to prevent it. The matter is of national moment.

MODERN LANGUAGES AND EXPORT TRADE

THE probability of reciprocal trade relations among the Allies being established and maintained for a time, at least, following the war, has directed attention to the subject of the acquirement by our youth in colleges, universities, etc., of an intelligent conversational grasp of one or more of the languages spoken in the different countries. Special activity is to be noted as regards acquirement of the Russian language, due of course to the greater business and commercial possibilities which Russia with her immense territory and its opportunity for development afford. It is self-evident that business worth the name can only be transacted when the accredited representative of a firm seeking to establish and build up trade relationships in a foreign country has the language of the latter at his tongue tip, so to speak, in the first instance. If he has this, a more or less brief association with his prospective clients usually suffices to become familiar with their whims and fancies, business methods and customs, etc.

There is so much of novelty in this Russian language development that it is quite possible to overlook the claims and advantages derivable from a conversational and literary intimacy with that of France. It may be said that so far as Europe is concerned, whether from a business or social standpoint, intimacy with the French language is much more important than is Russian, the former being by habit and general consent the medium through which international transactions—business and otherwise, are conducted. For some reason or other, acquirement of even a conversational intimacy with the French language has given little evidence of keen desire on the part of our English-speaking citizens, in spite of the fact that both business and social opportunities for its exercise are unusually abundant. Even our Minister of Trade and Commerce at the recent Trade Conference of the Allies in Paris, was among the very few—two altogether, we think, for whose benefit the proceedings had to be translated into English. He is now a powerful pleader, recognizing his own shortcoming. If from the standpoint of business or otherwise the Russian language must be acquired, the other should under no circumstances be neglected.

PLATING AND POLISHING DEPARTMENT

Practical Articles, Useful Data, Descriptions of Machinery, Equipment, etc., Used in the Plating and Polishing Industry.

EFFICIENCY IN METAL POLISHING

By "Abe Winters."

WE read more or less good advice regarding efficiency in the plating department, but very little is written relative to the economical treatment of the metal in the polishing and buffing departments previous to and following the interesting process of electro-plating. The following is based on statements made to the writer by one of the most progressive foremen polishers in the Province of Ontario. His long and varied experience has given him opportunity to study the metal polishing problems from many angles, thereby lending exceptional value to the opinions herein given:—

The Plater and Polisher

The polishing and plating of metals for all ordinary purposes is often unfortunately regarded as being a trade or profession which may ordinarily be mastered by any one man who may be capable of becoming an adept in either one or the other of above-named operations. Under certain restricted conditions this is true, but, generally speaking, a good polisher seldom develops into a good plater, and a man who studies the art of electro-plating until its possibilities have been properly grasped, seldom, if ever, becomes an efficient metal polisher. The two occupations are essentially quite remote from one another, although closely allied. In many industrial plants devoted to the manufacture of polished and plated wares, the polishing and plating is done under the supervision of one man. Such, however, is not the case in plants turning out high-grade lines of metal wares, which have become standard in respect of finish and durability of the electro-plate. These plants have realized the importance of employing foremen for the respective departments who were specialists in their particular branches of the business.

To be successful, these men should not however be averse to actually engaging in the various operations under their supervision when circumstances require it. Wet or soiled hands are not necessarily a brake on a foreman's efficiency. If the polisher is given new parts to polish and does not readily adopt the quickest and best method of finishing the operation, the foreman should be ready and willing to demonstrate the process he wishes employed. If a price is placed on piecework, the foreman should be capable of trying out the time on a given number of pieces and show the men that the work can be finished in the specified time. Foremen who depend on some favorite employee to perform the above duties for them seldom, if ever, become highly efficient and capable of supervising departments in the more modern, systematized industrial plants. The foreman must teach his men to keep their wheels in first-class condition, properly balanced, etc. Many polishers are very careless with the supplies, and consider the operation of balancing their wheels a trivial matter, with the result usually following careless, thoughtless action—inefficiency. They are not responsible for the supplies, and do not intend to use their grey matter in an effort to assist the foreman; therefore it behooves the latter to be on the alert in order to keep the burden rate of his department low. The cause of much carelessness on the part of the polisher when balancing wheels is that he will not take the time to balance them; yet he knows, or at least should know, that unbalanced wheels cause the waste of many dollars' worth of emery and glue in a very short time. If felt wheels, canvas wheels, or bull neck wheels are used, the waste is often extremely expensive and totals to a big sum at the end of a year.

> **AMERICAN ELECTRO-PLATERS' SOCIETY, TORONTO BRANCH.**
>
> **Officers 1916-1917.**
>
> President—Wm. J. Salmon, 104 Lake Front, Kew Beach, Toronto.
> Vice-President — John Acheson, 1065 Dundas Street, Toronto.
> Sec.-Treasurer—Ernest Coles, P.O. Box 5, Coleman, Ontario.
> Librarian — John A. Magill 591 St. Clarens Ave., Toronto.
>
> **PLACE AND DATES OF MEETING.**
>
> The Occident Hall, corner of Queen and Bathurst Streets. Fourth Thursday of each month, at 8 p.m.

The foreman polisher who studies his men, selects the work for them according to their respective abilities, exercises proper discipline, and treats his men as human beings, and with impartiality, can usually maintain a low figure for operating expenses. He must experiment, but thoughtfully. The burden rate and cost rate should always be his guide. He must endeavor to produce the best possible results with the least possible expense, not only at this particular time, when men and material are scarce and costs for labor and supplies run unusually high, but at all times. The foreman should strive to produce the maximum output at the minimum expense to his employer.

Polishing is not, and never has been, regarded as an operation requiring exceptional skill. It is an occupation which necessitates spending the working hours in a more or less distasteful atmosphere. Often the conditions are actually a menace to health; the labor is indeed tedious even on light work. Polishing rooms are not usually as bright and cheery as they should be. Grease, oil and dirt are well known factors in the process of polishing, but their influence on the daily life of the men can be wonderfully modified by consistent thought and attention on the part of the foreman. The sanitary conditions existing in the polishing room should be maintained satisfactorily throughout the year if best results are expected of the men.

Polishing Room Amenities

A suction system of adequate capacity, together with true running lathes, equipped with suction hoods, are very essential if the production of maximum output per day is desired. Air laden with fine particles of metal, emery, dirt, and glue, is not conducive to healthy human organisms. Too many polishing rooms are deficient in ventilation, and a still greater number are without proper and efficient blower systems. The men at the wheel naturally expect the foreman to observe deficiencies and have them corrected. If the men have reason to believe the foreman is an unobservant easy-going kind of chap, they soon learn to take many advantages of his carelessness, and gradually the control of the situation is transferred to the shop committee of the local Polishers' Union. A foreman polisher should divorce himself from the Polishers' Union as soon as he becomes a foreman, and while he may long retain a warm spot in his heart for the organization which at one time dictated to him a programme of action, as a foreman he should execute the orders of his employer with judgment and impartiality.

Much of the foreman's difficulties may be eliminated by special attention being given to the class of supplies he orders. He should try out all samples of wheels and material personally, in order to know the grade best suited to his specific requirements. The supply salesman will invariably tell him that a certain line of supplies are absolutely the best on the market, and name over a half dozen firms who are using the stuff Perhaps he is right, but he seldom has every article up to the standard; therefore, don't take the supply salesman's word, or that of anybody else. The foreman should find out himself. Purchasing agents many times place an order according to first cost—the lowest price. This is wrong. A low price is a poor guide. Expensive goods are also often useless for the purpose, and furnish trouble for the men. High prices cannot be taken as a guarantee of efficiency. A personal test will suffice to give the foreman a basis upon which to figure, as he can then reckon the costs from various angles.

Above all, don't stay in a rut; experiment, think. If you are polishing brass and take it from 120 emery (dry) to the buff, and cannot satisfy yourself that this method is best, try oiling the brass, using a compressed canvas wheel; 95 per cent. of the brass work polished can be treated with less expense in this manner. Felt wheels are often very inferior. They are almost invariably out of true, and the use of compressed canvas as a substitute has frequently lowered the burden rate in the polishing department very noticeably.

When refinishing plated goods, it is excellent economy to have the old plate stripped off by electro-chemical methods in the plating department, thereby saving time, material and labor. Stripping solutions, which permit both steel or brass to be cleaned of old deposits without injury to the base metal, are now in general use, and the polishing department should be benefited by the process.

The above points do not cover the entire range of economic ideas which should be employed in the polishing room, but they are some of the prominent ones, and their adoption will assist the foreman to appreciate further views on polishing room efficiency, which will appear in future issues.

Questions and Answers

Question.—We are moving our plating room to larger and better quarters, and wish to lay a floor which will prove durable and which may be kept clean. What would you advise for a nickel-plating room floor?—P. H.

Answer.—Lay at least four inches of good cement, reinforced and sloping to at least one joint for drainage. When well set, apply a heavy coat of asphalt and upon this a three or four-ply tar paper and asphalt dressing. When complete sprinkle with sifted sand and allow to stand at least forty-eight hours. Sweep off the surplus sand and cover the entire surface with a wooden slat covering cut in sections, so as to facilitate easy removal for cleaning. If care is taken to avoid puncturing the paper top dressing, such a floor will remain in splendid condition for many years. Flash the sides of posts and walls with asphalt to prevent water entering crevices made by wrinkled tar paper. If a flaw is detected at any time, melt some asphalt and apply to the dry, clean surface of floor, overlapping the imperfect spot by several inches.

* * *

Question.—What should be done with a mechanical plating barrel nickel solution, to cause it to plate properly. The solution appears very clear and thin, or watery; several hours' run does not produce a coating of nickel, the brass parts being treated become dark and require to be acid-dipped before plating in baskets, which we are now using in place of the machine.—M. E.

Answer.—Remove all the nickel solution from the tank, and place in a clean whiskey or wine barrel. Add one pound of double nickel salts to each gallon of the solution and boil the solution by injecting live steam through a clean iron pipe. Boil about fifteen minutes. All of the salts will not dissolve, but a saturated solution will be formed. Clean out the tank, clean all hooks and connections, and see that the anode surface is as great as is possible to obtain. Transfer the solution from barrel to tank and allow to cool; your nickel deposit should then be first class, if the machine is supplied with sufficient volume of current at proper voltage. One hundred amperes at five volts will give excellent results on eight quarts of small metal pieces.

* * *

Question.—In the manufacture of small machine parts which are subsequently nickel plated, we perform a polishing operation on certain steel pieces. This operation causes the metal surface to become badly smeared with a greasy composition called polishers' cake, the ingredients of which consist of Russian tallow and emery. We find that the electric cleaner removes the bulk of the dirt but no solution or process which we have yet tried will remove the cloudy film left after the removal of the patches of grease; as a result, we are forced to scour the parts with pumice. Can you inform us of any method which would eliminate the scouring, as it is a slow and expensive operation.—C. A.

Answer.—We would suggest that you wash the pieces in a strong solution of quick-cutting alkali, such as "metal cleaner." Keep the solution boiling as violently as possible to assist in the removal of grease; a mechanical apparatus operated from an eccentric, which would plunge the parts contained in a basket, slowly up and down in the solution, would also be beneficial. After a few minutes boiling, remove the baskets and empty the pieces into a tilting tumbling barrel built of wood and partly filled with clean, fine sawdust, kept dry. Allow the pieces to rotate for only a few minutes, then remove, place on holders and pass through usual dips to plating baths. The cloudy film will be removed by the sawdust, and if the barrel is composed of wood (a half oil barrel will answer), and the rotation slow, the pieces will not be scratched if time of drying does not exceed five minutes. By this method it is quite possible to thoroughly clean as much work with fifteen minutes of one man's time as is possible for two men to scour in two hours. Scouring of metallic surfaces for plating is almost a thing of the past, and for pieces less than twelve inches long, or those of very irregular shape and large, electro-chemical or mechanical methods are easily devised which will entirely dispense with hand scouring for general practice.

* * *

Question.—Is there any substitute for sawdust for drying silverware after plating? We are having difficulty with our sawdust drying.—I. A. N.

Answer.—Use finely shredded tissue paper kept in a box heated by steam coil or procure some of the cork scrap in which foreign grapes are packed. Either is a decided improvement over sawdust.

* * *

Question.—Kindly advise me how to obtain the finish on brass known as "Etruscan Gold."—W. E. R.

Answer.—Buff the castings and clean as is usual for plating; give them a quick plunge in a good bright dip. Immerse in potash, then direct into sulphurette, and rinse in cold, then hot water. This should produce a deep yellow shade. Dry with sawdust or strong blast of compressed air and lacquer at once with rose-gold lacquer. Dry in a lacquer oven and then brush over with a paste consisting of pulverized gold rouge, turpentine and orange chrome, to which has been added a little gold size. The paste dries in a few minutes, after which the high lights are relieved by rubbing off the paste, leaving a ground work of beautiful orange tone.

* * *

Question.—Can you give me a recipe or furnish me with information as to how tools are mottled, such as Brown & Sharpe, or Starrett tools.—H.E.

Answer.—The mottled finish on drop-forged steel tools is produced by case hardening in bonedust. This is a long, slow process of several hours, and requires a quantity of bonedust, a good-sized receptacle, and fire-clay. Practically the same thing can be obtained without these, although the case hardening will not run so deep. Put enough potassium cyanide in an iron receptacle of suitable size and heat until red-hot. Dip the articles mottled into the molten cyanide and leave a few minutes long enough to be brought thoroughly up to the red heat and a little longer; then take out and quench in clear, cold water, and you will have a fairly mottled surface.

The mottled finish may be imparted to steel surfaces by a mechanical method also. To the end of a short, round piece of steel fasten a disc of leather 1/8 inch thick by means of steel pins inserted in the end of a steel piece; the pins must protrude through only far enough to hold the leather, and not penetrate through. Place the steel piece in a drill chuck and apply a small quantity of fine emery and a little oil to the surface of the leather. Hold the tool against the leather while the tool revolves. Various effects may be obtained by moving the article being finished into different positions while holding it against the leather. Different sizes of circles or spots will require different sizes of leather and shank. When used in a universal milling machine, the mottled effect can be greatly diversified, and many graduations of the circles may be employed to good advantage.

CANADIAN HANSON & VAN WINKLE PLANT AND PRODUCT

IN the sphere of manufacture of polishing and plating supplies, the Canadian Hanson & Van Winkle Co. plant, at Toronto, gives evidence of considerable development having taken place in the past two or three years and of still further progress to be recorded in the near future. In view of the foregoing, the following brief description of the plant layout, its equipment, etc., should be of more or less interest.

The factory is of slow-burning mill construction and comprises approximately 40,000 square feet of floor space. It is located near the C.P.R. main line, West Toronto, a private siding affording every facility for receipt of raw materials and shipping of the finished product. The main building contains practically all the various departments, the exceptions being the new nickel foundry, warehouses, and offices. The warehouses contain ample space for the storage of raw materials as well as of the finished product.

The nickel foundry is a recent addition to the plant, and modern equipment has been installed for producing all kinds of nickel castings, the most important being nickel anodes. Other kinds of anodes, however, are made here, including Cobalt, copper, zinc, tin, and bronze anodes. The company have a well equipped machine shop for making electro-plating machinery, tumbling barrels, and other mechanical equipment. The chemical department is modern, enabling the production of practically all the chemicals necessary for electro-plating purposes. A plant for making brushes has been added. Here are made many lines of brushes used in plating and foundry work, including tampico, fibre, bristle, brass, and steel wire brushes. Previously, most of these brushes had to be imported from outside sources. During the year a department has been equipped for producing high grade lacquers for all metals, while another department is to provide equipment for making all kinds of polishing compositions, rouges, etc.

Manufacture of Polishing Wheels

Not the least important manufactured product is that of polishing wheels. These are made from various materials such as canvas, cotton, linen, sheepskin leather, bullneck leather, walrus hide, etc. Some of the wheels are made up of high priced felts. The cotton buffs are made in what is known as the "buff" department. The raw material, factory cotton, is received in bales. Circular pieces are first stamped out and sewn together in power sewing machines, and then made into sections. The number of sections to one buff varying according to the requirements of the purchaser. In view of the scarcity of chemicals, it is interesting to note that the company have received the Canadian agency for the Cassel Cyanide Co., of Glasgow, Scotland, one of the prominent manufacturers of sodium cyanide. Assurances have been given that ample supplies of this useful material will be available for the Canadian trade.

About eighteen months ago the company equipped a plating demonstration plant. Since then, however, the parent concern, The Hanson & Van Winkle Co., of Newark, N.J., introduced more modern appliances with the result that the Canadian company reconstructed their plant to demonstrate more up-to-date methods of plating. At this plant may be seen the latest methods of producing electroplate. There is also a complete laboratory equipment for testing metals, solutions, etc. The demonstration plant was equipped for the benefit of the trade, and may be visited by any member interested in the art of electro-plating.

Cartridge Case Clips

A development of the business of more or less recent date was the making of cartridge clips. As some of the operations were right in line with the company's regular business, it was a comparatively easy matter to adapt other sections of the plant for the new class of work. The clips are stamped out from thin black steel sheets, seven operations altogether being necessary to obtain the required form. The operations are performed in the following sequence. First operation is blanking out from the sheet steel strip; the second, drawing; the third, forming the hooks; the fourth, turning over the points of three hooks, the fourth and longer hook being formed at the fifth operation. The sixth operation consists of piercing the holes for the canvas straps, while the seventh operation is that of flattening and gauging. All this work is done on power presses with a high rate of production.

The clips are next cleaned in tumbling barrels and passed on to the electroplating department, where they are first coated with copper and afterwards with zinc. After being plated, the clips are taken to another department where is installed a plant for painting the hooks, which is done by girls. The hooks are painted red, the paint being applied in the form of spray by means of a pistol device held in one hand, with the clip in the other. The paint falls by gravity to the sprayers from cans above the painting bench. The clips with the exception of the hook, are then black lacquered and passed on to the assembling department, where the canvas strips are sewn on. This operation is done in power sewing machines, a large number of women being employed for the purpose. The clips are afterwards finally inspected and taken to the shipping room.

MELTING ALUMINUM CHIPS

THE Bureau of Mines, Department of the Interior, has issued Bulletin 108, "Melting Aluminum Chips," by H. W Gillett and G. M. James. It gives an account of experiments made to compare the recovery of metallic aluminum in melting down chips such as obtained in the automobile factories in machining aluminum castings. As aluminum has sold at three times its normal price for the past year, and as a recovery of but 60 per cent. of the metal in the chips is common, and a 90 per cent. recovery is commercially possible, the preventable loss is of considerable magnitude. The bulletin discusses the causes of the high loss in the usual method of melting chips, and shows that the difficulty of getting the tiny globules of molten metal, resulting from the fusion of the very fine chips, to coalesce when covered with a skin of oxide and dirt, is apparently the main cause for low recoveries.

Successful Melting

Two methods of melting can be successfully used to promote coalescence. In one method the chips are kept just above the fusion point, and the globules made to coalesce by hand puddling which breaks through the skin and makes the globules unite. In this method, melting is best done in an iron pot heated by oil. The other is by the use of a flux which dissolves off the skin or dirt and oxide, producing clean globules which can unite. The flux suggested is 85 per cent. common salt, 15 per cent. fluorspar, used in large amount (20 to 30 per cent. of the weight of the chips), and mixed with the chips before charging. Much higher temperatures are required by this method than by the puddling method, so the iron-pot furnace is not practicable, and melting is best done in graphite crucibles or in a reverberatory furnace. The flux method does not require the constant hand puddling of the other method. Since the presence of dirt and oxide causes low recoveries, the necessity for care and cleanliness in the collection and storage of chips is emphasized. Chips wet with cutting compound will oxidize superficially on storage, but by drying the chips by centrifuging this can be prevented. A copy of this bulletin may be obtained free of charge by addressing the Director of the Bureau of Mines, Washington, D.C.

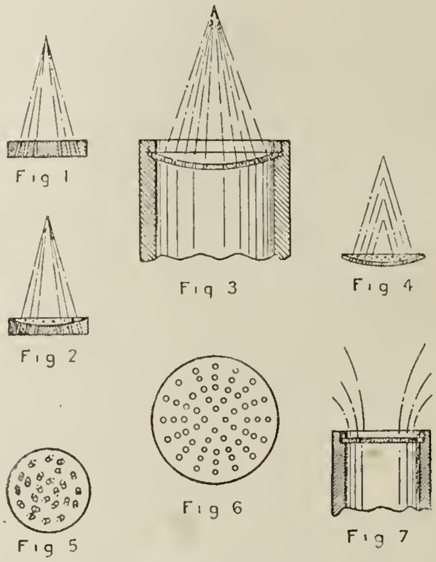
GAS BURNERS FOR INDUSTRIAL WORK

WHEN it is considered that 0.5 per cent. of carbon monoxide in air is sufficient to kill a robust human being, and that 0.1 per cent. is dangerous and that this gas acts as a cumulative poison, the dangers to health caused by improper methods of combustion of gas and defective ventilation are obvious, says the engineer. Many of the objectionable features of gas as a means of heating metal or other cold surfaces are overcome to a degree by mixing the gas with air under slight pressure previous to its arrival at the point of combustion. This gives a form of blow-pipe flame, and it is possible by this method to add to the gas the exact volume of air required for complete oxidation. The result of adding the requisite quantity of air to the gas is to make the mixture explosive, and, to prevent it exploding back into the mains, the mixture must be allowed to pass through and to burn upon a thick gauze or perforated plate. Back explosion is also preventable by increasing the speed at which the gas is flowing through the mains. A combination of the two, namely, a thin perforated plate and the gas flowing at a fairly high speed governs the method adopted in a series of experiments carried out recently by Mr. F. S. Sinnatt and described in the Journal of the Municipal School of Technology, Manchester. The flame obtained by burning gas in this way was carefully examined, with the following results:—

Experiment Data

When the explosive mixture is allowed to burn upon a perforated plate or gauze, each perforation forms a separate flame which is very short, but has a large circumference. In order to burn as much gas as possible on unit surface, the perforations must be made close together, with the result that each small flame will tend to displace those near to it. The flame consequently sprays out as shown in Fig. 7. The spraying becomes a source of danger when the gases are under pressure, for while it is possible for each flame to appear to be burning properly when examined by the eye, yet analysis will show that the gas is escaping unconsumed. The reason for this was found to be that the flames on certain perforations in the plate were not burning properly, and this was especially the case with those perforations near the perimeter when small discs were used.

Further, the author noticed that with any variation in the size of the perforations, especially where some became enlarged and others closed with foreign matter, the length of the flames on different perforations varied, and the surface had peaks which stood out above the remainder of the flame. In cases where the design of the burner was faulty and the gas travelled down a main and then directly on to the perforated plate, the rate at which the gas was flowing through the centre perforations was greater than through those near the perimeter. The flames, therefore, projected in the centre. If any of the above uneven flames are made to impinge against a cold metal surface a part may be extinguished or only partially burned, with the result that the gas escapes combustion. This is aggravated by the fact that the pressure and the composition of commercial fuel gases cannot be maintained at a constant figure, and that the flames are frequently employed in some machine which is subject to more or less violent vibrations.



GAS BURNER APPLICATIONS.

Overcoming Difficulties

Many of the above difficulties are overcome by making the perforated plate or gauze concave on the side upon which the gas is burning, an arrangement which has been patented by Messrs. Wallwin and Sinnatt. The perforations should have a common focus, as in Figs. 1, 2, 3, and 6, which can be varied by varying the degree of concavity of the plate—generally the perforated plates are made in the form of small circular discs, the size varying with the type of burner for which the disc is required, but usually ½ in. in diameter. The perforations in small groups may have a focus of their own as in Fig. 4. The whole of the flames burning on each of the separate perforations are thus made to pass through a common point, or the flames are focused. The effect of this treatment is to overcome within wide limits any variations in the composition of, or the pressure of, the gas. It is nearly impossible for the gas to escape combustion owing to it having to pass through the common focus. The combustion of the gas is in a degree self-induced, and the rate at which the gas burns on the plate is increased by the thorough mixing which occurs. Differences in the size of the perforations cannot influence the flame to the extent they do on a flat perforated plate.

The flame upon a concave perforated plate or "dished disc" assumes a fairly perfect conical form, and after leaving the point of focus the burned gas is in a single stream. The point of focus of the plate may be considered to be the place at which complete combustion for the system will take place, and this may be taken as marking the point at which the flame may be brought into contact with cold surfaces. The distance this point is from the plate may be varied according to the design of the particular machine or plant in which the burning is required. The fact that the whole of the flames pass through the common focus causes that point to assume a maximum flame temperature. The degree of concavity required for different pressures and for fuel gases of different compositions was determined experimentally for the gases which have been burned by the system. The size of the perforations and the thickness of the metal of the plate are factors which influence the concavity necessary for any particular gas. At present the method adopted practically is to use small discs about ½ in. in diameter and to fit these into any type of burner; the number of the discs being varied according to the volume of gas to be consumed.—*The Engineer.*

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products

PIG IRON.

Grey Forge, Pittsburg		$26 95
Lake Superior, charcoal, Chicago		26 75
Standard low phos., Philadelphia		47 00
Bessemer, Pittsburg		30 95
Basic, Valley, furnace		25 50
	Montreal	Toronto
Middlesboro, No. 3	.....	.....
Cleveland, No. 3	.....	.....
Clarence, No. 3	.....	.....
Victoria	$32 25	$32 00
Hamilton	32 25	32 00

FINISHED IRON AND STEEL

Per Pound to Large Buyers.	Cents
Iron bars, base	3.50
Steel bars, base	3.70
Steel bars, 2 in. and larger, base	5.25
Small shapes, base	3.90

METALS.

Aluminum	$ .68
Antimony	.18
Cobalt 97% pure	1.50
Copper lake	37.00
Copper, electrolytic	37.00
Copper, casting	36.00
Lead	.9½
Mercury	100.00
Nickel	50.00
Silver, per oz.	.79
Tin	.46
Zinc	.14

Prices Per Lb.

OLD MATERIAL.

Dealers' Buying Prices.	Montreal	Toronto
Copper, light	$23 00	$22 00
Copper, crucible	27 00	25 00
Copper, heavy	27 00	25 00
Copper, wire	27 00	25 00
No. 1 machine compos'n	21 00	20 00
No. 1 compos'n turnings	17 00	18 00
No. 1 wrought iron	11 00	11 00
Heavy melting steel	12 00	12 00
No. 1 machn'y cast iron	15 00	15 00
New brass clippings	17 00	17 00
New brass turnings	15 00	15 00
Heavy lead	7 50	7 50
Tea lead	6 00	6 50
Scrap zinc	8 00	8 00
Aluminum	35 00	35 00

COKE AND COAL.

Solvay foundry coke, on application ...
Connellsville foundry coke ....
Yough steam lump coal ....
Pittsburgh steam lump coal ....
Best slack ....

Net ton f.o.b. Toronto.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$52 50
Open-hearth billets, Pittsburg	52 50
Forging billets, Pittsburgh	78 00
Wire rods, Pittsburgh	65 00

PROOF COIL CHAIN.

¼ inch	$9.45
5-16 inch	9.10
⅜ inch	8.35
7-16	7.15
½ inch	6.95
9-16 inch	6.95
⅝ inch	6.80
¾ inch	6.70
⅞ inch	6.55
1 inch	6.40

Above quotations are per 100 lbs.

MISCELLANEOUS.

Solder, guaranteed	0.31½
Babbitt metals	.11 to .60
Putty, 100-lb. drums	3.00
Red dry lead, 100-lb. kegs, p.cwt.	13.87
Glue, French medal, per lb.	0.20
Motor gasoline, single bbls., gal.	0.26½
Benzine, single bbls. per gal.	0.26
Pure turpentine, single bbls.	0.71
Linseed oil, boiled, single bbls.	1.03
Linseed oil, raw, single bbls.	1.00
Plaster of Paris, per bbl.	2.50
Plumbers' oakum, per 100 lbs.	8.00
Lead wool, per lb.	0.12
Pure Manila rope	0.22½
Transmission rope, Manila	0.26½
Drilling cables, Manila	0.24½
Lard oil, per gal.	1.35

SHEETS.

	Montreal	Toronto
Sheets, black, No. 10	5 50	5 50
Sheets, black, No. 28	4 50	4 50
Canada plates, dull, 52 sheets	4 75	4 75
Canada plates, all bright	6 30	6 50
Apollo brand, 10¾ oz. galvanized)	6 95	6 95
Queen's Head, 28, B.W.G.	7 75	7 75
Fleur-de-Lis, 28, B.W.G.	7 45	7 35
Gorbal's best, No. 28	7 75	7 50
Colborne Crown, No. 28	7 25	6 75
Premier, No. 28, U.S.	6 50	6 75
Premier, 10¾ oz.	6 80	7 00

ELECTRIC WELD COIL CHAIN B.B.

3-16 in.	$11.70
¼ in.	8.40
5-16 in.	7.40
⅜ in.	6.35
7-16.	6.35
½ in.	6.35
⅝ in.	6.35
¾ in.	6.35

Prices per 100 lbs.

IRON PIPE FITTINGS.

Canadian malleable, A, net; B and C, 20 and 5 per cent.; cast iron, 50; standard bushings, 60; headers, 60; flanged unions, 55; malleable bushings, 60; nipples 72½; malleable, lipped union, 60.

PLATING CHEMICALS.

Asid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, Nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium, carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.10
Caustic soda	.07
Copper carbonate, anhy.	.35
Copper, sulphate	.17½
Cobalt, sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide substitute	.20
Silver nitrate (per oz.)	.55
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 129-130 per cent.	.41
Sodium cyanide, 98-100 per cent.	.32
Sodium hydrate	.05
Sodium phosphate	.14
Sodium hyposulphite (per 100 lbs.)	5.00
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Silver, per oz.	.82 to .84
Zinc	.23 to .25

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt, lb.	2.25
Polishing wheels, bullneck.	1.35
Emery composition	.12 to .14
Pumice, ground	.04
Emery composition	.08 to .09
Tripoli composition	.04 to .06
Crocus composition	.07 to .08
Rouge powder	.30 to .35
Rouge, silver	.35 to .50

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Toronto, Ont., Dec. 1.—Reports from the United States to the effect that the British Government is cancelling contracts for rifles have been denied in some quarters. There is, however, reason to believe that there may be some truth in these reports, as the Government has already inaugurated a policy of having all war equipment and munitions made, as far as possible, in the Empire. Such a policy will naturally be of the greatest benefit to Canada, and manufacturers and munition makers are thus assured of practically all the business that they can take care of for the duration of the war.

Steel

The situation in the steel trade is best illustrated by a recent announcement that the output of the Algoma Steel Corporation was sold out for 1917; this also applies to the three other important steel producing concerns in Canada. The Algoma Steel Co. had on Oct. 31 unfilled orders amounting to approximately 380,000 tons, consisting principally of shell steel and steel rails. The logical result of such a situation will be that prices will continue to advance until supply and demand are more equally balanced. The time when this is likely to happen is not yet in sight, for the demand appears to grow heavier in greater proportion than the increase in capacity of the mills. Another factor tending to further enhance steel prices is the more or less recent but rapid advance in pig iron. Prices of wrought pipe are very firm, following the quite recent advance, and higher prices are looked for before the first of the year. Another advance in boiler tubes has been made, which will be followed in the near future by a further advance. The tube mills are sold out for eight to ten months, and consumers continue to specify freely. The demand for plates, particularly from shipyards, is exceedingly heavy, and prices are consequently very high. The Carnegie Steel Co. has advanced its price on steel plates $5 a ton, making $3.50 per pound for shipment at mill convenience.

A serious scarcity of sheet bars has developed, which is threatening to tie up the sheet mills; a decided shortage in the supply of black, blue annealed, and galvanized sheets already exists. The American Sheet & Tin Plate Co. has advanced its prices on black sheets $7 a ton. Local quotations are also higher, black sheets, No. 28 gauge, being now quoted at $4.50. Galvanized sheets have also advanced, Premier No. 28, U.S., being quoted at $6.75, and Premier, 10¾ oz., $7 per 100 lbs. The local market is very firm.

In the U. S. the scarcity of steel is more pronounced than at any previous time, and buyers are exerting more pressure than ever on sellers to hasten shipments. Buying of all kinds of steel continues heavy, but the mills are unable to accept a large amount of the business offering. Tremendous orders have been placed recently by the Allied Governments for blooms and bars for shell steel manufacture, delivery to be over the last six months of 1917. Prices continue to advance, but they are more or less nominal. Steel bars are now quoted at 2.95c and shapes 3c, Pittsburgh, shipment at mill convenience. Forging billets are higher at $78, wire rods at $65 per ton Pittsburg; Bessemer billets, open-hearth billets, and sheet bars, $52.50 a ton Pittsburg.

Pig Iron

Lake Superior iron ore has advanced $1.50 per ton over the prices current for 1916. Pig iron prices continue very firm, and the situation is generally unchanged. Prices of domestic pig irons have not advanced during the week, but will no doubt do so at an early date. Prices of American brands of pig iron are still climbing, a few being quoted as follows:— Grey forge Pittsburg, $26.95; Basic, Valley furnace, $25.50; Bessemer, Pittsburg, $30.95; Lake Superior charcoal, Chicago, $26.75; and standard low phosphorus, Philadelphia, $47 per ton. Hamilton and Victoria are quoted at $32 per ton.

Scrap

The market for scrap metals is more active and the situation has improved; old copper of all kinds is higher, ranging from 1½c to 2c above last week's prices. Machine composition and turnings are up, as are also brass clippings and turnings. Heavy and tea lead and zinc have advanced ¼c per pound, while old aluminum is also higher. Steel turnings are in better demand, with a broader market; accumulated stocks are being disposed of steadily.

General Supplies

There have been no important developments during the month in this market. Business continues remarkably good, notwitstanding the high level of prices. Another advance in cotton waste is expected about the middle of December, while higher prices on rope may also be looked for. Copper wire is higher, and iron rivets are now quoted at 32½ per cent. discount, as against 35 per cent. formerly.

Metals

Copper continues to be the leading feature of the metal markets, and there is likely to be a scarcity of this metal next year. Lead and spelter are showing greater activity, the latter having advanced slightly, while higher prices for lead appear probable. Tin continues firm, but unchanged, while antimony and aluminum are also in better demand. The situation for all metals looks brighter, and all prices show a firmer tendency. Business locally continues brisk, and the outlook is favorable for the future.

Copper.—The market continues strong and quotations have advanced locally, although the primary market is unchanged. As nearly all of the production of many companies, which they are willing to sell in advance, has been disposed of until the third quarter of 1917, it is believed probable that prices will go far above the present level. Every effort is being made to increase the output of the metal, but unless some of the companies now in the prospect stage find large amounts of the metal, it is considered improbable that the output will be large enough to take care of any but the most urgent buyers next year, outside, of course, of those who have already contracted for their needs. Prices have advanced 2c locally, electrolytic and lake copper being quoted at 36c, and castings at 35c per pound.

Tin.—The market is firm and steady. The New York market continues firm, due to a shrinkage in stocks and an active demand, while the amount of tin coming in has decreased. The situation in the tin market is such that higher prices may be looked for. Local quotations are unchanged at 48c per pound.

Spelter.—The demand for this metal continues more active, particularly for brass special spelter, and the market is holding firm, with quotations up ½c per pound. Local price, 14½c per pound.

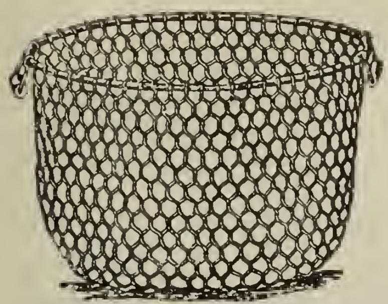
Lead.—While the "Trust" is holding the price of lead at 7c New York, independent producers have raised their quotations to 7.20c New York for spot metal. Local quotations firm and unchanged at 9c per pound.

Antimony.—There has recently been a more active demand for antimony and the market is firm. Local price, 18c per pound.

Aluminum.—The market is firmer, due to an improved demand and a scarcity of spot and nearby metal. Aluminum is quoted locally at 68c per pound.

Foundry and Plating Supplies

Continued strength characterizes the market in foundry and plating supplies.



Foundry Equipment Economy

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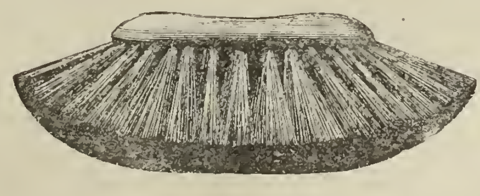
OUR reasonable prices are not the only reason of the popularity of our goods. Our service is like a magnet—on one end are our exceptional prices, on the other end is the quality of our products. Any need you have in your foundry we can fill to your entire satisfaction.

Our pure Ceylon Plumbago Facings are unequalled for dry and green sand work.

We are Ontario distributors for the Harbison Walker Refactories Celebrated Fire Brick.

Co-operation is the basis of better service, value and satisfaction. We are co-operative specialists. Get in touch with us.



The Hamilton Facing Mill Company, Limited

HAMILTON ONTARIO CANADA

and chemicals. The scarcity of raw materials is becoming more acute and there is no relief in sight, indications still pointing to higher prices. It is very likely that there will be a general advance in prices of plating supplies about the first of the year, owing to the increase in cost of raw materials which has not as yet been fully discounted. The lines that will be principally affected are felt, cotton, and leather polishing wheels, and compositions of all kinds.

The higher prices of ingot metals has resulted in an advance in anodes. Nickel anodes are now quoted at 50c to 54c, copper anodes 44c to 46c, and zinc anodes 23c to 25c per lb. Silver anodes are now 82c to 84c per oz. As regards chemicals, the market generally is very firm and prices continue to have an upward tendency. Copper sulphate is a shade higher at 17½c per lb., but nickel ammonium sulphate is lower at 10c per lb.

LAKE SUPERIOR CORPORATION

IT was recently announced that the Lake Superior Corporation would issue periodical statements to its shareholders. The first of these announces that "for four months ended October 31 there were produced 131,600 tons of ingots, and 82,500 tons of finished material. Production has not quite come up to expectations, due to labor difficulties generally. Conditions, however, are improving, and the results for the last few weeks have been more satisfactory.

"The output is practically sold up for the ensuing year. At October 31, the Steel Company had approximately 380,000 tons unfilled orders on hand, the tonnage preponderating being shell steel and steel rails. Prices are satisfactory, but profits on war material cannot be as high as in the States from the fact that heavy duties plus war taxes are payable in Canada, and in addition it must be kept in mind that the price of steel rails has increased but slightly in comparison with other steel products.

New Construction

"Some delay is being experienced in the completion of the two new 75-ton open-hearth furnaces, but, as far as can be seen, those furnaces will be completed by the end of the year, and with their completion the steel plant should be able to produce about 45,000 tons of ingots monthly. The end of the year should also see the finish of the more important construction work. On account of labor conditions, it is doubtful if, beyond a third 75-ton open-hearth furnace, any attempt will be made to embark upon further new construction; the most formidable of which yet to be undertaken is, of course, the development of the mills.

"The subsidiary companies of the Algoma Steel Corporation, namely, the Cannelton Coal and Coke Co., the Lake Superior Coal Co., and the Fiborn Limestone Co., are generally operating satisfactorily. The coal companies are handicapped through car shortage and their output and earnings will be somewhat affected." It is pointed out that the Fiborn Limestone Co. recently acquired the Ozark Dolomite Quarries containing large quantities of high-grade dolomite suitable for steel plant operations.

Trade Gossip

Guelph, Ont.—The Guelph Stove Co. will build a new foundry.

Lymburner Brass Works of Montreal has been incorporated with a capital of $50,000.

Hamilton, Ont.—The Dominion Steel Castings Co. will build an extension to their plant.

St. Catherines, Ont. — The Metal Drawing Co., will build a foundry at their plant here.

Montreal, Que.—The Canada Stove Co., will build an extension to their factory at St. Laurent near here.

New Glasgow, N.S.—The Nova Scotia Steel & Coal Co. are building a large steel foundry at their plant here.

H. E. Rice, of the Dominion Steel Corporation, Sydney, N.S., has been promoted to the position of assistant general superintendent.

Arthur H. Chadwick, director and manager of the Canadian Chadwick Metal Co., of Hamilton, Ont., died on November 8, aged 50.

The New Westminster Foundry Co., of New Westminster, B.C., has been incorporated to carry on a general business of iron founders, boilermakers, etc.

Pembroke, Ont.—The Thos. Pink Co. and the Pembroke Iron Works have purchased the Victoria Foundry at Ottawa. The purchase price is said to be about $100,000.

Charles C. Kawin Co., chemists and metallurgists, have extended their office and laboratory accommodation in the Kent Building, Toronto, in order to take care of increasing business.

Galt, Ont.—The contract for the construction of two new buildings for the Galt Brass Co., has been awarded to P. H. Secord & Sons, of Brantford, Ont. Estimated cost, $15,000.

New Toronto, Ont.—The general contract for the erection of a factory for the Dominion Abrasive Wheel Co., Ltd., has ben let to the Toms Contracting Co., Toronto. Approximate cost, $65,000.

Elipse Plating & Sales Co. has been incorporated at Ottawa with a capital of $50,000 to carry on business of electroplaters and manufacturers of electrical supplies at Ottawa, Ont. Incorporators are John Dorning, Philip M. Grimes and F. D. Hogg, all of Ottawa.

The Hamilton Steel Wheel Co. has been incorporated at Ottawa with a capital of $2,000,000 to manufacture steel wheels for railway carriages and locomotives, etc., at Hamilton, Ont. The incorporators are John R. Marshall, George A. Young and A. H. Johnson, all of Hamilton.

The Dominion Crucible Co. has been incorporated at Ottawa, with a capital of $200,000, to manufacture crucibles, graphite, clay and refractory materials, with head office in Montreal. Incorporators are: F. G. Bush, G. R. Drennan, and H. W. Jackson, all of Montreal.

The Kingston Smelting Co. has been incorporated at Toronto, with a capital of $30,000, to carry on the business of mining and smelting ores at Kingston, Ont. The incorporators are: Alexander McKinnon, J. L. Whiting and David Murray, all of Kingston, Ont.

Foundry Products, Ltd., has been incorporated at Ottawa, with a capital of $500,000, to carry on business as iron founders and steel makers, etc., at Calgary, Alta. The incorporators are: Daniel L. Redman, Charles W. Coole, and Peter D. McAlpine, all of Calgary, Alta.

J. M. Nelson, formerly with the Algoma Steel Co., Sault Ste. Marie, Ont., has been appointed superintendent of the Bethlehem Steel Co. open-hearth department, succeeding W. H. Bischoff, who resigned to become superintendent of coke ovens, blast furnaces and open-hearth furnaces of the Dominion Iron & Steel Co., Sydney, N.S.

William Henry Jaques, who did much to develop the American armor plate and ordnance industry, died at High Barnet, near London, England, on Nov. 24. Mr. Jaques was born in Philadelphia on December 24, 1848, and lived for the most of his life in the United States. He was active in many companies and was President of the Holland Submarine Co.

Steel and Iron Import Prohibition.—It is understood that the iron and steel sub-committee of Lord Balfour's Committee which was appointed to make recommendations on the basis of the Paris Conference economic proposals, has presented a report urging the entire prohibition of iron and steel imports into the United Kingdom during at least the period of demobilization and reconstruction after the war.

Kingston, Ont.—The repair work on the North American smelter, which was recently taken over by the Kingston Smelting Co., is being rushed to comple-

tion, and it is expected that the plant will be in operation in three or four weeks. The capacity of the smelter will be about twenty tons a day. The company has not found it necessary to install any new machinery, the old equipment being thoroughly adequate for the work required of it when put into a state of repair. The company intend to smelt lead concentrates into lead, for which there is a splendid market in Canada.

Russia's Iron and Steel Output.—Russia's production of pig iron, semi-finished and finished steel in the last two years, according to *L'Economiste Européen* of Sept. 29, 1916, was as follows in net tons:—

	1914.	1915
Pig iron	4,769,300	4,062,100
Semi-finished steel	5,308,800	4,539,100
Finished steel ..	4,334,100	3,599,500

Central Russia is credited with over 70 per cent. of the total pig-iron output, the Ural region coming second. Central Russia also leads in semi-finished and finished steel, making 60 per cent. of the total semi-finished steel, while the Ural region made 20 per cent. In 1914 Poland produced 269,500 tons of pig iron, 389,900 tons of semi-finished steel and 313,000 tons of finished steel.

Catalogues

Die Forming Machines.—Bulletin No. 1 deals with the die-forming machines and cutters made by the Anderson Die Co., Bridgeport, Conn., for use in the cleaning rooms of foundries. The machine is illustrated and fully described, as are also the main spindle and its parts. A price list is included, covering the "Anderson" super-helical, tapered, and straight milling cutters used in the above machine.

The Schoop Process Bulletin describes the "Schoop" metal spraying process, issued by the Metals Coating Company of Canada Ltd., Montreal. The bulletin first deals with the problem of corrosion, and the development and application of the "Schoop" process. Then follows matter relating to the construction of the spraying pistol, its mechanical details and method of operation all being described fully and accompanied by illustrations. The concluding pages illustrate and describe the "Gravitas" apparatus, devised for spraying zinc. A data sheet is included with the bulletin giving a detail cost of using the pistol with various metals.

FOR SALE

FOR SALE—HAMMER CORE MACHINE. Apply Gurney Foundry Co., Ltd., West Toronto. (3)

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GRAPHITE, ANTI-FLUX BRAZING
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GRINDERS, DISC, BENCH, SWING
Can. Hanson & Van Winkle Co., Toronto, Ont.
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HELMETS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tilghman-Brooksbank Sand Blast Co., Philadelphia, Pa.
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HOISTING AND CONVEYING MACHINERY, ELECTRIC AND PNEUMATIC
Can. Hanson & Van Winkle Co., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.

HOISTS, HAND, TROLLEY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.
Woodison, E. J., Co., Toronto, Ont.

IRON CEMENTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Stevens, Frederic B., Detroit, Mich.

IRON FILLER
Can. Hanson & Van Winkle Co., Toronto, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

JOLT MACHINES AND SQUEEZERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Midland Machine Co., Detroit, Mich.
Mumford, E. H., Co., Elizabeth, N.J.
Mumford Molding Mach. Co., Chicago, Ill.
Woodison, E. J., Co., Toronto, Ont.

KAOLIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Wm. Penn Silica Works, Wm. Penn P.O., Pa.
Woodison, E. J., Co., Toronto, Ont.

LADLES, FOUNDRY
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, N.J.
Hamilton Facing Mill Co., Hamilton, Ont.
Northern Crane Works, Walkerville.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphit, Pa.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

LADLE HEATERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hawley Down Draft Furnace Co., Easton, Pa.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Woodison, E. J., Co., Toronto, Ont.

LADLE STOPPERS, LADLE NOZZLES, AND SLEEVES (GRAPHITE)
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Joseph Dixon Crucible Co., Jersey City, N.J.
J. W. Paxson Co., Philadelphia, Pa.
Seidel, R. B., Philadelphia.
McCulloch-Dalzell Crucible Company, Pittsburg, Pa.
Woodison, E. J., Co., Toronto, Ont.

MELTING POTS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Can. Inspection & Testing Laboratories, Montreal.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

METALLURGISTS
Can. Inspection & Testing Laboratories, Montreal.
Charles C. Kawin Co., Toronto.
Toronto Testing Laboratories, Toronto.

MIXERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

MOLDERS' TOOLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

MOLDING MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
E. H. Mumford Co., Elizabeth, N.J.
Midland Machine Co., Detroit.
Mumford Molding Mach. Co., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

MOLDING SAND—SEE SAND

MOLDING SIFTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Whitehead Bros. Co., Buffalo, N.Y.
Woodison, E. J., Co., Toronto, Ont.

OVENS FOR CORE-BAKING AND DRYING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Monarch Engineering & Mfg. Co., Baltimore, Md.
Wadsworth Core Mach. & Equip. Co., Akron, Ohio
Woodison, E. J., Co., Toronto, Ont.

OIL AND GAS FURNACES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Monarch Eng. & Mfg. Co., Baltimore.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

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Jonathan Bartley Crucible Co., Trenton, N.J.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
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J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

RESIN
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
W. W. Wells, Toronto.
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Brown Specialty Machy. Co., Chicago, Ill.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
New Haven Sand Blast Co., New Haven, Conn.
Sly, W. W., Mfg. Co., The, Cleveland, O.
Standard Sand & Mach. Co., Cleveland, O.
Woodison, E. J., Co., Toronto, Ont.

SAND MOLDING
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
J. W. Paxson, Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Buffalo, N.Y.
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SAND MIXING MACHINERY
Wadsworth Core Mach. & Equip. Co., Akron, Ohio

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Battle Creek Sand Sifter Co., Battle Creek, Mich.
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J. W. Paxson Co., Philadelphia, Pa.
Woodison, E. J., Co., Toronto, Ont.

SIEVES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Stevens, Frederic B., Detroit, Mich.
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SILICA WASH
Can. Hanson & Van Winkle Co., Toronto, Ont.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
Wm. Penn Silica Works, Wm. Penn Po., Pa.
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Can. Hanson & Van Winkle Co., Toronto, Ont.
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SMALL ANGLES
Can. Hanson & Van Winkle Co., Toronto, Ont.
Dom. Iron & Steel Co., Sydney, N.S.
Woodison, E. J., Co., Toronto, Ont.

SOAPSTONE
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Woodison, E. J., Co., Toronto, Ont.

SPELTER BOWLS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Joseph Dixon Crucible Co., Jersey City, Pa.
Woodison, E. J., Co., Toronto, Ont.

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Mumford, E. H., Co., Elizabeth, N.J.

SPRUE CUTTERS
Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
J. W. Paxson Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Woodison, E. J., Co., Toronto, Ont.

SQUEEZER MOLDING MACHINES
Can. Hanson & Van Winkle Co., Toronto, Ont.
E. H. Mumford Co., Elizabeth, N.J.
Mumford Molding Mach. Co., Chicago, Ill.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

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Can. Hanson & Van Winkle Co., Toronto, Ont.
Hamilton Facing Mill Co., Hamilton, Ont.
Mumford, E. H. Co., Elizabeth, N.J.
Tabor Mfg. Co., Philadelphia.
Woodison, E. J., Co., Toronto, Ont.

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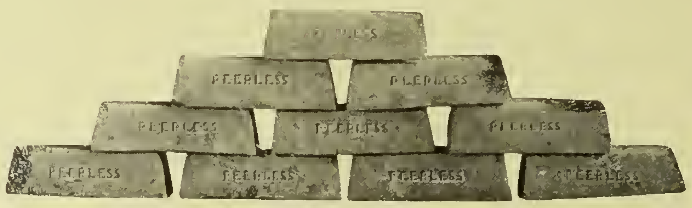

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