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Editor

REGINALD E. HORE

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GRANBY'S SMELTERS

The Granby Consolidated Mining Smelting and Power Co. is and has been for years one of the largest producers of copper. From its mines at Phoenix, B.C., the company has shipped over 10,000,000 tons of ore. The ore is treated in the company's smelter at Grand Forks, B.C., the largest copper smelter in Canada.

The Phoenix ore is low grade. In the year ending June 30th, 1913, there was treated 1,264,690 tons, yielding an average of 17.68 lb. copper, 0.208 oz. silver and 0.0326 oz. gold. The average smelting cost was $1.214 per ton. For the year ending June 30, 1914, the records show a recovery of 16.89 lb. copper per ton of ore smelted.

That such ore can be mined and smelted profitably is very creditable to those who have been in charge of operations. The method of treatment is of great interest, and the careful description of plant and methods prepared by Mr. A. W. G. Wilson, of the Mines Branch, Ottawa, and reproduced in the Journal, will doubtless prove interesting to many readers.

While operations are carried on satisfactorily at Phoenix and Grank Forks, the company does not regard its ore reserves as inexhaustible by any means, and has in the past few years examined many mining properties in British Columbia with a view to taking up promising ones and providing a field for operations that will perpetuate the life of the company. Of the properties examined a few have been taken up. Of these the most important is the Hidden Creek mine on Observatory inlet, north of Prince Rupert. Here a large body of ore, much richer than the Phoenix ore, has been developed. To treat this ore a smelter has been built at Anyox, and is now in successful operation. This also is a smelter of large capacity, and our readers will be interested in the brief description of it written some time ago by Mr. Wilson; but only recently published by the Mines Branch. While the description has lost part of its interest owing to a long delay in publication, it is nevertheless an important contribution.

Supplementing Dr. Wilson's description, it may be stated that the plant at Anyox is now in successful operation. The first furnace was "blown in" in March. Mechanical troubles were encountered, as is usual with new plants. The process proved also not wholly satisfactory, and the output during the summer has not been as high as expected. Problems of an unexpected nature arose and added to the cost of treatment. It is stated, however, that there has been considerable improvement in the last few months, and that for October the output will be about 1,800,000 lb. cop-

per, and the cost of treatment lower than in previous months.

This improvement in yield and costs must be especially pleasing to Prof. Geo. Guess, head of the department of metallurgy of the University of Toronto, who has been for some time at Anyox in the capacity of consulting metallurgist. We congratulate him on his success.

CANADIAN MINING SOCIETIES

There are in Canada two important mining societies: The Canadian Mining Institute, with numerous branches throughout the Dominion, and the Mining Society of Nova Scotia. The latter is, as its name implies, a Provincial Society, confining its interest largely to Nova Scotia.

Nova Scotia is and has been for years an important mineral producing Province. In Cape Breton occur the greatest coal deposits in Canada. The Province owes to the mining industry no small part of its development. Mining began early in the history of Nova Scotia, and has continued with marked success. Gold mining was for some years actively carried on; though it has of late years received little attention. The number of men engaged in the mining industry resulted naturally in a desire for a society devoted to the interests of mining and allied industries. And so the Mining Society of Nova Scotia came into existence.

In the other Provinces, notably in British Columbia, Ontario and Quebec, mining is also one of the leading industries. But these Provinces have no Mining Societies. Instead the mining men have banded together to form the Canadian Mining Institute. Why, then, should Nova Scotia stay out?

The reasons seem to be many. The chief seems to be that the Society is an old one and wishes to retain its identity. Attempts have frequently been made to sound the members on their willingness to have their Society merged into the Canadian Mining Institute. This proposition meets with little favor. The Nova Scotians are willing to be closely affiliated; but they cannot be prevailed on to give up their first love.

And so the problem is not an easy one. The Institute and the Society should be on closer terms. But what are the terms that will be satisfactory to both parties?

Recently the officers of the Society have explained to the members the terms offered by the officers of the Institute. We published this explanation in our last issue, and wish to call it to the attention of members of the two institutions.

CONDITIONAL CONTRABAND

During the past month there has been plenty of evidence that Germany is obtaining war supplies from the United States and other countries by the simple expedient of importing through neutral countries. That the enemy would attempt this was of course expected. The surprising feature is that he seems by devious means to have in several cases succeeded, owing to the difficulty of determining the ultimate destination of cargoes consigned to Holland, Denmark, Sweden and Norway.

That the authorities are on the alert is indicated by the seizure of vessels with cargoes of oil or copper consigned to neutral countries. In one case a copper cargo was diverted en route to Holland and purchased by the British Government. During the past two weeks three ships laden with oil have been taken by the British fleet.

The vessels carrying these cargoes are neutral vessels, and they were, when seized, on their way to neutral ports. That objection to their seizure would be made by the owners was to be expected, and objection has been made. The owners can put up a very plausible story, and it would be difficult for the Allies to prove that Germany is the real buyer of the materials. The British Government is not easily fooled, however, and places the onus of proof on the shipper and the authorities of the neutral countries to which the goods are consigned.

As an instance of the traffic in oil, it is asserted that Denmark merchants have during the past two months been buying enormous quantities, while before the war they were small buyers. The Scandinavian countries also have suddenly become large importers. The significance of this new business is easily understood when it is recalled that Germany is short of oil.

The significance of recent large shipments of copper to Holland is also plain. Naturally, United States producers are not submitting to their loss of the German market without a fight, and they have protested against seizure of cargoes. It has been announced that Sir Cecil Spring-Rice, British Ambassador, and Mr. W. J. Bryan, U. S. Secretary, have agreed to meet the situation by endeavoring to obtain from the Government of Holland official assurance that Holland will not import copper in excess of her own requirements. It will thus be possible to prevent copper reaching the enemy without at the same time interfering with the copper industry in Holland and the trade between that country and the United States.

The safeguarding of all legitimate channels of trade is of importance to the copper mining industry. The Allies are at present fairly large consumers, but with Germany out of the market the price has fallen uncomfortably low, and it is to be expected that companies operating on a small margin will suffer seriously until conditions become normal again.

Production at the copper mines at present is only about one-half normal. The effect of the curtailment is not immediate, however, owing to the fact that several weeks elapse between the time of mining the ore and its shipment from the refineries.

SELLING SILVER

The early days of the war caused no little anxiety to the owners of silver mines and to their employees. No less seriously interested were the companies which buy the products of the mines and mills. It is now clear that there was some ground for fear that the industry would suffer; but fortunately it has not suffered very badly, not nearly so badly as many other industries.

When we examine into the cause of the stability of the industry in these trying times, we find that many things have contributed to bring about the satisfactory conditions. One of the first is that most of the companies are controlled by men who are not easily panic stricken. They have faith in the industry and in the Empire and a sense of obligation to their employees.

Immediately after war was declared the American firms who had previously purchased a large portion of the output of Cobalt silver mines refused to buy. They doubtless had good reasons for adopting this policy, as the output of silver by American mines has to be taken care of, and there was a possibility of shipments to Europe being interfered with.

The Canadian smelters, however, continued operations in spite of the rather dark outlook. The Coniagas Reduction Company and Deloro Mining & Reduction Company had courage when it was needed, and, as a result, have been able to keep their men at work and enable the mining companies to keep their men busy also. It is a pleasure to learn, therefore, that their policy has proven a profitable one, owing to the early resumption of buying orders from England.

Mr. Thomas Southworth, vice-president and general manager of the Deloro Mining and Reduction Company says with regard to the company's policy:

"We felt sure that despite the reported presence of German cruisers on the Atlantic shipping would not be interrupted for any length of time, and that there was likely to be a market for silver in the near future, and results have justified our action.

"While the market for silver is restricted and our sales of cobalt to Europe ceased entirely, we have been able through the co-operation of the mine owners and the good feeling of our employees, who themselves suggested and accepted a reduction in salaries and wages till the war is over or until normal conditions are restored, to take care of a very large part of the output of the camp and keep the mines open without any serious loss to ourselves."

Another factor which was of great aid in preventing the closing of mines owing to lack of market was the prompt action of the Government in arranging that the banks should advance money on silver bullion. Even though buying orders be temporarily discontinued, the mining companies will thus be enabled to continue operations with some regularity.

The British Government has, since the war broke out, made purchases of silver that have helped to stay the market. The price has dropped owing to the fact that the usual buying orders for the East have been lacking. When the war risks are minimized a movement of silver to India and China may be expected. When this occurs a rise to normal prices should not be long delayed.

When the buyers of silver ore sent notice to companies at Cobalt that they would receive no more ore, the condition of those companies which ship to Canadian smelters or produce bullion at Cobalt became enviable. Among the latter, the Nipissing Mining Co., by virtue of its high grade plant, was shown to be in a strong position. The Nipissing company sends out a large part of its silver in the form of bullion, ready for the market. This independence of the smelters enabled the company to take immediate advantage of London buying orders. The management of the Nipissing and La Rose mines have adopted a policy for war time that is very creditable and will, we hope, prove profitable.

THE WAR AND EUROPEAN COAL-FIELDS

By F. W. Gray.

It may have escaped general attention that the Germans in their occupation of Belgium and Northern France have become temporarily possessed of all the important coalfields of Western Europe. The district between Mons, Charleroi and Liege contains some of the most important collieries in Europe, and to the north is the comparatively newly developed coalfield of the Belgian Campine. In Northern France the Valenciennes field is in the hands of the invader, and it is more than probable that the Germans are going to make their stand against the Allies on a line that will run through the Valenciennes field, and that once again we shall hear of bloody fighting around the collieries of Mons, Binche, Charleroi, Huy and Seraing. One of the war correspondents has remarked that fighting in a colliery district is attended with great difficulties, and it may be easily seen that colliery buildings, solidly constructed as they usually are, shafts and concrete air-conduits, and colliery spoil-heaps offer many novel possibilities both for offence and defence. But the devastation which will be caused to the coal-mining industry and the poverty which will fall alike upon capitalist and miner is pitiful to contemplate. Perhaps when the victorious Russian marches through the coal district of Silesia, accounts may be balanced as between the invaders and their victims.

It would seem that there were reasons which made it convenient for the Germans to violate Belgium neutrality other than the cynical excuse of "military necessity" given by Herr von Jagow. In 1870 Germany acquired valuable iron-ore fields by the cession of Lorraine, and in invading Belgium and Northern France in the present struggle it was doubtless the aim of the Germans to permanently occupy Belgium and Northern France, thus incorporating within the Kaiser's dominions all the important coalfields of central and western Europe, and the valuable iron-ore

fields which since 1870 have been discovered in French Lorraine. Thus France would be permanently deprived of her best deposits of coal and iron, and the magnificent collieries and machine-shops of Belgium would help to make more guns for the Teuton.

Surely no person is to-day so unsophisticated as to believe that Germany had any other intention than to steal the Belgian's country, because of its suitability for German purposes and aims. Had the present occasion not arisen as it did, another occasion would have been made, because, as von Bernhardi grimly remarks, when political contingencies can be made to coincide with military readiness it is a suitable moment to commence war. The assassination of the Archduke Ferdinand was the political contingency, the German General Staff had the machine ready, and Antwerp's docks, Cockerill's works, the coalfields of Belgium and the Pas de Calais were the tempting prizes, to be had apparently for the mere taking.

It is unnecessary to dwell on the events which have hindered, and will eventually utterly frustrate Germany's attempted theft from a weaker neighbor; but it is equally unnecessary and extremely nauseous to listen to German apologies for her actions in Belgium. Germany wanted Belgium—wanted it badly— so she took it, and, if she can, Germany will keep Belgium, Northern France and the remainder of Lorraine; because coalfields, iron ore deposits and harbors on the North Sea are useful things, and are worth the bones of many Pomeranian Grenadiers.

METAL PRODUCTS AND IMPORTS

Although the present war was primarily a quarrel between Continental powers, it has developed into a war for the existence, integrity and supremacy of the British Empire, involving the question of ocean transportation and overseas trade.

Germany has built up a great industrial system at home and a vast overseas commerce. Her foreign trade has increased from $1,678,780,000 in 1893 to about $5,000,000,000 in 1913. Under present war conditions she has lost, temporarily, nearly all this trade and it must be filled from other sources.

In 1913 Canada imported about $14,475,000 worth of goods from Germany and $1,525,000 worth from Austria. Our first duty is to produce, in so far as possible all goods imported from Germany and from Austria, and to purchase from Great Britain and other parts of the Empire what we cannot supply ourselves.

The next step is to set out to supply a large part of the goods exported by Germany to other countries.

The following tables give a summary of the value and classes of metal and mineral products imported in 1913-14:

Acids and salts of acids	$ 456,346
Earthenware and chinaware	300,595
Electrical apparatus	204,388
Glass and manufactures of	276,221
Metal, minerals, manufactures of	3,514,949
Paints and colours	199,937
	$4,952,436

Acids and Salts of Acids.

	Year ending March 31st, 1914. Amount. Lbs.	Value.
Acids		$25,152
Alum (in bulk)	1,856,802	22,001
Aniline and coal tar dyes	1,354,928	223,871
Antimony salts	1,179	157
Arsenic sulphide	17,720	891
Chloride of lime and hypochlorite of lime	444,475	4,316
*Potassium cyanide, sodium cyanide and cyanogen bromide	1,715	204
Potassium bichromate	12,120	808
Muriate and sulphate of potassium	4,145,948	74,227
Potassium nitrate	560,700	25,708
Potassium prussiate	59,109	7,259
Sal-ammoniac	297,069	14,834
Sodium bichromate	41,501	2,373
Sodium nitrate	229,774	8,568
Sodium sulphide	293,065	3,644
Tartaric and crystals	184,700	42,333
Total		$456,346

*The total imports in 1914 amounted to $243,907. Of this amount $142,997 was imported from the United States and $100,706 from the United Kingdom.

Electrical Apparatus.

Carbons, electric light, and carbon paints	$ 43,308
Electrical apparatus, insulators electric batteries, telegraph and telephone instruments	141,252
Electric motors, generators, etc.	15,700
Other electrical apparatus	4,128
Total	$204,388

Metal and Minerals and Manufactures of

Brass and manufactures of	$ 130,389
Copper and manufactures of	52,206
Gold, silver and aluminum leaf, Dutch or Schlag metal leaf	31,359
Other gold, etc.	27,244
*Iron and steel manufactures of	2,824,900
Lead and manufactures of	10,441
Tin and manufactures of	29,763
Zinc and manufactures of	108,736
Miscellaneous metals and minerals and manufactures of	299,911
Total	$3,514,949

*The principal iron and steel manufactures of ore are as follows:

Iron and steel in sheets or rolled shapes	$ 132,294
Billets of iron and steel	68,728
Ferro-silicon, spiegeleisen and ferro-manganese	194,999
Cutlery	379,890
Total machinery	252,689
Locomotive tires and car wheels (steel in the rough)	348,059
Tubing	291,243

An examination of the above tables will show the relative value of the mineral products and manufactures imported, and a study of conditions will indicate whether they may be produced in Canada or not.

W. J. D.

GRANBY COPPER SMELTING PLANTS AT GRAND FORKS AND ANYOX, B.C.*

By A. W. G. Wilson.

Granby Consolidated owns 1,100 acres of mineral lands in the Phoenix camp of the Yale mining division, and 61 acres of land, containing a limestone quarry near Grand Forks, all being in British Columbia. Property ownership includes one hundred town lots in Phoenix and Grand Forks. The company also owns a large smelter site about a mile from Grand Forks. The ownership of all the capital stock of the Hidden Creek Mining Company gives the Granby Company virtual ownership of considerable areas of mineral lands, a smelter site, and the townsite of Anyox at Granby bay, on Observatory inlet, about 110 miles from Prince Rupert. The company also owns about 5,000 shares of Crow's Nest Pass Coal Company's stock.

The following descriptions of the smelting plants were written before the Anyox smelter was in operation. Through the courtesy of the Traylor Engineering and Manufacturing Company, it has been possible to include a brief description of the new furnaces and converters built for the Anyox plant.

Granby Smelter, Grand Forks, B.C.

This smeltery is located about three-fourths of a mile from the town of Grand Forks, Grand Forks mining division, British Columbia. It is situated in the valley of the North fork of the Kettle river on a bench standing about 100 ft. above the river level. This location is about 24 miles from the mines at Phoenix, the chief source of the ore supply, and about 3,000 ft. below it. The works are served by both the Canadian Pacific and Great Northern railways.

The plant was built primarily to reduce the ores from the company's own mines at Phoenix. The original plant, consisting of two furnaces, 44 in. by 160 in. at the tuyeres, with water power and dam, was built in the years 1899 and 1900 and blown in August 21, 1900. These furnaces were hand charged from a car extending their whole length and feeding from the side. The capacity was 700 tons per day. The slag was granulated, and the matte containing 50% to 60% copper was shipped to the refineries of the Nichols Chemical Co. near New York. The operation of this plant was so successful that plans for two similar furnaces and a converter plant were prepared. These furnaces, numbers 3 and 4, and three converter stands, 72 in. by 100 in., were installed and in operation in 1902. At this time additional power was obtained under contract from the Cascade Power Co., operating on the main branch of the Kettle river, 10 miles below Cascade, B.C. Blister copper 99% pure was consigned to New York; converter slag was returned to the blast furnaces.

In the year 1904 furnaces No. 5 and 6, similar to the others, were added. At this time the system of end charging, designed by Mr. A. W. Hodges, the then local manager, was introduced, changing from hand feed to mechanical feed.

In 1905 furnaces Nos. 7 and 8, 48 in. by 213 in. at the tuyeres, were erected. These furnaces were designed to make a higher grade matte than was ordinarily obtained in the earlier furnaces. The bosh was increased and carried directly to the bottom of the furnace, the width at the tuyeres was increased and the tuyeres of the new furnaces were 3.5 in. in diameter, set at 8 21/32 in. centres, instead of 5 in. tuyeres set at 17.75 in. centres, as on the old furnaces. By the end of 1906 all the furnaces were enlarged to this size. At this time the capacity of the plant was 3,000 to 3,500 tons of Granby ore per day. Additional power was obtained from the Bonnington Falls power plant. In this year the Great Northern railway was built into both mines and smelter. No further enlargements took place until 1909.

In 1909 six of the furnaces were enlarged to 260 in., and Nos. 7 and 8 to 266.5 in. in length, and were all made 4 ft. deeper, increasing the ore column from 9 ft. to 13 ft. Two of the old converter stands were also taken out and three 84 in. by 126 in. electrically operated converters installed in their place. These new furnaces have a capacity of 4,000 to 4,500 tons of Granby ore per day with cleaner slag and less fuel. The actual tonnage treated averages less than 4,000 tons per day. The converter capacity is 100,000 lbs. of copper per day.

During the period of expansion of the blast furnace and converter departments of the work, the other departments tributary to these were correspondingly enlarged by the addition of new equipment. The storage bin capacity was increased from 1,000 tons in 1900 to 9,000 tons of ore and 7,000 tons of coke in 1907; new rotary blowers and blowing engines were added; a new steel flue dust chamber with mechanical dust conveyor in part replaced the old brick chamber; the slag dump had become so large that it became necessary to substitute a haulage system; the early wooden buildings were replaced by steel, or steel and brick structures; additional power was procured from the Bonnington Falls plants.

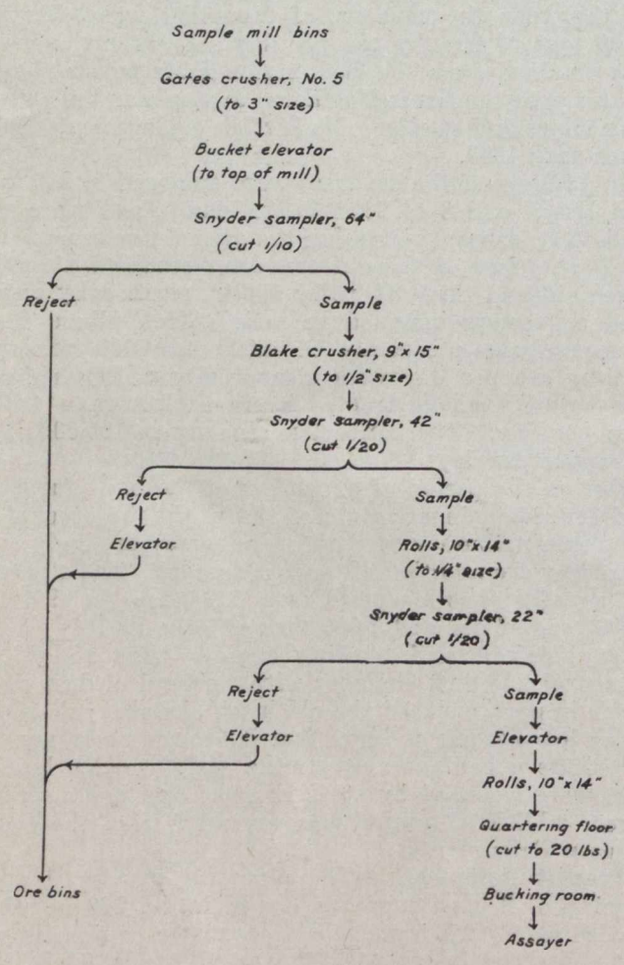
Present Equipment.—The plant, as it now stands, consists of 8 blast furnaces, six 48 in. by 260 in., and two 44 in. by 266.5 in., and a converter equipment of three electrically operated converter stands, 84 in. by 126 in. with 10 shells. The blower department is fully equipped to supply both blast furnaces and converters. Ample storage capacity for ore and coke is provided; an efficient haulage system and a new plant for distributing and disposing the slag have been installed. The works are served by shops fully provided with tools for making all necessary repairs and for executing designs of new equipment. There is a small power plant, a pumping and fire protection system, a sample mill, and an assay laboratory. The plant as a whole is capable of handling 4,000 to 4,500 tons of Granby ore per day, and of producing 50 tons of copper. It is well laid out, is easily operated, and on the whole is provided with good machinery and good buildings.

Power.—The power used in operating the works is wholly electric. The company's own power plant on the North Fork of the Kettle river is capable of generating about 400 h.p., the balance of the power needed is obtained from the lines of the West Kootenay Power and Light Co.

*(Extract from report on copper smelting industries of Canada, published by the Mines Branch, Ottawa).

The company's power dam is located about a mile above the smelter. This is a rock filled crib dam, 12 in. by 12 in. timber; it is 65 ft. in length, 127 ft. in width, and 26 ft. in height. It backs the water to form a lake of 600 acres. The 9 ft. by 11 ft. flume leading to the power house is 5,600 ft. in length, and has a fall of 0.03 ft. per 100 ft. It delivers water to the wheels under a 45 ft. head.

The power house is a wooden structure, 22 ft. by 168 ft., placed about 100 ft. lower than the smelter and 1,000 ft. away. The installation includes three 180 k.w. alternating current generators, each direct connected to two 16 in. American turbine wheels, generating current at 440 volts; one 180 k.w. alternating current generator, similarly connected, generating current at 2,200 volts for transmission to Grand Forks; and one 22.5 k.w. direct current generator, direct connected to a 10 in. turbine wheel, generating current at 125 volts for excitation and lighting. There is also a 13 in. turbine wheel driving two 40 h.p. triplex pumps. All the switchboards and meters necessary for this plant are also placed here.



Flow Sheet of sample mill No. 1, Granby Consolidated Mining and Smelting Co.

Power from the No. 2 plant of the West Kootenay Power & Light Co. reaches the transformer station at Grand Forks over two 3-phase, 60 cycle, 60,000 volt lines. At this station it is stepped down to 440 volts, the voltage for which all the motors in the works are designed. The transformer station for these lines is equipped with two banks (four transformers) 1,250 k.w. each, 60,000/440 volts, oil insulated, water cooled transformers, manufactured by the Canadian Westinghouse Company. All switchboard apparatus, motor operated oil break switches, lightning arresters, etc., are manufactured by the Canadian General Electric Co. When this installation is complete there will be two banks (six transformers) 1,250 k.w. each, 60,000/440 volt, oil insulated water-cooled transformers.

The No. 3 power plant is connected with two 3-phase 60 cycle, 22,000 volt lines to the Grand Forks sub-station. The equipment at this sub-station consists of one bank (three transformers) 312.5 k.w. each, 20,000/500 volt transformers, oil insulated, natural cooled, together with its switchboard apparatus, Westinghouse manufacture.

Power for use in the works may be taken from either plant.

Receiving Ores.—Ores are received over the lines of the Canadian Pacific and Great Northern railways. Each has its own yard, but the yards are connected by cross-overs. A switch engine is maintained jointly by both roads to handle all ore, coke, and freight passing through either yard.

A scale house between the yards and the ore and coke bins is so placed that the scales are easily accessible to both yards and bins. This house covers one 36 ft. and one 50 ft. 80-ton track scales. All cars are weighed in and empties are weighed out. These scales are inspected by a Dominion Government inspector every three months.

The ore bins are located on a terrace east of the main works and at a higher elevation. The ore cars are run from the yards to track over the bins. There are five sets of storage bins, built of wood, parallel to each other and 756 ft. in length; they are built high enough for the charge cars to pass beneath to be loaded by gravity. The dimensions and capacity of these bins are as follows: No. 1 ore bin, 20 ft. high, 17 ft. wide, bottom slope 45 deg.; No. 2 coke bin, 25 ft. high, 17 ft. wide, bottom flat; No. 3 ore bin, 25 ft. high, 20 ft. wide, bottom slope 45 deg.; No. 4 coke bin, 25 ft. high, 20 ft. wide, bottom flat; No. 5 ore bin, 25 ft. high, 20 ft. wide, bottom slope 45 deg.

The bottoms of the bins are made of two thicknesses of 2 in. plank. It will be noted that the coke bins are arranged alternately with the ore bins; the loading chutes from parallel sets of ore and coke bins open to the same line of track greatly facilitating the loading of the charge cars. The capacity of the ore bins is 12,000 tons; in addition there are bins holding 5,300 tons at the sample mill, giving a total ore storage capacity of 17,300 tons. The coke bins are of 7,000 tons capacity; yard storage of an additional 12,000 tons of coke is also provided.

Sample Mill.—The metal content of the ore is very uniform and very careful sampling is not required. The practice is to send about one car in ten to the sample mill bins; this is recrushed and sampled automatically in 1,000 ton lots. There are two Snyder Automatic sampling mills, built of wood, placed 35 ft. from the receiving ore bunkers. No. 1 mill, 64 ft. by 50 ft., has a bunker capacity of 500 tons and samples only Granby ore and the less siliceous ores. Two additional sets of storage bins, used chiefly for storing custom ores, are also provided near the mill. The flow sheet of the mill sampling custom ores is shown in the accompanying illustration. The equipment of the other mill is similar.

Granby ores being very uniform are left as coarse as is consistent with accurate sampling; siliceous ores, some of which are required for converter linings, are crushed to less than half inch size. In both mills the first crusher is a Gates gyratory crusher reducing the

ore to 3 in. size; it is then elevated to the top of its respective mill. From this point the treatment is different except that Snyder samples cutting one-twentieth are used in both mills.

Granby ore is cut at the top of the mill, the discards and all subsequent discards pass to storage bins and thence directly into charge cars; the sample passes to a Blake crusher which reduces to 0.5 in. size. The sample then successively passes a Snyder sampler, rolls set at 0.125 in., a third Snyder, and thence to the quartering floor, from which a 20 lb. sample is sent to the bucking room.

In the siliceous ore mill where the ore requires to be finely crushed, two separate operations take place. The sample first cut passes to a storage bin that receives the whole initial sample from a shipment. The discards pass over a half-inch grizzly to a crusher and two sets of rolls, reducing to half inch size, all the crushed ore being then elevated to receiving bins, the samplers being idle meanwhile.

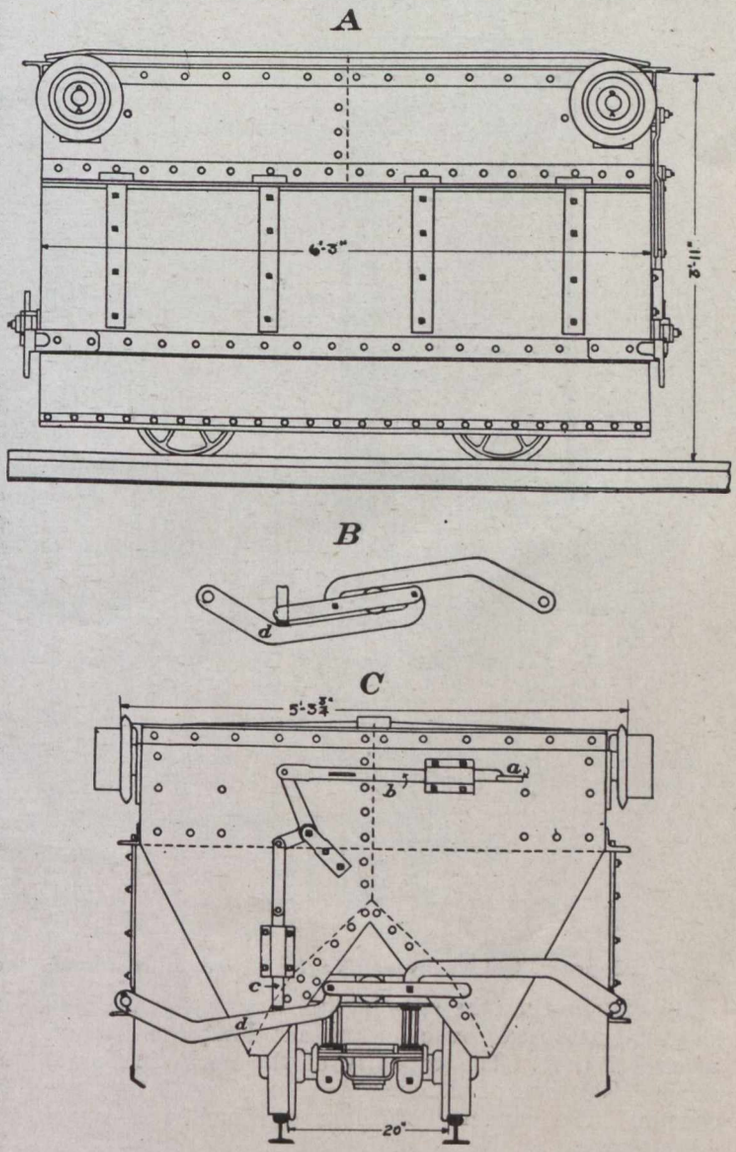
When the first discards have been treated and stored the chute of the sample bin is opened and the sample undergoes a similar treatment and is cut after each reduction in size; the sample from the last roll is split on a 1 in. riffle, and then quartered by hand. The mill has a capacity of 40 tons per hour.

Haulage and Distributing System—A system of tram car trucks, 20 in. gauge and 30 lb. rails with cross over switches, is laid on the charging floor level; these tracks run beneath the bins, the chutes of which are placed 6 ft. above this level, and lead to the furnaces.

The charging cars are designed specially for feeding the furnaces from the end. As shown in end view these cars are divided longitudinally into wedge-shaped sections, each closed by a side door which is hinged at the top; the wedge-shaped ridge which covers the truck of the car serves to spread the charge in the proper place along each side of the furnace. A transverse partition further divides the car into four compartments. The cars are provided with two sets of wheels. The lower or truck set are for ordinary locomotion over the charging floor tracks; the upper set, one wheel being placed near the corner of each car, engage in pairs with heavy rails set in the inside of the furnaces in the walls, and carry the load while the cars are in the furnace. The rails on the charging floor end at the mouth of the furnace, but as a car leaves the floor rails the hanger wheels engage with the sloping ends of the furnace rails and so the car passes into the furnace. When the cars are completely inside of the furnace the feeder by means of a long hook, inserted at A (Fig. C) pulls the release arm b. This in turn raises rod c and lifts gate arm D over centre unlocking the side doors, and the weight of the load then opens the doors, permitting the charge to drop into the furnace. The gate arms are shown closed in Fig. B and open in Fig. C and d. To facilitate discharging, the locks of the cars are chained together so that they will dump simultaneously. A train can be backed into a furnace, discharged, and pulled in 10 to 20 sec. The hoppers are closed after the train of cars is withdrawn from the furnace.

A charging train consists of three charge cars (whose combined length is just equal to the length of a furnace) and a 30 h.p. Westinghouse electric locomotive for hauling; one train serves two furnaces.

A slag haulage system was installed at the plant and was in use for a number of years. Each furnace was served by six slag cars 44 cu. ft. capacity each, three being used on each side of the small settler. These cars were handled by 14-ton Davenport steam locomotives, cylinders 9 in. by 14 in., one engine handling slag cars from two furnaces six cars at a trip. Six engines and 52 slag cars were required for this service. This system was discontinued in 1911, when a special equipment for distributing granulated slag was installed. This system was subsequently modified by discontinuing the use of the transverse distributing belt carried on the high trestles, and a new type of distributor was designed. A second unit with the incline rising to the opposite direction to that in the original system has recently been installed.



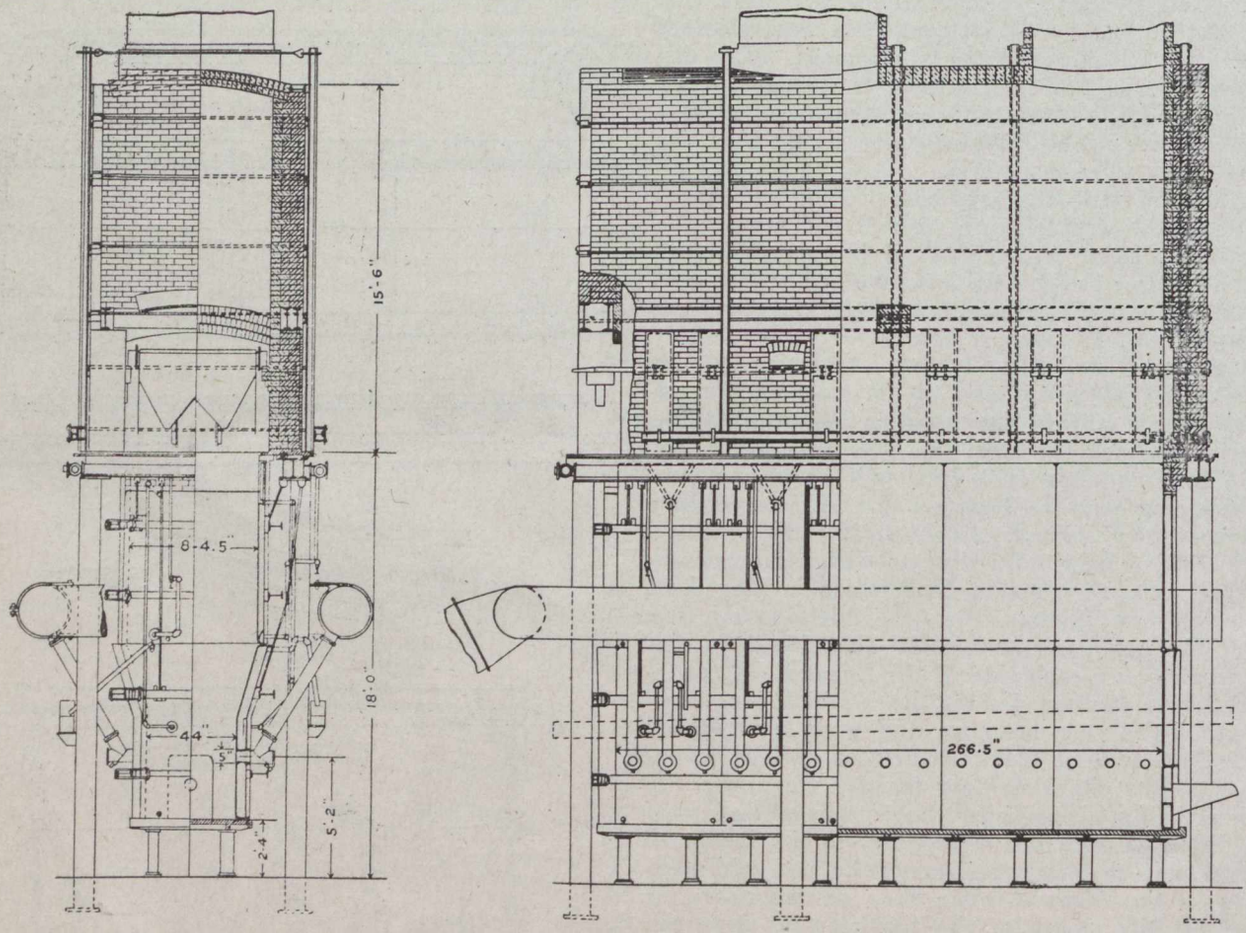
Charge Car, Granby Consolidated Mining and Smelting Co.

Granulated slag is now delivered to special drainage bins; the hoppers of these bins discharge to a belt 30 in. in width, running under the bins and extending for 40 ft. beyond them on each side. This belt can be driven in either direction to feed the belt on either incline. The conveyer to the north lifts the slag up an 18 deg. incline to a height of 120 ft. above the older dumps, where it delivers to a distributing car described below. The new conveyor to the south has an inclination of 18 deg. 26 min. and runs over 36 in. pulleys set 317 ft. centre to centre; the top is only 60 ft. above the old dumps. Special distributor cars receive the slag at the tops of the respective inclines, and deposit it where

required within a limited radius. The car on the older incline is 40 ft. in length, and carries a 24 in. belt. The car can be made to extend forward 20 ft. in front of the rails. It is pushed forward, as required, by a jack having a maximum extension of 3 ft.; it is held in place when discharging by being clamped at the heel to the 56-lb. rails on which it runs; the car may also be swung from side to side as required. The belt is longer than the car and extends below it to a tightener. As the car is projected forward new sections will be built in at the rear. The newer car on the south incline is similar to that on the north, except that it carries a 30 in. belt.

leading to a square brick stack, 11 ft. by 11 ft. by 153 ft. The converters are connected by downtakes with this latter flue. A partition in the main steel flue prevents an undue amount of furnace gases passing to either stack. The brick flues or chambers are provided on either side with hand doors at 6 ft. centres, through which the flue dust can be raked out.

Buildings.—The principal buildings on the property are of fireproof construction, steel, or brick and steel. The ore bins, the sample mill, and the various shops of the mechanical department are of wood. The furnace building is of steel, with roof and sides of corrugated



Copper Blast Furnace, Granby Consolidated Mining and Smelting Co., Grand Forks plant. (After Lathe.)

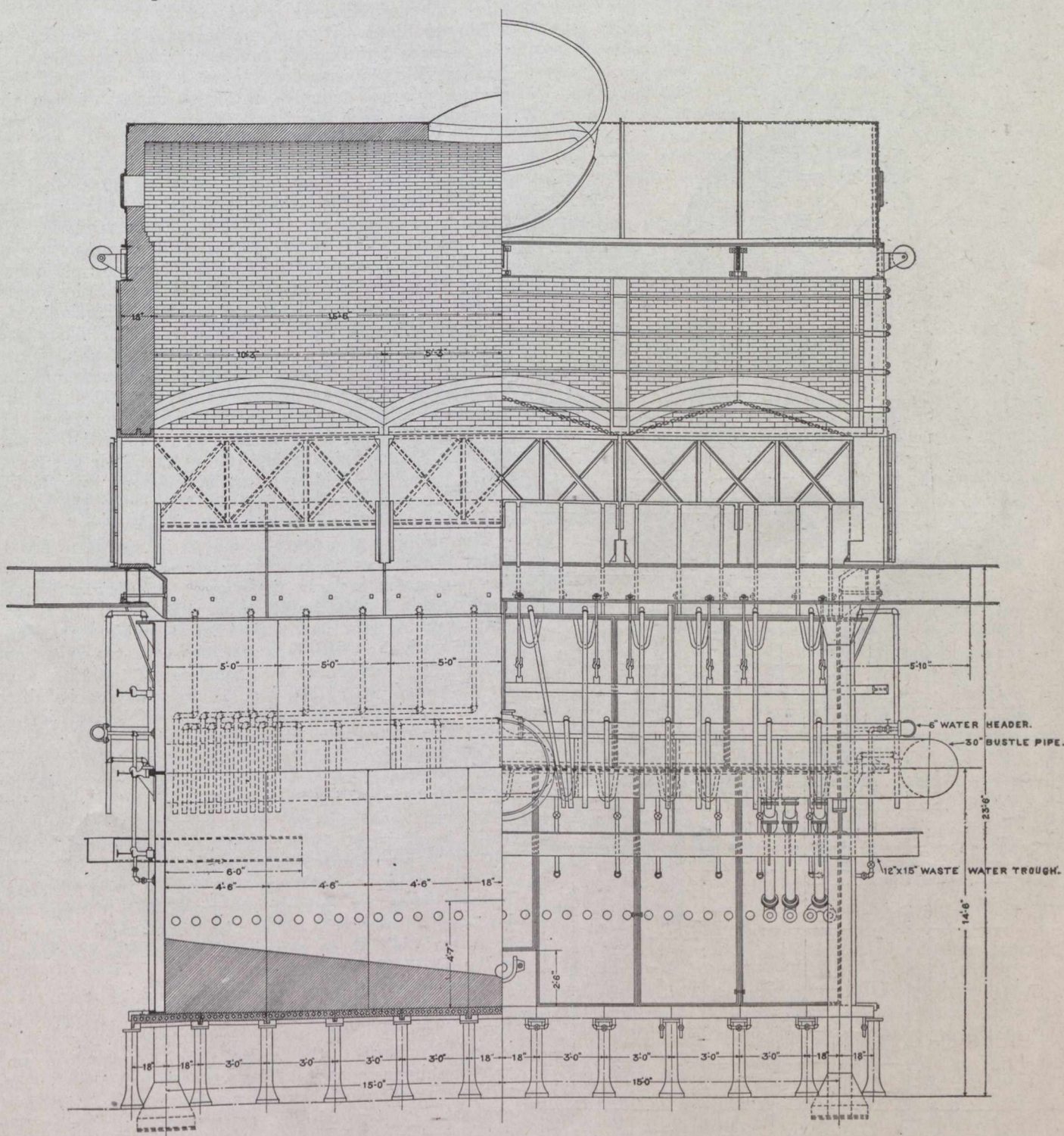
By distributing the slag in this way the granulated slag will be spread over the present dumps to a depth of over 100 ft. The capacity of the north incline is about 5,000 tons of slag per day, or about 3 tons per minute. The capacity of the south incline is somewhat larger.

Flue System, Stacks.—The eight furnaces are each provided with uptakes 6 ft. in diameter, with dampers, which can be raised if needed; these are seldom used. They are also provided with 6 ft. downtakes leading to an overhead steel flue-dust chamber paralleling the furnace building. This flue is 12 ft. above the feed floor, it is 19 ft. wide, 15 ft. high, 313 ft. 7 in. long; it is built of 3/16 in. and 5/16 in. steel plates. It has 28 hoppers in the bottom in which the flue dust collects. The dust is discharged through 9 in. openings into a trough kept clean by a wire rope drag conveyer. One end of the steel chamber connects to a brick flue 10 ft. by 15 ft. by 448 ft. leading to a brick stack 13 ft. in diameter and 153 ft. high. The other end also connects with a brick dust chamber, 10 ft. by 10 ft. by 340 ft., iron, 71 ft. wide, 289 ft. in length, and provided with a leanto 9.5 ft. wide and 12 ft. in height. It contains eight rectangular water-jacketed blast furnaces, each placed with its longer horizontal axis at right angles to the longer axis of the building. The average distance, centre to centre, of the furnaces is 36 ft.; the height from furnace floor to feed floor is 18 ft.

The converter building lies end to end with the furnace building, it is of steel construction with corrugated iron roof and sides. The main building is 42 ft. wide, and 240 ft. in length; the east leanto is 23 ft. wide, and the west leanto 32 ft. in width.

There are two buildings for housing the blowers. No. 1 lies north of the furnace building; it is a steel building with brick walls, a concrete floor, and corrugated iron roof, 57 ft. by 128 ft. 9 in. The main blowing engine building is placed back of the converter building. It is of steel, with brick walls, concrete floor, and corrugated iron roof. The main building is 55 ft. 4 in. by 212 ft. 9 in.; it is provided with an L 41 ft. 2 in. by 73 ft.

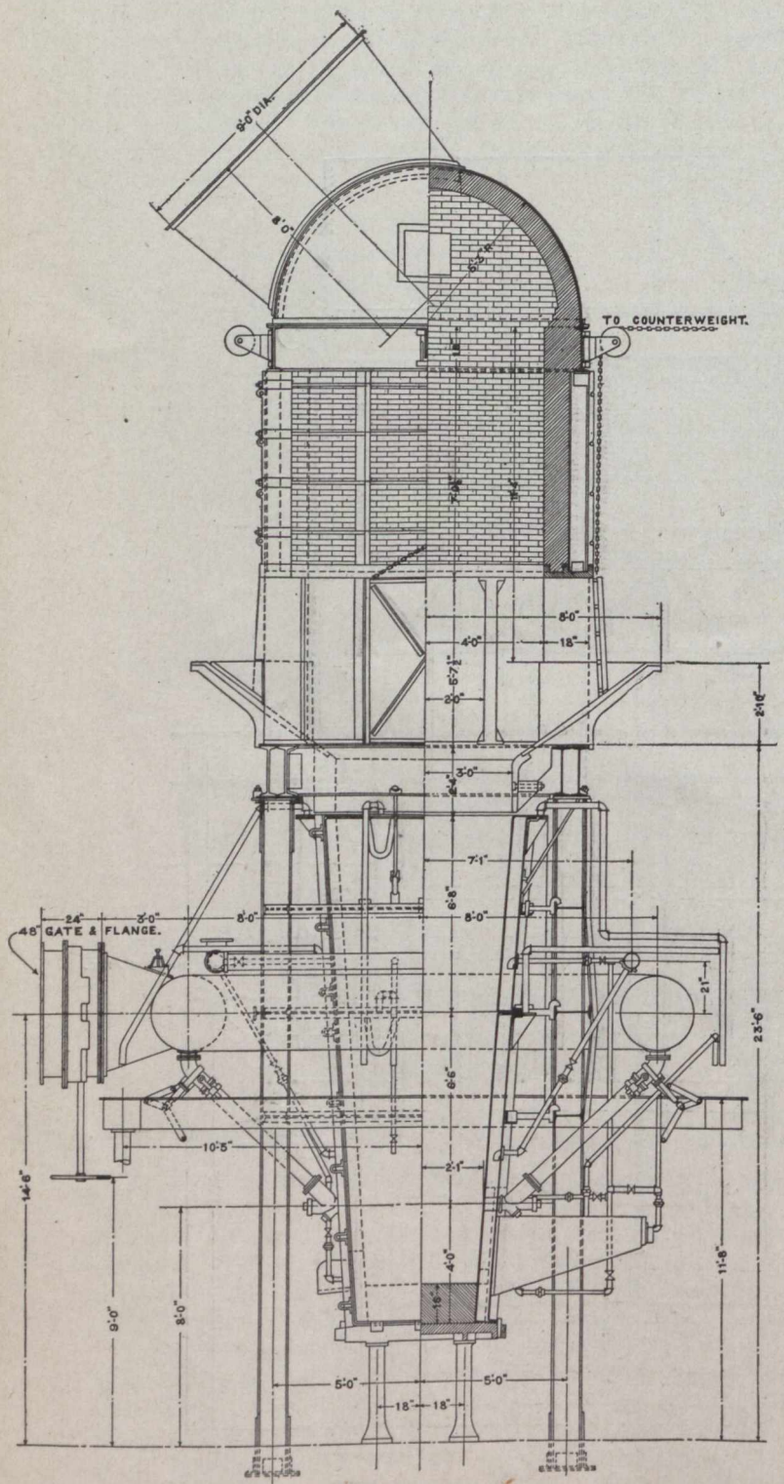
Shops.—The mechanical department of the plant includes the following buildings: machine shop, boiler shop, blacksmith shop, engine roundhouse, store room, and electrician's workshop. All are of wooden construction; on the whole they have been found too small for the needs of the plant.



Copper Blast Furnace, Anyox plant, Granby Consolidated Mining and Smelting Co. Vertical longitudinal section.

The machine shop is 27 ft. by 97 ft. It contains a planer, 30 in. by 32 in., with a 9 ft. table; one lathe 16 in. swing, 5 ft. centres; one lathe 32 in. swing, 12 ft. centres; one McCabe double spindle lathe, 26 in. and 48 in. swing, 12 ft. centres; one milling machine capable of milling 14 in. gears; one Bickford radial drill press 5 ft. swing arm, 24 speeds, Universal table; one No. 4 drill press; Curtis and Curtis pipe cutter cuts pipe from 215 in. to 12 in.; one bolt cutter; one small pipe machine; two power hack saws; one hydraulic wheel press 40 tons pressure. The boiler shop is 40 ft. by 50 ft. It contains a Whiting punch, No. 6, 13/16 in. hole through ¾ in. steel plate; air tools such as rippers and hammers; one power shears for cutting steel plates; one set 5 ft. rolls; one set pneumatic clamps. The blacksmith shop, 28 ft. by 45 ft., contains one 1,100 lb. Bement-Niles steam hammer and all the necessary tools and forges. The roundhouse, 28 ft. by 36 ft., holds two engines at a time and has repair pits under each track. The electrician's workshop, 15 ft. by 24 ft., has a lathe for rewinding armatures, and other necessary equipment. There are also several storage houses includ-

ing an iron house, 50 ft. by 50 ft., and a jacket, pipe, and storeroom, 24 ft. by 120 ft. The warehouse stands isolated from the other buildings, its dimensions are 50 ft. by 70 ft. The carpenter shop, 34 ft. by 47 ft., is equipped with planers, stickers, handsaw, a wood lathe, and other necessary machinery and tools.



Copper Blast Furnace, Anyox plant, Granby Consolidated Mining and Smelting Co. Vertical transverse section.

Ore and Coke.—As already indicated, the chief source of the ores treated at this smelter is the Phoenix camp of the Boundary district, 24 miles from the smelter. A small quantity of siliceous custom ores is also purchased. Much of this comes from the Snowstorm mine in Washington. Coke is received from Fernie and Michel in the Crowsnest Pass coal-fields. It comes partly in box cars having four long slots in the bottom, for dumping; most of the supply comes in 40-ton steel coke-racks which dump outwards. Clay for use in lining converters is received from Hendrix Cut, Washington. It is dumped into the end bins near the converters. The clay bins have a capacity of 500 tons, and the discharge at the end.

Blower Plant.—Blower engine room No. 1, north of the furnace building, is equipped with the following Connersville blowers: One No. 10, 30,000 cu. ft. of free air per minute; four No. 8, 52,000 cu. ft. of free air per minute; three No. 7, 37,500 cu. ft. of free air per minute.

In the main blower engine room, in the L there are four more No. 10 Connersville blowers, 30,000 cu. ft. capacity each. The total capacity of the blowing engines is 239,500 cu. ft of free air per minute. All the blowers deliver to a common receiver, consisting of two 60 in. pipes at the back of the furnaces. Connection with the tuyeres at each furnace is made by bustle pipes. All blowers are belt driven from Westinghouse alternating current motors. The No. 10 blowers are each driven by two 150 h.p. Canadian Westinghouse, 580 r.p.m., motors, belt connected at each end, running the blower at 100 r.p.m. and supplying 300 cu. ft. of air per revolution. The No. 8 blowers are driven by one 100 h.p. motor for each blower, running the blower at 130 r.p.m. and delivering 100 cu. ft. of air per revolution. The No. 7 blowers are also driven by individual 100 h.p. motors running the blower at 155 r.p.m. and delivering 80 cu. ft. of air per revolution.

The building also contains one 12 in. by 18 in. Rand, Class E compressor, supplying air at 80 lbs. pressure for pneumatic tools in the shops. A brick and steel room within blower building No. 1 contains the 22,000 volt transformers and switchboards which are connected with the Cascade power plant for use in emergency. They include an air-cooled set of 1,000 h.p. and an oil-cooled set of 800 h.p. Blower engine building No. 2 contains the following equipment in addition to the four Connersville blowers located in the L:

One 36 in. by 36 in. Nordberg blowing engine, capacity 3,700 cu. ft. of free air per minute; one 34 in. by 34 in. by 36 in. Allis-Chalmers duplex engine supplying 6 000 cu. ft. per minute, when running 81 r.p.m.; one 40 in. by 40 in. by 42 in. Nordberg duplex engine, 10,000 cu. ft. per minute, giving a total capacity of 19,700 cu. ft. per minute. All are belt driven from Westinghouse alternating current motors, of 200, 300 and 500 h.p. each respectively. This plant is of ample capacity to operate all three converter stands simultaneously using air at 12 lbs. pressure.

Air for the tampers, when silica linings were used, was supplied at 80 lbs. pressure, by one 12 in. by 18 in. Rand Class E compressor. A motor generator set is installed to operate the cranes, tilt the converters, and run the charge system. The motor is a 200 h.p. alternating current motor, running at 850 r.p.m.; it is direct connected to two 85 k.w. generators, running at 750 r.p.m. and supplying current at 220 volts. An hydraulic triplex plunger pump, 6 in. by 10 in., driven by a Westinghouse 30 h.p. running at 850 r.p.m., supplying water at 250 lbs. pressure, is also located in this building. This plant is used for operating the slag casting machine and the wheel press in the shops when the high pressure line is in trouble.

Copper Blast Furnaces.—The plant is equipped with six furnaces, 44 in. by 260 in. having 4.5 in. tuyeres, 18 in. centres, and 12 in. bosh, and two furnaces 48 in. by 266½ in., 3.5 in. tuyeres, 8 in. centres, 12 in. bosh.

These furnaces are served by two 12 in. water mains and two 60 in. blast mains, directly behind and running the entire length of the building in front of the furnaces. There are two 10-ton Morgan Engineering Co.'s cranes installed, one being kept in reserve. Each crane has three direct current motors, and is used for handling all heavy material and to deliver matte to the converters.

The furnaces are numbered in order beginning at the north end. Furnaces Nos. 1 and 8 are three jackets high, the others two; furnaces Nos. 5 and 6 have 60 small tuyeres, while the others have 30 tuyeres of the larger size. On furnaces 5 and 6 the upper jackets are placed vertical, while the lower jackets, which are straight, are set at an angle from the vertical; the upper jackets on the other furnaces are also vertical, but the lower jackets are boshed.

The portions of these furnaces above the water-jackets are built of brick, ordinary red brick being used outside, and firebrick inside for those parts which are exposed to greater heat. The brickwork is bound with 56 lb. rails, I beams and buckstays are used to hold the jackets in position.

The jackets are of riveted steel, fire plates 7/16 in., air plates 3/8 in. The circulating water enters the upper jackets and flows thence to the lower jackets; all the jackets have deflectors to throw the cold water to the bottom. About 2,000 gallons per minute are required by the eight furnaces, which is equivalent to 3 gallons per minute per sq. ft. of hearth area. Water enters at a temperature of 35 deg. to 50 deg. F. and issues at 140 deg. F.

Each furnace is provided with a water cooled trap spout; the trap is 5 in. to 5.5 in.

There are two settlers for each furnace. The one next the furnace, which receives the continuous flow of matte and slag, is rectangular in section, 72 in. by 90 in. with rounded corners, and 36 in. deep. It is surrounded by a continuous 2 in. water-jacket, the inner plate 3/8 in., the outer 1/4 in. steel. The removable bed plate is of cast-iron 2 in., in thickness. To prepare a settler for use a course of firebrick is laid in the bottom, then both bottom and sides are lined with the quartz-clay cement material used for lining the converters. A lining of one course of red brick and one course of firebrick is also used.

The life of a settler depends upon the rate at which it fills with metallics; when the bottom becomes high enough to materially decrease the capacity of a settler it is replaced by one newly lined. The metallics are then removed from the former and broken up with a heavy ball weight.

The second settler is similar to the first, but smaller, 48 in. x 60 in. and receives the slag overflow from the latter. The slag overflow from this settler discharges into granulating water and is washed to the draining bins, whence it passes to the slag elevator. A third small settler is sometimes introduced between this second settler and the granulating stream. Recently some experiments have been made in introducing as many as six settlers in a string. The additional saving has barely paid the cost of the operations.

Converter Plant.—The converter equipment consists of 3 converter stands, electrically operated by 25 h.p. motors, and 10 shells, 84 in. by 126 in., by the Power and Mining Machinery Company. There are also trucks carrying moulds for metallic copper, and a slag-casting machine and conveyer.

During the summer of 1912 experiments were made in lining the acid shells with a basic lining and the relining plant was not in use. The relining equipment, which was still in place, included three Allis-Chalmers self discharge mortar mills, two 7 ft. pans, and one 6.5 ft. pan. The shells were tamped with air rammers. All machinery was driven by a 75 h.p. motor. When acid lined converters were used the practice was to line with chrome brick placing some magnesite brick around the tuyeres; inside this was placed a 2 ft. layer of siliceous ore cemented with clay and well tamped; silica brick was used on the caps.

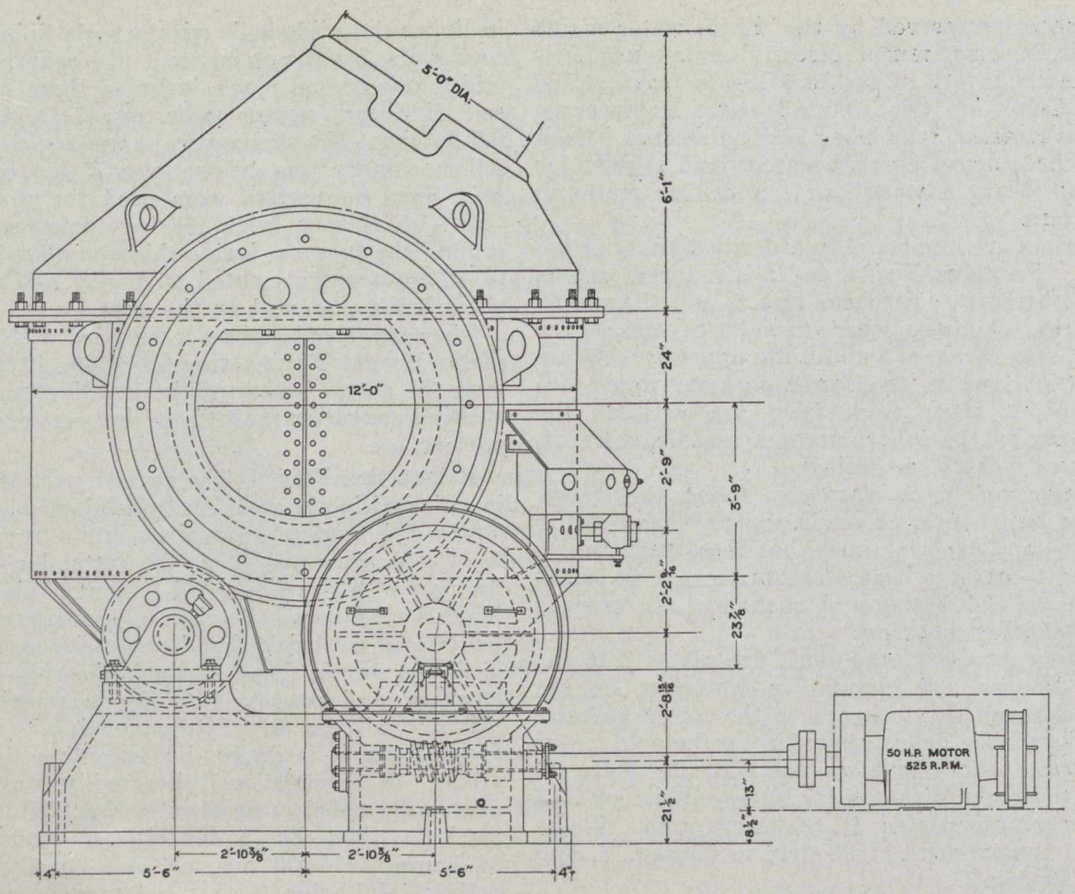
The converter building is supplied with a 40 ton four motor Morgan Engineering Co. crane, 42 ft. span, which runs the entire length of the building, and is used for shifting converter shells, handling matte, charging converters, etc.

Briquetting Plant.—The greater part of the flue dust is collected in the steel dust chamber, whence it is discharged through 9 in. openings into a trough kept clean by a rope drag conveyer. The attendance of one man for part of a day is needed to control the flow of dust from the hoppers; all other movements are automatic. Dust from the brick chambers at either end of the flue is drawn out by hand through the side openings into barrows, and conveyed to the briquetting mill. At this mill all the dust is dumped into a receiving bin from which it is drawn by an automatic feeder to a mixer. It is moistened thoroughly, no binder being necessary, and then passes to a No. 2 White briquetting machine which has a capacity of about 50 tons per 24 hours, or 4,000 briquets per hour. The machine delivers the briquets to a belt conveyer which transfers them to charge cars; they are recharged without drying.

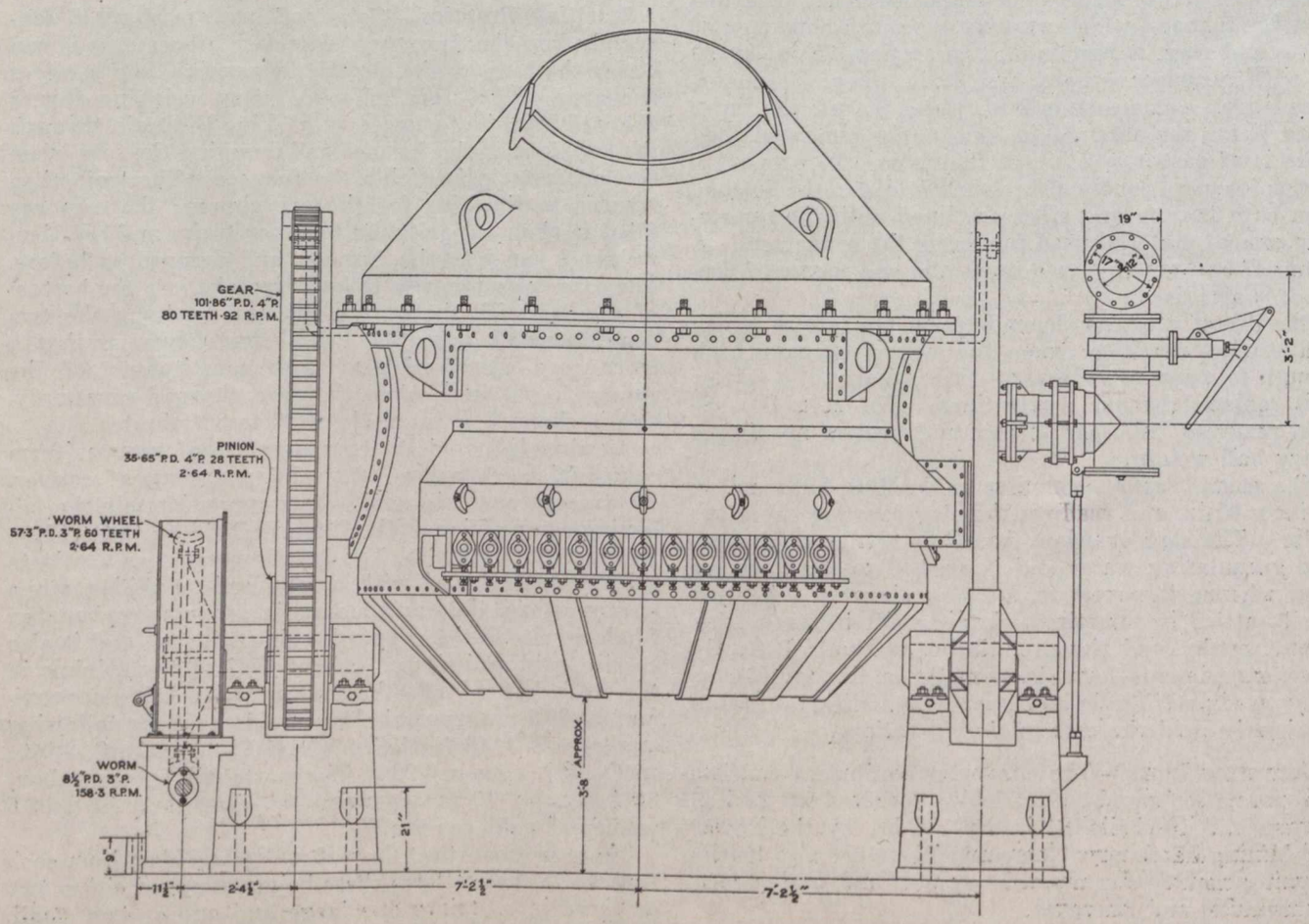
Smelting Practice.—Coke and ore are charged separately into the furnaces. A train of three cars is run under the bins by the electric locomotive, and receives a charge of 1¼ tons of coke; after weighing this is charged into the furnaces by backing the train through the end door of the furnace and dumping the cars when the entire train is within the furnace. The train then returns to the bins for the ore charge; the cars are filled to their capacity, 10 tons per train, and are then weighed, run into the furnace, and dumped as before. The former custom was to load the coke into the bottom of the car with the ore on top and to dump the two simultaneously; practice has shown, however, that a more even distribution of both constituents of the charge is obtained when they are charged separately. Ore is charged at intervals of 20 to 30 minutes.

As already noted Phoenix ores are of very uniform composition, carrying 1.2 to 1.6 per cent. of copper. An average analysis would show approximately the following composition, SiO_2, 35%; FeO, 13%; CaO, 17%; Al_2O_3, 8%; MgO, 3%. The iron is present as a silicate chiefly, uncombined with oxides and sulphides, while nearly all the lime and magnesia occur as carbonates. Chalcopyrite is the copper-bearing mineral, and it also carries gold and silver. About 65% of the sulphur in the ore is burned off—the concentration being approximately 32.1. A typical slag would show the following analysis: SiO, 45%; FeO, 15%; CaO, 22%; MgO, 3.8%; Al_2O_3, 7%; copper 0.22%. The matte will average about 35% copper, 10 to 15 ounces of silver, and 1.6 to 2.6 ounces of gold per ton.

There is a constant flow of matte and slag from each furnace to the settlers; these being arranged either two or three in a string, one large and one or two small. The furnace slag from the last settler is discharged



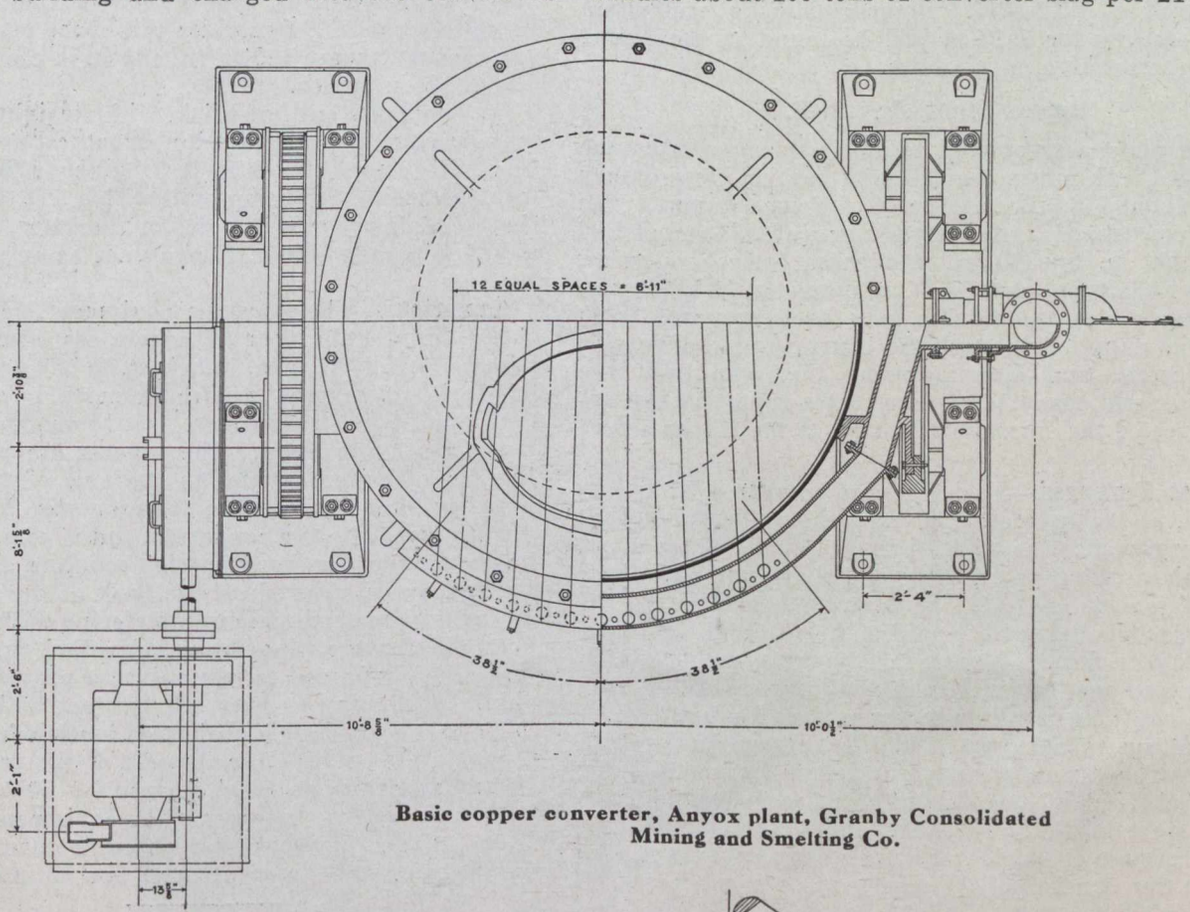
Basic copper converter, Anyox plant, Granby Consolidated Mining and Smelting Co. Vertical transverse section.



Basic copper converter, Anyox plant, Granby Consolidated Mining and Smelting Co. Front elevation.

into granulating water, which sweeps it down into the drainage bins, whence it passes to a belt leading to the distributor. The matte is tapped at intervals into 5-ton pots in which it is conveyed to the converter building.

Matte pots are received by the 40-ton crane in the converter building and charged into the converters. dumps into a bin from which the slag can be drawn into steel railway cars. The converter slag is transferred to the charging bins and thence to the blast furnaces as part of the charge. This conveyor is driven by a 5 h.p. motor at a speed of 20 ft. per minute. It handles about 100 tons of converter slag per 24 hours.

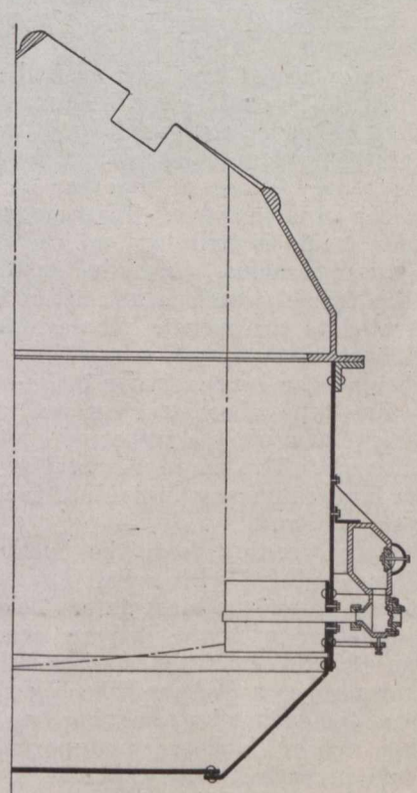


Basic copper converter, Anyox plant, Granby Consolidated Mining and Smelting Co.

There is no definite quantity of matte per charge as the converters are seldom run to their capacity. The blast is used at about 12 pounds per sq. in. Converter copper carries 99.5 to 99.6 per cent. copper, 25 to 37 ounces of silver, 4 to 6.5 ounces of gold per ton. The impurities shown by an average analysis were as follows: Fe, 0.17%; S, 0.11%; As, 0.014%; Sb, 0.008%; Se and Fe, 0.012%; Ni and Co, 0.123%; Zn, 0.004%; Pb and Bi, none.

Converter copper is run into moulds carried on a truck. These trucks are 16 ft. in length and run on 44 in. gauge tracks, and there are 3 trucks to a stand; each truck carries 8 moulds 33 in. by 24 in. outside dimensions, forming a continuous row from car to car. When a converter is ready to pour, a train of these cars is drawn underneath this converter by a wire rope operated by a motor driven drum. The converter is turned over and the pouring begins when the last mould is under the lip; the copper is poured in a continuous stream, the train being pulled forward as the moulds are filled. A bar of cast copper from one of these moulds weighs about 220 lbs. The bars are cobbled, removed, trimmed, and loaded directly into cars for shipment.

The converter slag is poured into pots holding about 3 tons. These are picked up by the crane and set in a tilting frame above the slag conveyer. The frame is then tilted by hydraulic power and the slag pours into the moulds of a conveyer that carries it up an inclined plane under water sprays, which cool it. The conveyer



Basic copper converter, Anyox plant, Granby Consolidated Mining and Smelting Co. Section on a tuyere.

This slag contains up to 40 per cent. SiO_2, and varying amounts of copper; the balance is principally iron oxide.

Costs.—Steady improvement has been made in cost of treatment. In 1902 cost was 4.08 per ton, in 1907 3.28, and in 1912 2.47. Figures showing production and recovery for 1913-14 will be found in the report printed elsewhere in this issue.

Anyox Plant, Anyox, B.C.

This plant was erected to smelt the ores from the Hidden Creek mines near Granby bay, on Observatory inlet, about 110 miles northeast of Prince Rupert. The plant consists of three rectangular water-jacketed furnaces, 50 in. by 360 in., and three basic converters, Great Falls type, each 12 ft. in diameter. The accompanying plates and figures have been prepared from material supplied through the courtesy of the Traylor Engineering and Manufacturing Co., who built the furnaces and converters. The plates represent the appearance of the furnaces as set up at the works before shipment.

Blast Furnaces.—Each furnace measures 50 in. by 360 in. at the tuyeres. The height from tapping floor to charging floor is 26 ft. 4 in.; the sole plates stand 4 ft. above the tapping floor, and the top of the upper tier of jackets is 17 ft. 2 in. above the sole plates, the lower jackets being 10 ft. 6 in. in height, and the upper jackets 6 ft. 8 in. There are six jackets, each 54 in. in width, and one tap hole jacket, 36 in. in width, on each side of each furnace, the larger jackets being provided with 5 tuyere openings, and the narrow jacket with three. The tuyere openings are of an improved form, the steel thimble being fused to the fire sheet, and forming a smooth joint. The outer end of the thimble projects through the air sheet, and is beaded in place. The upper tier consists of 6 jackets on each side, each 60 in. in width.

The sole plates are of iron cast around coiled pipe, through which cooling water can be circulated. They are carried on 24 pedestals, each 3 ft. 8 in. in height, the sole plate being 4 in. thick, with 2 in. flanges.

The jackets are connected together by bolts and brackets in the usual manner. To prevent bulging, a jacket binder frame is built around the furnace, between the corner columns. Cast steel spacing rods extend from this frame to each jacket, fitting into sockets that are riveted to the jacket. These binder rods fit over the I beams with a hook connection, and wedges driven in behind the binder frame make a very rigid fastening. This type of construction makes it possible to easily remove or replace a jacket without disturbing the binder frames. The simple removal of the wedges releases the binders on any individual jacket without disturbing the others.

Each blowpipe leading from the bustle pipe to a tuyere opening is fitted with a ball and socket joint, which is placed below the blast gate. This allows the blow-pipe, together with the tuyere casting, to be swung down clear of the furnace when it is necessary to remove or replace a jacket. The tuyere casting is released from the jacket by removing two hook bolts.

The upper tier of jackets is supported from the mantle frame in such a way that the lower jackets may be removed without disturbing them. The breast jackets are constructed of iron cast around wrought iron pipes for carrying the cooling water. The furnaces are arranged to be charged from either side, and the charging doors are operated by counterweights.

The furnaces are designed in such a way that the mantle frames are connected together, forming one continuous mantle for the three furnaces. The sole plates extend beyond the end jackets so that the furnaces may be extended at any time. The three furnaces are placed with two 15 ft. spaces between the middle and the end furnaces. Eventually this space may be filled, making one furnace 120 ft. in length, in place of three, each 30 ft. in length.

The hoods are built of brick, with straight sides, and semi-circular top, stayed with structural steel and tie rods. The crown stands 16 ft. 7 in. above the charging floor, the arched top being built with a 5 ft. 3 in. radius. The steel downcomber, 9 ft. in diameter, leaves the middle of a long side of the furnace at an angle of 45 deg.

Converters.—The converter equipment includes three of the Great Falls type of converters, each 12 ft. in diameter and 17 ft. 7 in. in height. They are each provided with 13 tuyeres, 2 in. in diameter, in place of the 25 to 30, 1.5 in. in diameter, used on the standard Pierce-Smith converter. The tuyeres are placed with their axes at right angles to the axis of the shell so that they blow directly into the converter. Each tuyere pipe projects into the converter, and is connected with the tuyere casting by a special coupling so designed that it may be screwed off the back of the tuyere and the casting removed without interfering with the tuyere pipes. The tuyere pipes have individual tuyeres, with the Shelby improved tuyere valve; a projection in the middle of the valve comes into contact with the point of the barring rod; this projection is made high enough to enable the bar to clear the seat of the valve.

The converters are each turned by 50 h.p. electric motors through worm gears. The equipment is designed to operate the converter through about 235 deg., or nine-tenths of a revolution in one minute.

DOME.

The Dome Mines, Porcupine, in September, made the largest gold production recorded since the mill began to take low grade ore. The amount of gold produced, $99,301.80, has been exceeded in only four months during the last fifteen. The average value of the tonnage milled was $4.52.

During September the mill treated 21,940 tons, or almost 2,000 tons more than in August, the largest month to that date.

The record of the Dome for the past fifteen months is as follows:

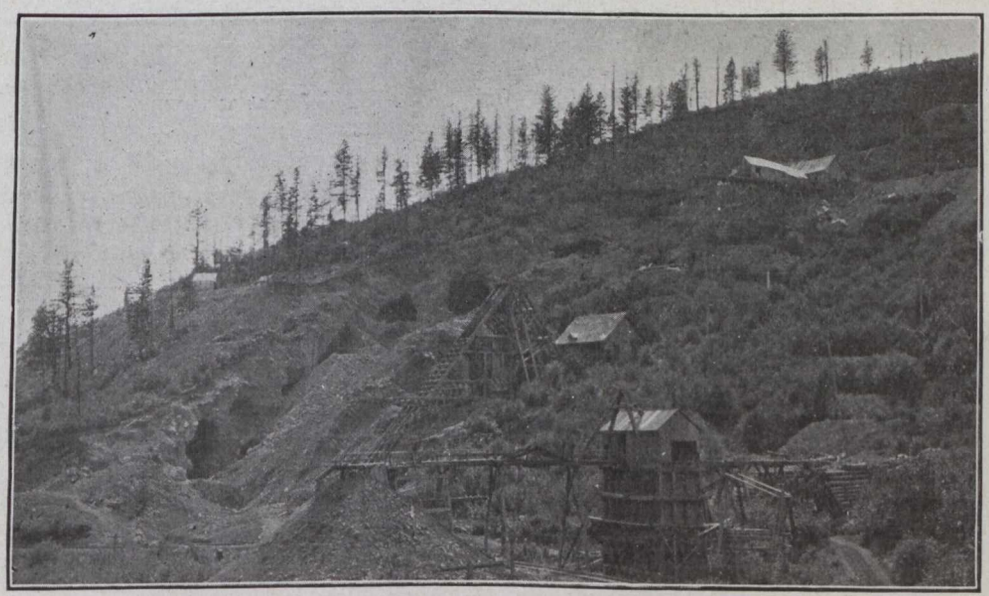
	Tons.	Value gold	Value per
1913.	milled.	produced.	ton.
July.	11,150	$75,958	$6.81
August.	10.720	67,660	6.31
September.	10.790	70.135	6.50
October	12 370	118.000	9.53
November.	13 820	121.150	8.76
December.	13,470	106,904	7.93
1914.			
January.	13 900	111.500	8.02
February.	12.010	69.000	5.74
March.	14.979	87,657	5.85
April.	14,770	97,454	6.59
May.	16,180	62,109	3.83
June.	18,250	83.421	4.51
July.	19,780	82.984	4.19
August.	20,170	90 893	4.50
September.	21,940	99,302	4.52

ANNUAL REPORT, GRANBY CONSOLIDATED MINING, SMELTING AND POWER COMPANY

The report for the year ending June 30, 1914, of the Granby Consolidated, Mining, Smelting and Power Co. has been issued. General Manager Sylvester says:

"At Phoenix the acquisition of the Snowshoe mine, adjoining the Gold Drop mine, added 140,000 tons to the total ore of the mines there, while the diamond drilling and other development work has further increased this by 142,684 tons, the total ore to date showing as 15,132,368 tons, from which has been shipped 10,440,837 tons, the balance of the developed ore being 4,691,531 tons.

"The development work for the year ending June 30, 1914, at Phoenix has been more extensive than during any previous year, and though the total tonnage increase of ore has not been considerable, a part of this increased tonnage is of higher grade than the average has continued the good showing of previous years' work; the diamond drill work and extension of drifts and raises has materially increased the tonnage of a grade of 2.2 per cent. copper (as well as the amount of ore of a lower grade), the present estimates indicating 9,563,500 tons, or 1,803,950 tons more than the report of the last fiscal year showed. In addition to this there is estimated a tonnage of 8,589,500, showing an average of 0.6 per cent. copper. While the average copper content of this ore is taken at 0.6 per cent., there is much of it having 1 per cent. or 1.25 per cent. copper, which may be mined with the higher grade ore and taken care of by the furnaces. It may develop as the operation of the furnaces progresses, that the addition of reverberatory furnaces will be desirable to properly take care of the fines from the ore and the flue dust, and following such



Snowshoe and Gold Drop Mines, Phoenix, B.C.

ore remaining in the mine. The operating cost of 80 cents per ton of ore shipped, which includes all costs of breaking, handling, timbering, development work and general expense, compares very favorably with previous years.

The exploration work and investigation of near-by mine properties, which has been carried on from the Phoenix office, and confined mostly to the district south of this point and east of the Republic camp of the State of Washington, has so far shown only negative results.

"The Grand Forks smelter treated 1,225,745 tons of ore during the year and produced therefrom: Copper, 21,181,000 lb.; silver, 407,506 oz.; gold, 43,232 oz, at a cost for smelting and converting of $1.28 per ton, which cost is as low as has ever been obtained at this plant.

Regarding the Hidden Creek properties, Mr. Sylvester says:

"The work of opening up the Hidden Creek mines and developing the orebodies during the last three years has been conducted in a thorough, systematic and efficient manner, making these orebodies easily accessible for future mining operations in producing ore for the smelter. The further development of the mines this year a provision, the concentration of low grade, high silica ores to furnish an additional product for the reverberatory plant.

"The construction of the smelter plant, with the necessary appurtenances, such as wharf, and town buildings comprising a large retail store and warehouse, office, hotel, hospital, dwellings for the families, quarters and mess for single men, railroads connecting wharf, mine and smelter plant, power house, pipe line and dam, all of which was practically started in the spring of 1913, though much of the logging and clearing had been accomplished prior to that time, was sufficiently completed by the middle of March, this year, to warrant blowing-in one of the furnaces, and beginning the metallurgical operations. This was done at that time, and the efforts of solving the problems of handling and treating most economically, new and untried ores, though slow of solution, requiring as they do experimenting with and changing of ore charge, amount of coke used, quantity and pressure of air, are meeting with success. Some of the lesser difficulties, such as breaking in and training green men to make up the necessary crews for three shifts, and the mechanical

troubles incident to starting a new plant, have been satisfactorily overcome, and much progress has been made with the purely metallurgical perplexities.

"During the year many properties located on or near the coast and tributary to the Anyox smelter, have been examined. Three of these, the Midas mine, near Valdez, the Mamie mine, at Hadley, and the Dean mine, on the west side of Kasaan peninsula, Prince of Wales island, Alaska, have been purchased, and an option has been taken on the It mine, near the Dean. Working options were also taken on some old mines at Van Anda, Texada island, north of the city of Vancouver.

"Many other properties have been examined by our men in this general district, with the result that a few of them will warrant our further interest and investigation; the balance have very little merit and are not likely to prove of value in the future. Prior to the purchase of the Midas mine, considerable work had been done, and ore developed in sufficient quantities and values to warrant not only its purchase, but the construction of wharf and shipping bunkers at Valdez bay, with an aerial tram line to the mine, mine bunk house buildings, power equipment and preparation for putting the mine on a shipping basis. When this work was started, about May first of this year, it was expected shipments would be made by October first, and the progress which has been made in constructing the several parts of the surface improvements, and the work in the mine has indicated that this expectation would have been met had it not recently been deemed desirable to curtail the company's operations at this point.

"The Mamie mine at Hadley, Prince of Wales island, was purchased after thorough examination. The subsequent preliminary work incident to clearing the mine and starting development work, permitting further examination and sampling, has shown sufficient ore of a grade of at least 2.25 per cent., to more than meet the purchase price and expense of putting the property on a shipping basis. This property was partially equipped with a boiler and compressor, with an aerial bucket tram from the mine bunkers to the old bunkers at the smelter at the beach. To ship this ore to the Anyox smelter it was necessary to construct a small shipping wharf in the Bay in front of Hadley, known as the Lyman Anchorage, and to extend the tram line to a receiving bin on the wharf, put the power plant in an operating condition, pump out the mine and otherwise prepare it for working. This work was well along, and it is probable shipments, which may be made at the rate of 8,000 to 10,000 tons per month, could have been started in October, had not work been discontinued for the same reasons which influenced this course at Valdez. The preliminary work in connection with shipping from the It and Dean properties, which adjoin one another, was well in hand. It is not likely they will ever be very large producers, probably about 1,000 to 1,200 tons per month. All three of these properties, as well as the Midas mine, may be put upon a shipping basis in a short time, whenever the general market conditions for the disposal of copper will warrant it.

"The general result of the company's campaign for new sources of ore tributary to the Anyox smelter may be stated: Examinations have been made of approximately forty-five properties, from which eight were selected for further investigation or work under option to purchase or mine the ore on a royalty basis. Of these, three have been found unsuited to our requirements, three have been purchased, while two are still under option. Of these latter, four have sufficient potential value to more than compensate for the cost of the work done on the former three, and one considerable property under option in Maple bay, upon which very little work has been done so far, remains to be considered at a later date."

Mineral Bearing Ores Treated.

Following is a summary of the year's business:

Phoenix ores smelted	1,201,955	dry tons
Anyox ores smelted	63,105	dry tons
Foreign ores smelted	23,940	dry tons

Produced.

23,320,097 lb. of copper fine, sold at average price of	$ 0.1458
435,275 oz. of silver fine, sold at average price of	.5774
43,882 oz. of gold fine, sold at average price of	20.00
The total amount realized equals	$4,504,765.91

Costs.

Working expenses at mines and smelters, freight, refining, selling and general expenses	$3,627,924.26	
Foreign ore purchased	254,770.30	$3,882,694.56

Cost per ton, including all expenses, $2.73.

Cost per lb. of copper after deducting value of gold and silver, 11.5c.

Profit and surplus.

Net profit for year ending June 30th, 1914		$ 622,071.35
Less—		
Dividends paid during year	$899,900.54	
Interest and special taxes paid	182,519.63	1,082,420.17
Surplus decrease for year		460,348.82
Surplus carried over from last year		3,199,270.73
Total surplus at credit June 30th, 1914		$2,738,921.91
There has been expended during the year for developing and equipping Anyox and other properties	$3,002,691.46	

ASSETS AND LIABILITIES.

June 30, 1914.

Assets.

1. Cost of mineral lands	$14,461,873.08
2. Cost of lands, real estate, machinery buildings, dwellings and equipment Grand Forks and Phoenix, less depreciation allowed	1,811,280.76
3. Cost of lands, real estate, machinery, buildings, dwellings, railroads, seagoing launches and vessels, mine smelter equipment at Anyox, B.C.	2,888,737.02
4. Cost of mine purchase—now under development	468,135.31
5. Stocks and bonds	514,808.92
6. Fuel and store supplies	525,096.60
7. Cash and copper	1,375,793.80
	$22,045,725.49

Liabilities.

8. Capital stock—issued shares 149,985.15 at $100	$14,998,515.00
9. Series "A" convertible first mortgage, six per cent. gold bonds, due May 1st, 1912	1,440,000.00
Series "B" non-convertible first mortgage, six per cent. gold bonds, subject to agreement for re-purchase May 8th, 1915, with interest adjusted to 5 per cent.	850,000.00
10. Loans secured by copper in transit	536,684.34
11. Loans unsecured	960,000.00
12. Accounts payable	519,555.31
13. Dividends held for liquidation	1,057.25
14. Surplus	2,739,913.59
	$22,045,725.49

At present there is "in sight" in the various properties the following quantities of ore: Phoenix, 4,691,531 tons; Anyox, 18,153,000 tons; Midas, 116,344 tons; Mamie, 135,200 tons; It—Dean, 5,000 tons. Total, 23,101,075 tons.

During the past year the company completed the following development work upon shipping properties: Drifts and raises, etc., 19,046 ft.; diamond drilling, 25,743 ft.

At Phoenix the compay can recover 17 lb. copper per ton of ore; 0.033 oz. gold per ton of ore; 0.2 oz. silver per ton of ore. The cost of mining is approximately 80 cents per ton.

At Anyox the company may mine 18,153,000 tons of ore running 1.4 per cent. copper, or 9,563,000 tons running 2.2 per cent. copper. The gold and silver values will amount to about 30 cents per ton. The cost will be approximately $1.00 per ton when mining from 1,500 to 2,000 tons per day of average mine run. This cost will decrease as the stopes are opened and enlarged.

Mr. O. B. Smith, superintendent of mines, says:

"We have done sufficient stoping to prove our former reports conservative. The ground drills well and is going to stand without timber. Up to date (Sept. 1st) the average ore shipped has been higher in copper and lower in silica and alumina than the estimates we have made.

"We are equipped and prepared to ship 2,000 tons of average mine run daily. Supporting this equipment, with a small daily output will, of necessity, increase mining costs. Also, any selective mining we may do will have a tendency to place mining costs above our former estimates."

At Midas mine there has been developed 116,344 tons of ore. This will run: Copper, 4 per cent.; gold, 0.065 oz.; silver, 0.46 oz.

This ore will be mined and delivered on the boat for approximately $2.00 per ton. A lower tunnel has been run and has encountered the ore, which holds its width and value.

At Mamie mine the ore (135,200 tons) will average 2.25 per cent. copper, and from 25 to 50 cents gold and silver. The ore has a value also as a flux. Undoubtedly a small amount of development work will increase the tonnage in sight to a great extent.

At It—Dean mines so little work has been done that it is not possible to deal accurately with tonnage and values. At least 5,000 tons of ore will run from $15.00 to $20.00 per ton. The properties are fully equipped and mining costs should not be excessive.

Granby's Gloryhole, Phoenix, B.C.

At Van Anda, Texada island, work has been discontinued. It is highly improbable that the ore there can be made to pay unless it is mined in large quantities with the country rock (limestone) and considered as a flux.

At present the company is prepared to produce the following tonnage daily: Phoenix, 3,000 to 4,000 tons; Anyox, 2,000 tons; Midas, 100 tons; Mamie, 300 tons; It—Dean, 30 tons. Total, 5,430 tons.

Grand Forks and Anyox Smelters.

Mr. W. A. Williams, smelter superintendent, says: "The Grand Forks smelter has done very good work from an operating standpoint. There has been a very high average of furnaces in blast, with good tonnages smelted; recovery good. Our losses were the same as previous year. Silica was higher in slags. Costs were a trifle lower than any former year. These results have only been attained by the careful attention of our entire crew of men.

"At Anyox we 'blew-in' the first furnace in March. With the new crew of men to be broken in to this kind

of ore and smelting, and the organization of the other departments, we have and are just getting settled.

"We have had some mechanical troubles. The settlers were hard to hold and to prevent break-outs; the converter worm-drive also gave us trouble. At the present time we have most of these troubles eliminated. Mechanically the plant is all right and operates as we intended.

"We have metallurgical problems to work out. The ore seems to contain a lot of 'fines,' especially No. 1 ore, and it looks as if it would be better to screen this, using the coarse on blast furnaces, and either nodulizing the 'fines' and flue dust, or smelting them in reverberatory furnace, and using the matte on the blast.

"The railroad department is in good working order; both cars and locomotives acting well and handling tonnage satisfactorily. With our docks and unloading equipment we are able to handle and unload any ship or barge quickly and easily. We have all the cottages erected for our present requirements, and the water and lighting systems are completed. Everything in the town department is in excellent shape. I wish to give credit to Mr. Bone and the heads of departments for their zeal and energy and the close attention they have given to organization and their work. We are gathering a good crew of men and every one seems to take interest in the plant generally."

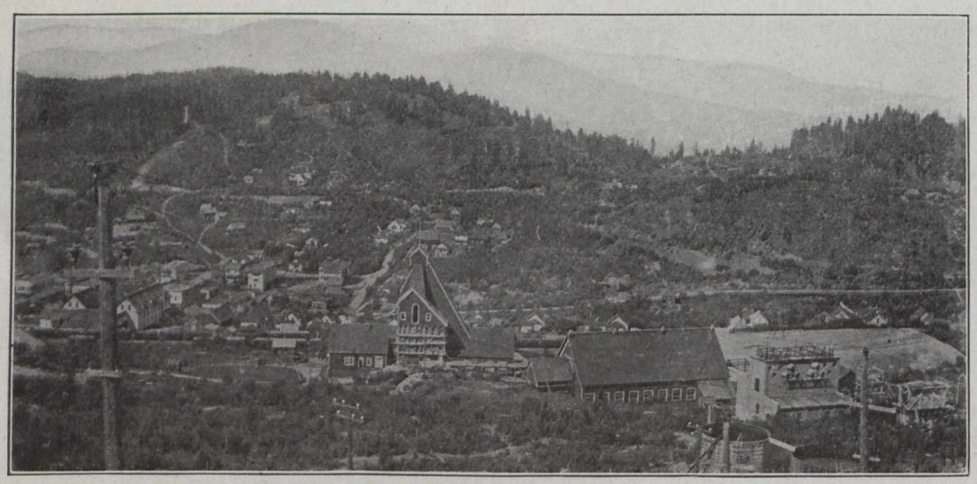
"Diamond drilling for the year amounted to 19,670½ ft. and the total to date is now 95,812 ft. The Snowshoe mine was acquired during the year.

"The average cost per ton, on cars, including all development was 80.4 cents. This means an increase of five cents per ton over last year's costs. This increase is in part due to extra development and in part to extra work necessary to mine and handle ore from outlying and thinner orebodies. In addition to this more waste was handled than ever before, the tonnage being 176,027.

"New ore developed during the year amounted to 282,684 tons. The present condition of the ore reserves is therefore as follows:

	Gold Drop.	Ironsides.	Total.
Ore developed	1,401,000	13,731,368	15,131,368
Mine has produced and shipped	1,268,737	9,172,100	10,440,837
Remaining ore	132,263	4,559,268	4,691,531

"Returns from the smelter show a recovery of 16.89 lb. of copper per ton or ore. We consider a recovery of 17 lb. can be maintained."



Victoria Shaft, Granby Mine, Phoenix, B.C.

Phoenix Mines.

Superintendent C. M. Campbell reports: "Shipments from Phoenix mines amounted to 1,202,555 tons. The following table shows an analysis of the ore shipments to date:

	Above No. 3 Tunnel	Victoria Shaft.	Gold Drop.	Totals.
Prior to July 1st, 1913	5,276,758	2,867,926	1,091,598	9,236,282
Year ending June 30, 1914	483,065	544,351	177,139	1,240,555
Total to date...	5,759,823	3,412,277	1,268,737	10,440,837

"This was the largest on record both in respect to underground work and diamond drilling. Totals for the different places and the totals to date are as follows:

	Sinking.	Raising.	Drifting.	Total.
Gold Drop	—	2,260	2,700	4,960
Ironsides.	15	4,791	3,881	8,687
Total for year	15	7,051	6,581	13,647
Total to date	2,487	46,095	72,913	121,495

Hidden Creek Mine.

Superintendent H. J. C. MacDonald reports: "The work on the Hidden Creek mine for the first half of the preceding twelve months consisted of the development and equipment of the mine for production. This work was completed by the first of the year, and the mine was then in condition to mine and ship ore to the smelter. During the period elapsing until the smelter started operating, on the sixteenth of March, the development work was put into use, in order to correct defects and place everything in a smooth working condition. Upon the "blowing in" of the smelter the mining and shipping of regular daily lots of ore commenced and has been continued up to the present time.

"The mining development consisted of 3,794 ft. of raising and sinking with 1,525 ft. of drifting and crosscutting; making a total footage of 5,319 ft. for the year. Nearly half of the footage was made on the 530 level, and this level still remains the most completely developed in the mine. The greater part of the work consisted in the driving of raises in preparation to the stoping of the ore.

"The 385 tunnel was driven ahead to intercept the No. 2 orebody on this level. The 130 ft. driven into the ore gave an assay return of 2.6 copper, the grade of the

ore appearing to be better at this depth than on the 530 level above. Starting near the end of the 385 tunnel a system of raises was driven leading to the surface of No. 2 orebody. Here open-cut mining has been started, and through these raises it is possible to handle a large portion of No. 2 ore without transferring on the upper levels. Three raises in the No. 1 orebody were driven and are now available for the transfer of ore from the 530 to the 385 level.

"On the 530 level some drifting was done in the north end of No. 1 orebody, and the 130 and 140 drifts were driven in the development of No. 3 orebody. With the exception of this the remainder of the driving was done in raises opening up the stopes above the level.

"Thirty holes, Nos. 136 to 166, were drilled, making a total footage of 6,072.5 ft. These holes were drilled in the six following groups for the exploration of certain orebodies or portions of orebodies.

"The mining having been done in areas already estimated in the ore reserves, practically all the additional tonnage gained during the year was through the diamond drilling. A considerable amount was added to No. 1 orebody, while our estimates show a slight decrease in the bulk of No. 2 orebody. Two entirely new orebodies, No. 3 and No. 4, were discovered and explored. They are of the same general type as No. 2 orebody and in the same mineralized area. The total ore developed in the two bodies is 1,407,500 tons, carrying 1.8 per cent. copper.

"Diamond drilling was discontinued in March, as holes can be placed to a greater advantage in the future when the mine openings are more numerous. We have now drilled 166 holes, making a total footage of 43,591 ft. The drilling of the known orebodies above the 385 level is now thorough enough for our purposes at the present time.

"The previous estimates have been based on vertical sections taken at irregular distances through the orebodies. The place of these sections was determined by the areas where the most development work had been done, and therefore where the value and character of the ore was best known. This year's estimate is upon vertical sections, which are taken at regular 100 ft. intervals throughout the length of the bodies. These sections will be retained as a basis for our ore estimates in future reports. A very close agreement in the value and the tonnage of the ore was obtained in the two estimates based on the old and new sections, so that no appreciable error has been introduced into our calculations.

"The ore reserves are now estimated at 9,563,000 tons of ore carrying 2.2 per cent. copper and about 30 cents in gold and silver. This ore which we call the "high grade," is surrounded by a large body of "low grade" ore, running 0.6 per cent. in copper, containing 8,589,500 tons. Taking the low and high grade together gives a total of 18,153,000 tons of 1.4 per cent. ore. While it will not be policy to mine all the low grade ore, the mining of a certain percentage along with the high grade will, from the nature of ore bodies, considerably reduce the cost of mining and smelting.

"There has been shipped from the mine 77,377 tons of 2.4 per cent. ore since the smelter was started. This has been principally No. 1 ore from the stopes above the 530 level. From the No. 2 orebody only 8,476 tons has been shipped. We have been mining a larger tonnage than could be used, and there is now 15,000 tons of broken ore in the mine.

"The year's work has consisted in brief, not taking into consideration the equipment of the mine, for production, of 5,399 ft. of mine openings with 6,072.5 of diamond drilling. Through this work the orebodies have been explored to a greater extent than before, so that we are now able to make a conservative estimate of 9,563,00 tons of 2.2 per cent. copper ore, having a gold and silver content of about 30 cents a ton. This is a gain for the year of 1,803,950 tons of 2.2 per cent. ore. The shipments, while small, can be regarded as the best sample of the ore we have as yet obtained; and they have checked closely our previous estimates of the grade and analysis of the orebodies. The physical condition of the mine at the end of the year is the strongest that it has been since the starting of its development."

Midas Mine.

Mr. E. E. Campbell reports: "A large number of mining prospects were examined during the year. All are located in the Prince William Sound section that is directly tributary to the coast. No examination work was done in the interior, or Copper River district, as it would not be practicable for the Granby Co. to make any extensive investments in that country, under the present railroad service. Of the properties examined, the only one showing distinct merit is the 'Midas' mine, situated near Valdez, and the work on this constitutes the mining development in this district.

"Construction work started May 1st, 1914, and is proceeding so satisfactorily that at the present date it is apparent that a shipment of ore will be made before winter. The mining equipment being installed consists of a wharf, a three thousand ton bunker and a discharge belt at the beach; a five and one-half mile tramway extending from the beach bunkers to the mine; a three hundred ton bin with ore sorting belt and an air compressor at the mine. The power installation will consist of a two hundred horse power Diesel engine to drive the air compressor and supply whatever power may be required at the mine, a thirty horse power Foos engine at the beach to drive the aerial tramway and a fifteen horse power Fairbanks Morse distillate engine to drive the loading belt. At the mine a lower tunnel is being driven to serve as a main haulage tunnel, and it is intended to connect this with the next tunnel above by a raise which will serve as an ore pocket. Three cottages are in course of construction and a bunkhouse to accommodate forty men.

"The development work already done on the property on the date of purchase, October 15th, 1913, consisted of 2,000 ft. of drifting, raising and crosscutting, 1,500 ft. of which is on ore, and is made up of two tunnels, 500 ft. and 700 ft. respectively, and 300 ft. of raising. This work exposed a tonnage of ore estimated at 116,344 tons, containing an average value of: copper, 4 per cent.; silver, .46 oz.; gold, 0.065 oz.

"Under ordinary conditions, with the equipment that is being installed, this ore will be mined and delivered at the boat at a cost not to exceed $2.00 per ton."

Mamie Mine.

Mr. N. W. Sweetser reports: "This property is situated on Prince of Wales island, at an elevation of 700 ft., 1 mile south of the town of Hadley, which is on the shore of Lyman anchorage. The property consists of eight claims; namely, the L. Kensington, Middlesex, Doolittle No. 2, Shamrock, Mamie No. 2, Doolittle No. 1, Mamie No. 1. Work was started by the Granby Co. on the Mamie mine, December 10th, 1913. The first four months were spent in repairing of equipment, and mining was not started until April 1st, 1914. Since April 1st about 250 ft. of drift work and 500 ft.

of raise work have been done. This work has been confined to the tunnel level, due to the fact that the lower levels were full of water, and there were no hoisting facilities.

"There is proven ore in the mine at present: On or above the tunnel level, 80,000 tons; on or above the 50 ft. level, 44,000 tons; on or above the 125 ft. level, 11,200 tons. Total, 135,200 tons. This ore will average 2¼ per cent. copper.

"Boiler plant and compressor are ample for mining purposes. A number of places are ready to begin the stoping of ore. The dock for the delivery of ore from the tram should be completed by the 1st of October, and delivery of ore can be started immediately. Mining methods will be the same as those pursued at Phoenix.

"Work is being pushed upon the two lower levels. There is no question that the tonnage will be greatly augmented upon these levels. The crosscut recently driven upon the 50 ft. level showed 50 ft. of ore. On the lowest level the old company crosscut 35 ft. of ore near the shaft, and drove long drifts which are apparently in the hanging wall and footwall of the orebody. Drifting has been started and this drift will determine the future possibilities of the mine."

The It and Dean Mines.

Mr. Sweetser reports: "These properties are situated on Prince of Wales island, on the southern side of Kasaan Peninsula, about 4 miles north-east of the Kasaan Post Office. They are situated about 3,000 ft. from tide water at an elevation of 400 ft.

"Work was started by the Granby Co. on the It and Dean properties, June 20th, 1914. The first ten days were spent in cleaning and overhauling the plant, and underground work was not started until July 1st.

"The group comprise the following: The It property, under bond to the company, consisting of five patented claims, namely, the Alarm, It, Fraction, Eagle's Nest and Mesabi. The Dean property owned by the company. During the month of July the following claims were staked for the company, namely, Mint No. 1, Mint No. 2, Mint No. 3, Morning, intermittent No. 1, Intermittent No. 2.

"The ore consists of chalcopyrite in a gangue of garnet, epidote and calcite The ore averages forty cents a ton in gold to each per cent. of copper. There are five lenses of ore showing upon the properties, one upon the Dean and four upon the It group, two of which have been worked. The ore upon which most of the work has been done has been opened to a depth of 200 ft. by means of a tunnel and three levels below driven from a winze.

"The ore in the lower levels is more irregular and of lower grade than above, and has not yet been encountered in the long crosscut tunnel driven below, although ore of too low a grade to be commercial has been encountered. A surface tram to the Dean orebody is nearly completed and stoping of ore will be started early in September.

"The natural advantages, such as wood, water, ease of transportation are all in favor of the properties. The It power plant located at the beach is an economical plant capable of furnishing power for all purposes.

"The larger lens upon the It produced nearly $150,000. This ore averaged eight per cent. copper and four dollars in gold. Insufficient work has been done upon any of the ore exposures to determine the available tonnage, and only an estimate can be given. The ore in sight at present might be safely put up 5,000 tons. This ore will average between $15 and $20 a ton. The whole group is a mineralized area and there is no question that other lenses can be discovered by surface trenching."

The President's Report.

Wm. H. Nichols in presenting the report for the year ending June 30, 1914, said under date of Oct. 6.:

"Since the close of the fiscal year a quarterly letter was issued advising the shareholders that the market conditions arising in August had rendered advisable a curtailment of production, and that accordingly operations at Phoenix and Grand Forks had been suspended. It is not expected to resume work there until the market shall become more nearly normal.

"At Anyox the problems involved in economical smelting of the ores proved to be even more intricate than anticipated, but it is now believed that a very satisfactory solution has been reached. It would now appear, therefore, that we shall be fully ready at both properties to take advantage of improved market conditions when they shall arise.

"In the meantime, in common with other mining enterprises, we are curtailing expenses wherever practicable. A considerable reduction in salaries of officials, effective September 1st, has been made, at the suggestion of the officials themselves.

"The fundamental conditions, both as to property and the organization, are highly satisfactory."

ASBESTOS AS A BUILDING MATERIAL.

The marked increase in disastrous fires is directing more attention every day to the need of fireproof building materials that can be relied upon. The failure of many so-called fireproof materials when subjected to the intense heat of large conflagrations suggests the need of more careful judgment in the choice of these materials as well as a more stringent interpretation of fireproof building regulations.

The demand for building materials that would not be affected by fire has encouraged manufacturers to experiment with all kinds of materials, including asbestos.

Deposits of asbestos occur in Russia, Italy, Egypt, India, South Africa, and, in fact, in all parts of the world. But Canada is the chief producer of commercial asbestos. The H. W. Johns-Manville Co. uses Canadian asbestos.

This asbestos produces long silk fibres which are manufactured into fireproof goods of various kinds, the most familiar of which, no doubt, is the asbestos theatre curtain.

Asbestos fibres are made into felt, much as the felt for hats is manufactured. This felt is then saturated with Trinidad Lake asphalt, after which several sheets are cemented together with this material and thus made into ready roofings.

For shingles these same rock fibres are mixed with Portland cement and other ingredients, put in molds of various sizes and shapes and subjected to intense hydraulic pressure. The various colors are mixed with these ingredients, producing shingles of a number of handsome shades.

Asbestos wood or lumber is also made in very much the same manner as the shingles. This is furnished in slabs of varying sizes, so that it can be easily used for making fireproof partitions, fire doors, booths for moving picture machines, etc.

Another use that is made of this material is in stucco, and wall plaster. Here the asbestos fibre takes the place of hair ordinarily used and the asbestos takes the place of sand.

Asbestos is also much used as a pipe covering and in the form of mastic, for flooring.

ANNUAL REPORT KERR LAKE MINING COMPANY

The report of the Kerr Lake Mining Co. for the year ending August 31, 1914, shows that in that period the company produced 1,828,424 oz. of silver at a cost slightly higher than in the previous year. The ore reserves show only a slight decrease.

Manager Robert Livermore says:

The gross production from all ores, for the year ending August 31st, 1914, amounts to 1,828,424 ozs. of silver. This figure includes 15,944 ozs. of silver on hand August 31st, 1914, according to inventory. Of the total, 1,196,401 oz. was produced from shipping ore, and 632,023 oz. from low grade ore milled by the Dominion Reduction Co., Ltd., at Cobalt.

Ore production for the year ending August 31, 1914:

Grade of Ore.	Net Weight, lb.	Silver Contents, oz.	Average Silver Contents per ton, oz.
1st Class	542,197	1,015,043	4,193.83
Bullion from 1st		121,898	
2nd Class	55,994	26,731	954.78
Jig and table concentrates	44,986	22,925	1,019.21
Bullion from metallics		9,804	
Mill ore	18,682 tons.	632,023	33.83
		1,828,424	

August estimated in part.

Development.

Development work was carried on at a rate slightly in excess of that of last year. Including drifting, crosscutting, sinking and raising, 5,399.5 linear ft. was done as compared with 4,984 linear ft. in the previous year. During the last third of the year 2,513 ft. was trenched in exploratory work on surface in the lake basin and elsewhere. There were some new discoveries during the year, consisting partly of new veins, and partly of extensions to known ore bodies. Of the latter developments increased the silver contents of the Main East and Fleming veins, and of the former, Lake veins Nos. 1, 2 and 3, and No. 218, were added to the reserves.

At No. 3 shaft a long crosscut was driven westward from the sixth level to prospect the Keewatin-diabase contact, and to intercept No. 2 vein at that depth. A strong calcite vein was cut 400 ft. west of No. 3 vein in Keewatin formation. This is called the "Keewatin vein." Although nearly barren of value where encountered, the lead being strong was followed for several hundred feet, and the work resulted in opening a small body of milling and high grade ore, which has produced over 9,000 oz. of sacking ore to date. This pocket was found near the contact, and it is probable that the ore will be confined to that neighborhood. It is also probable that this vein is a continuation at depth of No. 2 vein, hitherto opened only on the second level. This vein may be a considerable producer, depending on the frequency of occurrence of ore pockets, but owing to their erratic nature estimates of even possible ore are entirely too uncertain to warrant making. A number of raises were put in on No. 2 vein on the second level and No. 21 vein, its continuation connecting with No. 7 shaft workings. One of these raises on No. 21 vein disclosed another pocket of rich ore, from which 3,000 oz. were taken, but this proved to be very limited in extent. The development in these veins although yielding so far comparatively small production is important as showing the existence of ore in the more unfavorable formation, and in a little prospected part of the property, and gives encouragement for future developments.

At Little No. 3 shaft no new discoveries were made. A connecting raise was driven from the 140 ft. level of No. 7 workings, so that this part of the mine may be worked through the main shaft.

No. 7 shaft. Fleming vein—A 140 ft. winze was sunk from the 225 ft. level and drifts were run on the vein at 275 ft. and 325 ft. This latter level is now the deepest working in No. 7 shaft. Both of these drifts are in Keewatin formation. On the 325 ft. level, except for a short shoot of fair grade, no ore was found. It is apparent that this level is at the bottom of the pay ore in the vein. On the 275 ft. level the vein carries values of very fair milling grade, with occasional spots of high grade for over 200 ft. The draining of Kerr lake allowed a considerable area of the surface of this vein to be exposed by trenching, and where so exposed it was found to be divided into a number of leads, some barren or nearly so, and some very rich. On the whole the average value of the vein on surface is fully as good as that exposed in the nearest underground workings, the 195 ft. level, 60 ft. below. This development in the above named workings on the 275 ft. level has increased estimated value of the vein very considerably.

Main East vein—Some drifting was done on the fourth level, but the ore was not found at this depth. Since the vein has been thoroughly explored on the 140 ft. level, developments were confined to side veins and stringers in which small additions of ore were opened up. On surface this vein was exposed by the draining for its full length. The ore was found to be much better in width, length and value than underground, and the estimated content has been materially increased.

No. 218 vein—This vein is a branch of the Main East drifted on some years ago, but the work at that time exposed only a barren calcite lead. A short raise opened ore of good grade and a drift was run for over 100 ft. in the ore. Owing to the heavy overburden this vein has not been explored on surface.

Lake Veins Nos. 1 and 2—These were discovered by the draining last year, and though narrow are rich on surface. On the 140 ft. level they were followed up, but have not been so far productive. Better results may be expected at higher levels.

Nos. 28 and 29 veins—These were two narrow veins discovered by crosscutting on the 140 ft. level and although containing some high grade ore have not been productive to date.

Little No. 7 vein—A drift was run upon this at the 90 ft. level, which exposed a shoot of good ore 160 ft. long. The better value encountered here allowed an increase to the previous estimate for this vein.

Lake Vein No. 3—The most important discovery during the year was of the above vein, which was first exposed on surface after the mud level had been sufficiently lowered in the lake basin. It is a system of veins lying north of the Main East and connecting that vein with the Fleming. It lies in the north central area of the property, not hitherto explored owing to uncertainty as to the depth of ground. Although the main lead is comparatively narrow it has a very good high

average silver content, and has been exposed for over 200 ft. Crosscuts driven at the 140 ft. level cut this vein underground, and drifts have been run upon it for 240 ft. The average value at the 140 ft. level while not so high as on surface makes the vein with its adjacent stringers a very important addition to the reserves.

Crosscutting—Several long crosscuts were driven at different levels to explore the larger unprospected blocks, but these were with the exceptions above noted, unsuccessful in finding new veins.

Developments for the coming year will complete the openings through the still unprospected areas, such as the south central part in diabase formation, and the north-east corner in conglomerate formation, and will comprise following up any leads encountered as well as extending those already known. Close attention also will be paid to cutting up small blocks in favorable ground. More work will be done on the Keewatin or No. 2 vein, both at depth and in exploratory raising.

Developments for the year are given in detail below.

Stoping.

During the year stoping was confined mostly to the older reserves of the mine, the largest amounts of silver being produced from No. 7 vein, the Big Chamber and No. 10 vein in order. Smaller amounts were taken from No. 15 and the McDonald. The estimated amount of silver in the blocks removed was well maintained, in fact, in most cases exceeded. It is found to be almost invariably the case that the silver content is greater in the higher levels of the mine, so that inferentially former estimates which were based on production from lower levels may be considered conservative. It will be noted that the reserves of No. 7 and the Big Chamber have been most largely drawn upon, and it is probable that during the coming year it will be found advisable to complete these stopes and fill with waste, to avoid the necessity of further supporting with timber. The McDonald has been little drawn upon during the year, and still shows a good reserve above the 140 ft. level. No. 10 vein is intact above this level, all stoping having been done in the lower levels. No. 15 vein is also in place above the 140 ft. level. No stoping has been done on the Fleming vein during the year except for a cutting-out stope on the new ore developed at the 275 ft. level. Also no stoping has been done in the Main East above the 140 ft. level. The square set method of timbering introduced last year has been found satisfactory, and has increased the safety of mining, and aided regularity of production.

Total development and stoping, September 1st, 1913, to September 1st, 1914:

	Development.	Stoping.
Drifting ft.	3,310.0	
Crosscutting ft.	1,747.0	
Raising ft.	285.0	
Sinking ft.	57.0	
Stoping sq. ft.		36,767
Side-cutting sq. ft.		333
Total	5,399.5	37,100

Trenching, 2,513 ft.

Total development to date, 40,062 ft.

Production of individual veins for the year ending August 31st, 1914:

Vein System.	Development Oz.	Stoping Oz.	Total Production Oz.
Big Chamber		381,858	381,522
No. 7		459,522	459,858
Little No. 7	1,815		1,815
No. 8		1,608	1,608
No. 10		236,837	236,837
No. 15		31,845	31,845
No. 18		225	225
No. 21	3,184	704	3,888
No. 218	14,227		14,227
McDonald		45,205	45,205
Main East		5,286	5,286
Fleming	2,249		2,249
Lake Veins	2,749		2,749
Keewatin	217	8,870	9,087
Total	24,441	1,171,960	1,196,401
Mill ore			632,023
Grand total			1,828,424

Ore Sorting and Jigging Plant.

Apparent production from this source was small, owing to the fact that poor market conditions for ore of the grade ordinarily concentrated made it advisable to sort the products from the jigs, and to divide them between first class and mill ore. The total production is shown under the head of ore production; it amounts to 44,986 lbs., assaying 1,019.21 oz. per ton, a total of 22,925 oz. of silver.

Mill Ore.

Production was kept up at a slightly higher rate than last year. The total production of silver was greater than that of last year, owing to the larger tonnage of better grade ore. Like the higher grade, the mill rock is found to have a greater silver content in the upper levels of the mine from which a large part of the tonnage was drawn. Of the 18,862 tons sent to the mill, 2,552 tons were taken from the dumps. Improvements and additions were made to the ore bins at No. 7 shaft. Due to the discovery of ore in the Keewatin vein, and the advisability of starting work on No. 3 dumps, the No. 3 ore house was remodelled and a receiving bin for mill ore was put in, from which the ore is teamed to No. 7. The No. 3 dump ore so far treated amounts to 533 tons, and shows a satisfactory grade of 42 oz. per ton.

Mining cost per ton of rock hoisted, August 31st, 1913, to August 31st, 1914:

Tons Hoisted—	
Ore	33,955
Waste	10,839
Total	44,794

*Sacking Ore—

	Tons.
1st grade	271
2nd grade	28
Jig Concentrate	22
Total	321
Mill ore	16,130
Waste from bumping tables	17,504
Total	33,955

The following were the costs: 44,794 tons rock hoisted at a mining cost of $5.09 per ton; 1,828,424 silver oz. at a mining cost of 12.49c. per oz.

Lake Draining.

The work started in August of last year, and was continued up to the last of November, when the approach of winter stopped operations for the season of 1913.

During that time all of the water and a large quantity of liquid mud was removed, lowering the level of the lake some 40 ft. In May of the present year operations were resumed, and at the last of August the scow rested on bed-rock near the centre of the basin at a depth of 80 ft. below the original water line. The work this season consisted almost entirely of pumping the semi-liquid mud which was left after the water had been pumped out. Owing to the mud slipping down from the sides with the receding water, and the narrowing of the area of the basin, the original depth of the mud had been greatly increased. As it would not have been safe to mine to surface while it remained in liquid form, that mud which would flow to the pumps was handled. This was done without difficulty until the drying out of the exposed surface made it necessary to install a simple hydraulic apparatus to sluice down the loose material, and to cut a way through the underlying bed of clay which lies under the mud, to bed-rock.

This hydraulic apparatus consists briefly of small monitors mounted on the scow and others on tripods for use at some distance away from the scow. An auxiliary 1,000 gal. turbine pump was installed in the Giroux Lake pump house to supply extra water through a 6 in. line to the nozzles. With this apparatus satisfactory results have been had, and at the present time the actual draining operation is virtually concluded. The present work consists of enlarging the pump or basin in which the boat lies, and in cutting through the clay for proper drainage.

The sloping nature of the ground on the Kerr Lake Mining Co. property has resulted in there being but little accumulation of clay or mud, and active trenching operations have been carried on through such as remains to expose the veins. The exposure of the bottom by the draining has resulted favorably for the company by the discovery both of new veins, and of the fact that outcrops of known veins have invariably proven richer below. This is especially true of No. 10 and the Main East veins. Nos. 1, 2 and 3 Lake veins are new discoveries, but besides these there are numerous stringers, some containing rich ore which might be called separate veins, but which from their proximity to others have been included under one or another of the above numbers.

Drummond Fraction.

Work was started on this property in November. The lake draining early exposed a vein system containing mill and high grade ore. A 100 ft. shaft near the boundary was leased from the Cobalt Comet Co., and put in repair. An ore sorting plant with sorting table and receiving bin was built. Arrangements were made for receiving the ore at the Dominion Reduction Co., and in January the regular production was started. The mine has made a profit over operating costs since arriving at full production of mill ore, and ten tons of high grade ore have been sacked and are at present awaiting shipment; 2,514 tons, averaging 27.4 oz. per ton, have been milled. The reserves left in the one vein so far opened are not great, and the main hopes for the future of the property lie in thorough prospecting of the conglomerate area in the lake basin, which work is now being actively prosecuted.

Ore Reserves.

Estimates this year are based partly on previous production figures and partly on sampling. Figures given for the older reserves, such as the Big Chamber, McDonald, No. 7 and No. 10 veins having been checked or exceeded by subsequent production, have been allowed to stand decreased simply by the amount of high grade ore removed during the year. Little No. 7, the Main East, No. 218, Lake vein No. 3 and the Fleming vein have been carefully sampled, and the more accurate method of estimation, together with the new development of these veins, has shown a satisfactory increase to their previously estimated value.

In some cases no distinction is made between high grade and mill ore owing to the difficulty of differentiating between the two products by sampling methods. An attempt has been made to arrive at the tonnage of mill ore by means of sampling and measurement, but because of the difficulty of getting accurate results by this method in the very variable ground which furnishes mill rock, the estimate has been kept purposely low. From the appearance of the lake bottom in the vicinity of the Main East and Fleming veins where the surface is a network of stringers which will undoubtedly furnish a very large tonnage of mill ore, it is safe to say that the present estimate will be exceeded. The estimates given may be considered as of positive ore.

Regarding probable and possible ore it is impracticable to give any definite figures. As mentioned above mill ore is liable to exceed the figures given. A considerable tonnage will undoubtedly be taken from No. 3 shaft from the Keewatin and No. 2 veins, also from various low grade veins not at present worked which are liable to contain better values nearer surface.

Under the head of possible ore there is still a favorable area in the north-east corner of the property, and late developments have shown that there are still possibilities in the Keewatin-diabase area in the south end of the property. An estimate of ore in reserve follows.

Estimate of ore reserves, Sept. 1st, 1914:

High Grade Ore—	Estimated Oz.	
Big Chamber vein system	185,800	
McDonald vein	708,700	
No. 7 vein	409,900	
No. 8 vein	66,000	
Main East vein system	532,000	
Xmas vein	49,900	
No. 10 vein system	836,500	
No. 15 vein	108,400	
Little No. 7 vein	62,000	
Lake No. 3 vein system	235,000	
No. 218 vein	64,500	
		3,258,700
Mill and High Grade Ore Not Separated—		
Fleming vein system	1,200,000	
Little No. 3, Nos. 2, 18, 21, 23-29 Lake veins 1 and 2, Keewatin vein systems	40,000	
		1,240,000
Other milling ore		800,000
Dump ore		400,000
Grand total		5,698,700

The treasurer reports that while the shipments for the year amounted to 1,845,055 oz. gross, the smelter settlements aggregate 1,670,933 oz. The difference is accounted for by the deductions made by the smelting works for losses and in the way of treatment charges.

The costs of production per oz. are as follows: Mining and development cost, 12.49c.; shipment and treatment charges, 11.61c.; administration and general, 0.76c. Total, 24.86c.

There has been written off on account of expenses connected with Kerr Lake-Crown Reserve drainage account the sum of $6,200, leaving a balance of $30,000, as at 31st August, 1914.

The Drummond Fraction development showing an asset of $8,692.02 is more than covered by the value of silver on hand as at 31st August, 1914. The company has not taken any account of profits derived from this operation during the last fiscal year.

All construction expenditures during the year have been charged to operating expense, under the heading "Repairs to Plant and Buildings."

The following is a statement of the dividends paid by the company to August, 31, 1914:

In the year ending August 31—	
1906	$90,000.00
1907	210,000.00
1908	360,000.00
1909	480,000.00
1910	990,000.00
1911	1,200,000.00
1912	690,000.00
1913	600,000.00
1914	600,000.00
Total	$5,220,000.00

Balance Sheet—31st August, 1914.

Assets.

Mine property	$130,000.00
Buildings, plant and equipment	33,351.21
Inventory of materials and supplies	11,664.56
Ore on hand, sold and in transit, unsettled for, at estimated value	108,180.38
Bank interest accrued	416.81
Sundry debtors	5,701.10
Cash	93,333.13
Short term bonds	256,598.49
Call loans (secured by collateral)	350,000.00
Kerr Lake-Crown Reserve drainage account	30,000.00
Kerr Lake-Crown Reserve drainage account	30,000.00
Drummond Fraction development	8,692.02
	$1,027,937.70

Liabilities.

Capital Stock—		
400 shares at par value of $100 each		$40,000.00
Accounts payable		6,844.72
Accrued wages		2,348.90
Reserve for accrued taxes		15,150.14
Reserve for outstanding liabilities		2,500.00
Surplus—		
Balance 1st Sept., 1913	$954,308.27	
Profit for year ended 31st August, 1914, as per Operating, Profit and Loss Account	620,785.67	
	$1,575,093.94	
Deduct—		
Dividends paid during the year	614,000.00	
		961,093.94
		$1,027,937.70

Exclusive of dividend No. 36 of $150,000 paid 15th September, 1914.

CONIAGAS.

Coniagas has declared a regular 6 per cent. quarterly dividend, payable on Nov. 1, but no bonus. This will make a total disbursement for 1914 or $1,320,000.

TIMISKAMING MINING CO.

Mr. F. L. Culver, president and general manager, has issued the following report on the Timiskaming Mining Co., Limited, for the quarter ending September 30, 1914:

Your directors cannot report much additional development since June 30 owing to the fact that labor conditions were very unsettled, and on August 1 mining operations were suspended entirely. Since 1907, the Timiskaming Mining Company had been paying a higher rate of wages than was being paid by other companies in the Cobalt District, and the results were not in keeping with the wages paid. On July 1 notices to the employees were posted stating that, commencing August 1, the wages paid by the Timiskaming Mining Company would be the same as the wages paid by other mining companies throughout the district. The Local Miners' Union protested against this reduction, and petitioned the Government, under the Lemieux Act, for the appointment of a Committee of Conciliation and Investigation. The appointment of this committee prohibited the company from making any change whatsoever in the wage scale during this investigation, so your directors decided that on August 1 it would be good policy to suspend operations on the property until such time as the committee was ready to submit its findings to the Government. About the middle of September, a certified copy of the report of the committee was received from the Government, which your directors interpreted to mean that they were amply justified in equalizing the wage scale. During this temporary suspension, the plant was put in splendid condition for winter operation, also the hoist overhauled, which we believe will result in a great saving of fuel.

The main shaft is down to a depth of 768 feet; the station cut at the 750-foot level. A crosscut was started from this station to intercept veins No. 3 and No. 11, and a drift driven north to intercept vein No. 6. We also started to drift on a small vein leading south from the shaft, and at a distance of about forty feet we encountered an excellent showing of high-grade ore. Quite a bit of work has been done in the northern part of the property where we have splendid mill ore, but have not encountered any high-grade except in a subdrift between the 500 and the 575-foot levels which, however, does not appear extensive. On October 1, six drills were started underground, when one or two shots in the drift on the 750-foot level, where we encountered the showing of high-grade, revealed results which are very encouraging. It is not the intention to resume operations at the mill until we have a very much larger tonnage of mill rock broken, and for this purpose more drills will be started as soon as practicable.

In the last circular letter sent to the shareholders it was stated that the North Dome Mining Company was indebted to the Timiskaming Mining Company, for monies advanced, approximately $88,000. It seems that one or two very serious accidents had occurred on the North Dome property, and actions brought against that company for heavy damages, judgments being obtained, and writs put into the hands of the sheriff for execution. This necessitated the Timiskaming Mining Company immediately applying for a winding-up order against the North Dome Mining Company in order to protect its claim against that company, and this matter is now in the hands of the liquidator.

The company's cash balance on September 30 was	$59,782.24
Less wages and accounts payable	3,328.09
Available balance	$56,454.15

THE ELECTRIC FURNACE FOR STEEL MAKING

By Walter N. Croft

(*Continued from October 15th issue*)

A slag is made on the bath of steel by the addition of lime and sometimes flourspar and other slag forming materials. Ore is also added if the carbon in the bath is to be lowered. This first slag with the ore has an oxidizing action. The carbon is oxidized to CO and CO_2, and the phosphorus in the steel is slagged off as calcium phosphate. This first slag reduces the phosphorus very greatly, but lowers the sulphur very little. After the phosphorus has been lowered to the desired point, this so-called phosphorus or oxidizing slag is rabbled off from the bath by tilting the furnace slightly. A second slag is now made by the addition to the bath of finely ground lime with some other materials for thinning the slag that is formed. Over this slag is thrown a thin layer of fine coke or charcoal. A reducing condition is thus obtained in the slag and the sulphur is removed from the steel to the slag as calcium sulphide ($FeS + CaO + C = Fe + CaS + CO$).

The possibility of maintaining on the bath of steel at will, either an oxidizing or reducing slag is the feature that gives all kinds of electric furnaces their great advantage over the Bessemer or open hearth processes. In both of the latter processes, the heat of the steel is maintained by oxidation, either within the steel itself, or in immediate contact with the steel or its slag. In the electric furnace, the heat does not come from oxidation at all, and any considerable removal of sulphur can only be accomplished by a chemical reducing process.

In the making of electric steel after the phosphorus and sulphur have been lowered as far as desired, pig iron may be added to obtain the desired carbon content, and any other alloys, if alloy steels are being made. In passing, it should be noted that it has been found in electric furnace practice that there is a great saving in the amount of alloy required for a given final content in the steel; this is because, when the metallic alloys are added just before tapping, the slag and atmosphere in the furnace are either chemically neutral or reducing. In open hearth practice, the atmosphere and slag are almost always oxidizing, so that a portion of the alloy additions may be oxidized and pass off into the slag instead of steel.

Leaving the consideration of the chemical effect of slags, let us pass on to the chemical and physical condition of the finished steel in the ingot. It has been claimed ever since electric steel has been made that segregation in the ingot is eliminated, and the investigations made in the United States, as well as in Europe, seem to substantiate this claim to a surprising degree. It is well known to engineers that there is frequently a wide variation of carbon, phosphorus and sulphur at different points in a steel ingot; this variation is sometimes so great that it is very serious in its effect on the rolled product. This is a familiar subject to those who have anything to do with steel rails. In the case of electric steel ingots this segregation is negligible, sometimes being reduced to the variation due to the personal equation of the chemists making the analysis. It is an interesting fact concerning electrically made steel that it seems to be more dense than either Bessemer or open hearth steel, which is probably due to its greater freedom from occluded gas pockets, both of blow-hole, as well as microscopic size. In the case of Bessemer steel, oxygen and nitrogen gas are blown through the metal and it is easily conceivable that large or small globules of these gases may be retained in the steel when it is poured. In this connection, it is interesting to note that it is quite common in European Bessemer practice to hold the heat of steel in the belly of the converter for twenty or thirty minutes after it is blown. This is done in order to give the metal time to "kill"; that is, for gases, as well as particles of slag, to separate from the metal and rise to the surface. In most mills in this country such a delay after each "blow" in a converter would doubtless be the occasion for a change in practice or a change of superintendent. But here again in European practice "delay" reports from a mill do not seem to be nearly so important as the quality reports, and a conscientious engineer would not care to criticize the European view. The ideal would be for the Americans to keep up their present speed in steel mill practice and at the same time attain to a quality of output corresponding to the European quality (taking into account, of course, the difference in raw materials).

Future of Electric Steel Furnace.

As to the future manufacture and use of electrically made steel, one can speak publicly only in a very general way. Perhaps the best forecast for the future can be made by reviewing the present activities and then mentioning a few elements that may affect the production of electric steel in the future.

Electric steel furnaces were first used in Europe to make steel of tool quality. At first, only the lower grades of tool steel were made, but gradually furnace practice has been improved until now excellent tool steel (even high speed) is being made in the electric furnaces and at costs very much lower than are possible in the old crucible process.

The next step was the use of electric steel in small and intricate steel castings where the crucible or Bessemer process is used. In Europe the electric furnace has very largely superseded these two older processes for steel castings, although there are a few plants where excellent castings are still made from the Bessemer converter.

For some time in Europe and just lately in the United States, electric steel castings have been entering into competition with open hearth steel castings. In Europe there are several steel foundries making castings exclusively from electric furnaces and they are able to sell in competition with open hearth foundries. A considerable tonnage of electric steel castings is being sold in the United States by European steel foundries. The author believes that so far in this country electric furnaces have made no effort to lower their prices sufficiently to compete with the open hearth foundries. This is probably not yet possible on account of the higher costs than in the open hearth foundry, and also a lowering of price is not necessary since the electrically made casting has advantages that should sell it at a higher price even in competition with the open hearth foundry.

There has been, as yet, no great development of the electric furnace for the production of tonnage products. In Europe there are several plants using the electric furnaces for making steel for tubes, extra high

quality ingots for rolling or forging steel armor plate, projectiles, etc.; thus far in this country there has been very little development along this line.

In Germany there have been some electric steel rails made and they have given good service, but the makers have found it more profitable to use their electric furnace equipment for the manufacture of higher priced products such as castings and tool steels. The United States Steel Corporation has made the most progress in the production of tonnage products. Beside the manufacture of many different steels of various qualities for rolling and forging purposes, they have made and put into service on various railroads about 10,000 tons of steel rails made in the electric furnace. These rails have not been in service long enough to justify any statement as to their qualities as compared with Bessemer or open hearth rails. It can be said, however, that they are almost entirely free from such disadvantages as may be due to segregation in the steel. The electric steel rails roll much better than either Bessemer or open hearth rails.

In addition to this and perhaps most significant, experience thus far seems to indicate that electrically made steel rails have much greater resistance to shock, which is of importance in the consideration of rail breakage in service under the blow of the locomotive driving wheel. This apparently greater freedom from breakage is especially noticeable under conditions of extreme cold, when there is a great deal of trouble from the breakage of Bessemer and open hearth rails.

It is needless to say that electric steel rails are selling at more than $28.00 per ton. You can buy them now from the Steel Corporation at $1.80 per one hundred pounds, or between $40.00 and $41.00 per ton. Thus it will be seen that the present use of electric steel is somewhat limited, and it is the belief of the writer that it will continue to be so until certain difficulties in the production of electric steel are overcome.

It is very generally agreed that, while electric steel costs more, for most purposes better steel can be made in the electric furnace than is now possible by any other method. This being the case, a greater use of electric steel can come only from two causes. The first cause will be a demand by the consuming public for a steel of better quality even though the first cost of that steel may be higher. If the traveling public in a few years should wake up to the fact that danger from disaster due to rail breakage can be avoided (if future experience should prove this), the traveling public would demand safety even if the rails should cost $40.00 per ton—and the high cost of living would be still further increased, but some of us might live longer than we would on the old Bessemer rail. The other cause of a greater use of electric steel will be a reduction in the cost of its manufacture. This reduction in cost is sure to come sooner or later, and it will come from three different sources.

First—The price of electricity may be reduced in the future. America has possibilities in this respect much greater than those of Europe and it has only begun to conserve its resources. The water powers will probably be running and making steel long after the coal supplies are exhausted.

Second—An improvement and enlargement of the present furnace designs that will lower the current consumption per ton of steel, and also reduce the cost of repairs and replacement, which is now higher than that of the Bessemer and open hearth.

Third—Development of a furnace in which it will be possible at a low current consumption to convert pig iron directly into steel as is now done in the Bessemer or open hearth. In its present stage of development, the electric furnace is a second step for further refining steel, after the original pig iron has been made into steel and partially refined in the Bessemer or open hearth. As a matter of fact, the present electric furnaces can use to advantage only steel; they cannot use pig iron to any advantage. If, however, an electric furnace could be devised which would do away with that intermediate step of Bessemer or open hearth and would make and refine steel directly from the molten pig iron, a long step would be taken toward a better quality of steel at a cost equal to and perhaps lower than is now obtained in Bessemer and open hearth practice. Of course, this step is a long way off, but the author believes it will come sooner than many steel men expect.

In this paper, it has been the purpose to present the electric steel furnace as fairly as possible. While the author feels sure that electrically made steel will come into more and more general use, he does not believe that it is going to come rapidly. Many mistakes will be made, doubtless, both in its manufacture and its use, but the steel making art will profit even by the mistakes, and the honest effort of each individual (whether crowned with failure or with success) will have its small share in increasing the sum stotal of human knowledge.

NOVA SCOTIA STEEL.

With splendid success attending their efforts we learn that the Nova Scotia Steel & Coal Co., New Glasgow, N.S., are at present turning out approximately 170 shells per day for twelve pound field artillery guns for the Dominion Government.

About three weeks ago the work began after a series of experiments and since that time the output has been rapidly increasing from day to day. In addition to this a large quantity of raw material for the construction of similar shells has been forwarded to the Quebec Arsenal, where it will be used, the order upon which they are at present working is for 250,000 shells in all which will keep certain departments of the big concern busily engaged for the entire winter season.

It is stated that the extraordinary success attending the efforts of the company in shell production may give rise to the establishment of a department at the company's plant to be given over exclusively to the manufacture of munitions of war.

ICE IN HUDSON'S BAY.

St. John's, Nfld., Oct. 22.—Immense masses of ice, driven to and fro with every change of wind, have remained in Hudson's Bay throughout the summer and fall, according to officers of the steamer Mona Venture, under charter to the Canadian Government, which has just returned from the second of two trips this season to Port Nelson. The season's work at that port, where the Government is preparing a terminal for the Hudson's Bay Railway, is practically ended, and the other steamers which have carried men and materials there will leave shortly.

Surveying and meteorological parties which have been studying conditions in the bay will come out on the cruiser Acadia. Work on the breakwater in the Nelson estuary, where the Government plans to create a safe harbor, has made considerable progress, and it is expected that dredging will be begun next summer.

PERSONAL AND GENERAL

Mr. W. E. Holloway, Pittsburg representative of Roberts & Schaefer Co., now has his headquarters at the home office, McCormick building, Chicago.

Mr. Stuart M. Thorne is manager of the Trethewey mine, Cobalt, succeeding Mr. Horace G. Young, who is now at Jualin, Alaska.

Mr. Geoffrey Pearson, third son of Lord Cowdray, was killed in France. He was captured while acting as a dispatch rider and unsuccessfully attempted to escape.

The Canadian General Electric Co. has issued bulletins on mine hoist equipment and on electric hoists designed to fill the gap between the hand chain block and the traveling crane.

Mr. A. L. Dean, for some years metallurgist for the Mt. Lyall Mining & Railway Co., at Queenstown, Tasmania, has removed from Quebec to Victoria, B.C.

Mr. Hermann C. Bellinger, of Spokane, Wash., last month went to Chile to make a report to the Branden Copper Co. on some of its property in that country.

Mr. M. K. Rodgers, of Santa Monica, California, last month paid a visit to the Granby Co.'s Hidden Creek copper mines and smelting works near Alice arm of Observatory inlet.

Mr. Frank E. Pearce, formerly of Baker City, Ore., is now superintendent of the Pingree mine, near Nelson, B.C.

Prof. Heinrich Ries has returned to Ithaca, N.Y., from Europe after having visited important mineral deposits on the continent. He is professor of geology at Cornell University, and is best known in Canada in connection with his investigations and reports on the clay deposits of the Dominion for the Canada Department of Mines.

Mr. Wm. Fleet Robertson, provincial mineralogist for British Columbia, last month proceeded from Victoria to Stewart, Portland canal, in the neighborhood of which he examined the important mineral veins lately opened at considerable depth by the Portland Canal Tunnels Co.

The many friends in Ontario and elsewhere of Hon. Wm. Templeman, of Victoria, B.C., formerly Dominion Minister of Mines, will doubtless be pleased to read that he is now convalescent after having been ill for a while in the Royal Jubilee Hospital, Victoria.

Mention was made in the Journal on August 1 of Mr. Arthur L. Walker, professor of metallurgy at the Columbia University School of Mines, New York, having gone on a vacation visit to the Orient, and his intention to return via Suez Canal and Europe. Owing to the European war he has had to alter his plans.

Mr. J. W. Bryant, for several years in charge of mining properties in British Columbia for the Tyee Copper Co., was in Southern Russia during the summer.

Mr. Lorne A. Campbell, of Rossland, B.C., recently paid one of his periodical visits to the colliery, in southwestern Alberta, of the McGillivray Creek Coal and Coke Co., of which company he is president.

Mr. Lyman A. Carter, of Spokane, Washington, formerly in charge of the Bluebird mine, in the south belt of Rossland camp, British Columbia, last month attended a meeting in Rossland of the Rosalia Mining Co., when directors were elected and plans adopted for raising money to provide for resuming operations at the Bluebird.

Mr. W. D. Dalglish, in charge of the mineral section of the Canadian Government Exhibition Commission, lately left Vancouver for San Francisco, California, after having completed arrangements for ensuring a fully representative display of British Columbia minerals being made at the Panama-Pacific Exposition next year. Mr. Wm. Thomlinson, who has been collecting the minerals, is supervising the work of packing and shipping them from Vancouver to San Francisco.

Mr. R. D. Fetherstonhaugh, who represents the Omineca Exploration Syndicate, of Edmonton, Alberta, returned to Vancouver, B.C., last month from an exploratory trip through parts of the Peace River and Omineca districts, placer ground and mineral claims in which have been acquired by the syndicate. The statement has been attributed to him in the press that there was this year a greater number of prospecting parties in those districts than for some years past, and that the outlook is promising for mining being done there in the near future.

Mr. F. August Heinze has again been spending two or three weeks in British Columbia, investigating conditions in connection with interests he holds in mineral claims, and in a large area of lands obtained years ago as a railway subsidy and now taxable.

Mr. A. W. McCune, of Salt Lake City, Utah, has been visiting mining properties he owns, situated in Ainsworth and Slocan mining divisions of British Columbia, on one or two of which it is intended shortly to do development work.

Mr. J. W. D. Moodie, of Britannia Beach, near Vancouver, B.C., general manager for the Britannia Mining and Smelting Co., was in New York last month meeting there the chief owners of the Britannia mines and concentrating works.

Mr. W. S. Ayres, of Hazelton, Pennsylvania, was one of a party of men from the United States lately at Copper mountain, Similkameen, B.C., in connection with the intended acquirement of a group of copper-bearing mineral claims there.

Mr. W. M. Brewer has returned to Victoria after having been for five months engaged in making investigations into mining conditions and obtaining information relative to mineral claims for the British Columbia Department of Mines. Mr. Brewer obtained many particulars of claims in the Skeena country between Hazelton and the coast, of the prospects for coal on Graham island of the Queen Charlotte group, and of mining in parts of Atlin mining division, on all of which he will report to the department.

Mr. K. B. Carruthers, superintendent of the Consolidated Mining and Smelting Co.'s Molly Gibson mine, in Nelson mining division, British Columbia, left that Province last month for Ontario to spend several weeks at Kingston and other places.

Mr. Jas. Cronin, well known in British Columbia in connection with the development of the St. Eugene lead mine in East Kootenay, of which he was manager during the several years of its greatest production, has returned to his home in Spokane, Washington, after having spent the summer and early autumn in the Babine Mountain section of the Omineca mining division, B.C., in which part of the Province is situated mining property he is largely interested in and has been developing.

Dr. Chas. W. Drysdale, of the Geological Survey of Canada, has returned from British Columbia after having spent the field-work season of this year in geo-

logical work, chiefly in the near neighborhood of Rossland, and about Ymir, in Nelson mining division. Among other parts he visited was a mining camp above Lost creek, distant from Salmo by road and trail about 15 miles, where a deposit of bolybdenite ore has been opened and from which a test shipment of a carload was made a short time ago.

Mr. C. D. Emmons, formerly of Eugene, Oregon, who for two or three years has paid periodical visits to Graham island, of the Queen Charlotte group, British Columbia, in connection with oil prospecting operations of a Vancouver organization, was again on the island last month. Near Otard bay a depth of 1,100 ft. had been reached in drilling for oil, and indications were said to be encouraging.

Mr. Robert R. Hedley, of Vancouver, B.C., is now at the Kellapa copper mine, on Mares island Clayaquot mining division, on the west coast of Vancouver island.

Mr. W. S. Haskins, manager of the Silver Standard silver-lead group, on Glen mountain, Omineca mining division, B. C., lately paid his first visit to the copper mining camp on Rocher Deboule mountain, a few miles from New Hazelton.

Mr. John Hopp has returned to the Coast after having been on his several hydraulic placer gold mines in the neighborhood of Barkerville, Cariboo district of British Columbia. Beside his hydraulicking operations, Mr. Hopp has been engaged in prospecting with a Keystone drill extensive beds of gravel at the "Meadows," Williams creek, with the object of ascertaining whether there is sufficient gold in the gravel to warrant the establishment there of a gold dredging enterprise.

Mr. W. S. Spencer Hutchinson, of Boston, Mass., last month examined some mining property situated in mountains near Kaslo, Kootenay lake, B.C.

Mr. Frank E. Lathe, chief chemist at the Granby Consolidated Co.'s smeltery laboratory, Grand Forks, B.C., has been appointed assistant professor of metallurgy at Toronto University. Mr. Lathe graduated from McGill, Montreal, B.A. 1904, and B.Sc. 1907. He has contributed several exhaustive and instructive papers to the Transactions of the Canadian Mining Institute, and has also been a contributor to the technical press.

Mr. F. J. Longworth, for years with the British Columbia Copper Co. as superintendent of its Napoleon mine and mill, in the State of Washington; as assistant superintendent at its copper smelting works at Boundary district of British Columbia, and in other capacities, has joined the staff of the Western Union mine at Republic, Washington.

Sir Richard McBride, Premier and Minister of Mines for British Columbia, recently paid an official visit to Ottawa, and went thence to New York before returning to Victoria, B.C.

Mr. Edward C. Musgrave, a graduate from the Royal Military College, Kingston, Ontario, has been gazetted to a captaincy in the 60th Regiment, King's Royal Rifles, England. Mr. Musgrave had charge, as superintendent, of the Tyee copper mine, Mt. Sicker, Vancouver Island, B.C., from the time of its development as a prospect throughout the several years of its activity as the largest and most important producer, at that time, of gold-copper ore in the Coast district of British Columbia. Afterward he was manager of mines in Montana and Mexico, respectively, until he proceeded to England when troublous times came on in Mexico.

Mr. Geo. W. Otterson, manager for the Kildare Mines, Ltd., an Ottawa company operating on Slate creek, in the Omineca gold field of British Columbia, has closed his placer mining work for the season and left the Omineca district for the coast.

Mr. M. E. Purcell, of Rossland, B.C., superintendent of the Consolidated Co.'s Centre Star-War Eagle group of mines, has been elected a vice-president of the Canadian Mining Institute in place of the late Mr. W. J. Sutton, of Victoria, B.C., who died last May. Mr. Thos. Graham, Chief Inspector of Mines for British Columbia, has been elected a Councillor of the Institute, to fill the vacancy caused by Mr. Purcell's becoming a vice-president. Both men are well known and active members of the Institute, in connection with the Western Branch particularly.

Mr. J. M. Ruffner has resigned as general manager for the North Columbia Gold Mining Co. and allied organizations, operating in Atlin mining division. Mr. Frank Breeze is now superintendent of the company's properties on Pine creek, succeeding Mr. A. D. Hughes, who has taken a "lay" on a Spruce Creek placer gold property.

Mr. Alex. Smith, for years manager of the Surprise mine, above Cody, Slocan division, B.C., will shortly leave for Ontario to spend the winter in that Province.

Mr. J. J. Streit has recovered from a long illness and is superintending operations at the John L. Retallack & Co.'s mines at Whitewater, Slocan, B.C.

Mr. Samuel W. Traylor, president of the Traylor Engineering and Manufacturing Co., N.Y., has been on a visit to the Granby Consolidated Co.'s smelting works at Anyox, Observatory inlet, B.C.

Mr. T. J. Vaughan-Rhys has gone to the Fort George district after having spent three months investigating mining properties in the neighborhood of New Hazelton, Omineca mining division, B.C.

Mr. D. J. Williams, formerly of Butte, Montana, continues in charge of the Montana Continental Development Co.'s mining work on Rocher Deboule mountain, in the Skeena district, B.C.

Mr. T. W. Gibson, Deputy Minister of Lands and Mines, returned to Canada improved in health after being for several months abroad. He is now in Northern Ontario.

Mr. P. E. Hopkins is in Toronto.

Mr. G. C. Bateman, consulting engineer for the Canadian Exploration Co., operating a gold mine at Long Lake, Ont., is now at the property.

Mr. Cyril Knight, Assistant Provincial Geologist of Ontario, has during the past field season been working in pre-Cambrian areas near Sault Ste. Marie. He has mapped areas at Thessalon and Echo Bay.

Messrs. A. G. Burrows and P. E. Hopkins, of the Ontario Bureau of Mines, have been working this summer in Northern Ontario gold fields. They have restudied and mapped in greater detail the geology of the Porcupine district.

Dr. W. G. Miller, Provincial Geologist of Ontario, during the past month has been with Mr. Knight examining pre-Cambrian formations near Sault Ste. Marie.

Dr. F. S. Pearson was in Toronto on Oct. 16.

Mr. Jas. McEvoy, who has been investigating coal lands in British Columbia and Alberta, has returned to Toronto.

Mr. W. C. West, superintendent of the Peterson Lake mine at Cobalt, has resigned to go to Florida.

Mr. A. C. Bailey, formerly manager of the Cobalt Townsite mine, has been appointed manager of the Porcupine Pet mine.

Mr. H. E. Cunningham, mill superintendent at the Hollinger mine, Porcupine, has resigned.

SPECIAL CORRESPONDENCE

BRITISH COLUMBIA

Neglected fields.—About the middle of October Mr. W. M. Brewer, a mining engineer who has been closely associated with mining in the Coast districts of British Columbia, Yukon and south-eastern Alaska for fifteen years or more, returned to Victoria from a five months' trip in parts of the Skeena and Atlin districts, and to Graham island, of the Queen Charlotte group. One part of the Skeena country that had his close attention was that drained by several tributaries of Skeena river entering that stream near Kitsumkalum, Copper City, and Kitsalas, respectively—the Zymoetz or Copper river and Gold creek flowing from the east, and the Kitsumkalum from the north. For 30 to 40 miles back from the Skeena on both sides of the river, in country through which pass the several streams mentioned, and others in regions just beyond, there is, in Mr. Brewer's opinion, much ground well worth prospecting, for already some good showings of mineral have been found, and the general character of the country seems to be favorable to the occurrence of much more mineral than has yet been discovered. Earlier, when there were not any transportation facilities other than by river steamers or boats, and those not available all the year round, it was not surprising that comparatively little prospecting was done, but now that the Grand Trunk Pacific Railway is completed along Skeena river, giving convenient and rapid connection with Prince Rupert, it is surprising that so little effort is being made to find and develop the mineral deposits of this district within the distance stated above. In some instances gold-bearing quartz of good average value has been found to occur, in others silver or copper, or both. Horse trails to the outlying parts and wagon roads here and there along the river, or connecting with the railway in the valley of the Skeena, assist in making the country accessible in larger measure than is the case in many districts where not much prospecting has been done. Yet over quite wide areas of this country little or no prospecting is being done, at which fact Mr. Brewer expresses genuine surprise, bearing in mind the promising nature of the country and the excellent showings of mineral opened in a few places here and there in this part of the district.

Again, in parts of Atlin mining division, conditions appear to be somewhat similar. The gold quartz property, known as the Engineer or Northern Partnership group, is undoubtedly one that in some mining countries would occasion so much practical interest that many prospectors would spend much time and labor in trying to find other veins similarly gold-bearing. Yet there is little if any effective work being done in the country around the Engineer group. Then, as to placer gold mining. Of course the various streams from which approximately $6,000,000 worth of gold has been won since the opening of this gold field in 1898 are becoming worked out, but these do not constitute all the placer gold bearing country in this easily accessible part of Atlin mining division. O'Donnell river has during the 1914 season had more attention in the direction of actual mining than ever before, but it is stated that although this stream has a length of about 50 miles, only about one-third has been taken up. If this be so, it certainly appears to be remarkable that more prospectors and placer miners are not in that country. If the comments here made were based upon the opinions of a man unacquainted with mining conditions and indications of the occurrence of mineral, they might be regarded as what is often styled—and frequently rightly so, too—mere newspaper talk; but they have been prompted by the deliberately stated views of a man well qualified to judge what the prospects are for success, and he expresses much surprise that a mining country easily within reach of prospectors and giving indications of the presence of much mineral is so generally neglected by men fitted for prospecting.

Cariboo.

Now that the gravel-washing season is at an end for 1914, the news coming from the Cariboo gold fields is of more than usual interest, since it tells of what has been accomplished, while earlier in the year it was rather what was expected to be done. No figures known to be reliable have yet been received in Victoria relative to the gold yield of the year, but there appears to be general agreement that at least as much gold has been recovered this year as last. The official figures for 1913 of the three divisions included in Cariboo district were as follows: Cariboo $131,000, Quesnel $30,000, Omineca, $6,000; total $167,000. It is to be expected that this year's production will be found to have exceeded that of 1913, for the water supply was fairly good, and the number of placer mines worked quite as large.

Cassiar.

From Atlin has come preliminary news generally favorable as to the gold production during the season just ended. Here, too, the information is general, but it indicates that there has been a larger recovery of gold from Atlin creeks in 1914 than in 1913. Last year's total for placer gold was $315,000, and for lode gold $28,000. The latter amount may not have been reached this year for lode gold, the Engineer group having been inactive for a good part of the year, owing to an option of purchase having been given to prospective buyers, during the time of whose examination, and since then, only a little development has been in progress, with less ore taken out and crushed than in 1913. On the whole, the accounts of the year's results seem to show that they will be found to have been better than those of any other year since 1907.

East Kootenay.

The quantity of ore received at the Consolidated Co.'s smelting works at Trail from metalliferous mines in Fort Steele mining division during nine months ended September 30, is 24,810 tons, of which 949 tons was from the company's St. Eugene mine and the whole of the remainder from its Sullivan group mines.

In the Crowsnest district, coal mining has continued to be quiet, with some of the mines being worked three or four days a week and others only half time.

West Kootenay.

Ainsworth.—Mines in this division shipped to Trail during the three expired quarters of the year 14,243 tons, of which 5,076 tons was from the Consolidated Co.'s No. 1 mine, 3,008 tons from its Highland mine, and 4,954 tons from the New Canadian Metal Co.'s Bluebell mine. Of eight smaller shippers, the Maestro shipped 703 tons and the Utica 308 tons.

Early in October ore was received at Trail from the J. L. Retallack & Co.'s Whitewater group of mines. The Eagle Lode Mining Co., of Spokane, is reported to be likely to have its bond on the Eureka cancelled;

this company has been doing development work, but the crosscut adit driven did not reach the ore before the work of driving for it was stopped. A published report is to the effect that mining zinc ore in Jackson basin is to be commenced shortly by Spokane men.

Slocan.—Quite recently the Nelson "Daily News" quoted Mr. G. A. Carlson, of Spokane, one of the syndicate that for more than a year has been doing deep-level development on the Payne property, as its authority for a report that an excellent showing of ore had been opened from the low level at which driving has been done. It has been announced that raising from the low level to the old workings some 800 ft. above is to be undertaken during the ensuing winter, and that about 20 men will be employed on the property.

Small shipments of ore have been made lately from the Ruth, near Sandon; the Surprise, above Cody; and the Hewitt-Lorna Doone group of the Silverton Mines, Ltd. No silver-lead ore nor concentrate is being shipped to Trail from the Standard mine, but zinc ore is being sent to a smeltery in the United States.

Nelson.—There is little to add to the news sent two weeks ago of mining in this division. Ore shipments continue to be very light, only an occasional car of gold concentrate from the Queen mine, Sheep creek, and some lead ore from near Salmo.

Rossland.—The output of the mines in Rossland camp constitutes by far the larger part of the total of ore received at Trail during the nine expired months of the year. The total quantity, as shown by published figures, of ore received was 293,049, of which 207,881 tons was from Rossland mines. The figures of individual mines are as follows: Centre Star group, 130,317 tons; Le Roi, 62,590; Le Roi No. 2, Co.'s Josie group, 14,936; and Bluebird, 38.

General.

There is little change in the Boundary district, the large mines still being inactive. The discovery of more ore of good grade has been reported from Franklin camp, up the North Fork of Kettle river.

On the west coast of Vancouver island work is being continued at the Kallapa group, in Clayoquot division. The coal mines are finding an active demand for their product, and a continuance of this favorable condition is expected.

From Stewart, at the head of Porland canal, the information has been received to the effect that developments continue to be encouraging in the deep of the mine of the Portland Canal Tunnels, Ltd.

NOVA SCOTIA

Dominion Coal Outputs.—The production of the Dominion Coal Company's mines at Glace Bay and Springhill to the end of October, compared with the corresponding period of 1913, is roughly as follows:

	1913, tons.	1914, tons.
Glace Bay mines—		
October.	438,272	390,000
10 months ending Oct..	3,965,979	3,730,000
Springhill mines—		
October.	32,608	36,000
10 months, ending Oct..	318,510	341,000
Total—		
October.	470,880	426,000
10 months ending Oct..	4,284,489	4,071,000

These figures show a total decrease over the ten months of 1914, ending October 31st, as compared with the corresponding period of 1913, of approximately 213,000 tons.

The Springhill collieries, it will be noted, show an appreciable increase over last year's production, and these mines have worked without interruption throughout the whole year.

Some new hoisting records were made during the first half of October at the Glace Bay collieries. On the 8th October the combined shaft at No. 2 colliery produced 5,800 tons, 3,918 tons from the Phalen side and 1,882 tons from the Harbor seam. It will not be surprising to see a production of 6,000 tons in one shift from this shaft in the near future. No. 22 colliery (Birch Grove) is now producing over 700 tons daily, and No. 11 colliery has passed the 500 ton mark. No. 16 colliery is producing over 1,300 tons daily. Although the market conditions have very considerably restricted the total production of the collieries, the rate of production of the individual collieries is unusually high, and it would not have been a difficult matter, had the outlet allowed, to have raised 500,000 tons from the Glace Bay mines in October.

For a good many years past the mines of the Dominion Coal Co. have been working at high pressure, and the mines have worked every day except legal holidays, Sundays and occasional idle days in the winter caused by weather conditions. Since the commencement of last winter and during the summer just past there has, however, been some idle time, but not so much as many persons may have imagined. For the twelve months ending 30th September—the fiscal year of the Nova Scotia Mines Department—the collieries have worked an average of between twenty and twenty-one days per month, meaning that each colliery has had from four to five idle days per month. In view of the trade depression and the war it would not have been surprising had conditions been much worse.

The coal-banks—which were unusually large this season—have all been loaded up and shipped away.

COBALT, ELK LAKE, GOWGANDA, SOUTH LORRAINE

Cyanide.—There is now no longer any danger of the mills using cyanide in the Cobalt or Porcupine camps being handicapped by shortage. The price has indeed gone up appreciably, but it is now announced that avenues have been found for meeting all reasonable supplies of cyanide. A month ago the danger of the shutting down of various mills was far more immediate than was generally known at the time.

Zinc dust has also gone up in price, and the supply of it on this side of the Atlantic is none too adequate.

The shortage of cyanide would now be a very serious matter to the camp since a large tonnage is being reduced to bullion before being shipped. The Nipissing alone produced $351,000 in bullion last month from its own and customs ore, and the Dominion Reduction and O'Brien also ship largely. The production of silver from Cobalt would have been seriously diminished by any shortage of cyanide.

Nipissing.—During the month of September the Nipissing Mining Co. mined ore of an estimated net value of $202,243, and shipped bullion from Nipissing and customs ore amounting to $351,424.

Below the fourth level of shaft 73 a winze is being started at the eastern end of the 540 ft. drift to determine the depth of the Keewatin and also to establish a fifth level. At the beginning of the month it was down 17 ft.

A raise from the eastern end of the fourth level showed 85 ft. of ore, at which point the vein was small and faulted. A crosscut was started at the top of the raise, and at a distance of 15 ft. encountered a vein assaying 800 oz. over a width of 1 in.

Further development on branches of vein 98 have been generally satisfactory. A fifth vein connecting two other branches assays 500 oz. over a width of 1 in. No better news is available from the drifting of the main vein at 900 ft. at the 64 shaft. The drift to the east still runs from 6 to 8 in. wide, but assays very low in silver. Drifting will be continued until a point is reached vertically below the good ore shoots.

Of the total production for the month $115,397 came from high grade ore and $86,845 from low grade.

Peterson Lake.—It is with much regret that mining men of Cobalt heard of the resignation of Mr. W. C. West, who for the past year has been superintendent of the Peterson Lake Mining Co. Mr. Lamb has made a good record of development at the Peterson Lake. It is understood that Mr. West resigns mining in order to take up farming in Florida. Mr. West has put in most of his career in the sub-tropics and he is looking forward to getting back into a part of the world where mackinaws are not essential for several months in the year.

Elk Lake.—It is stated from Elk Lake that as soon as the road out to the mine is put in repair the company will resume work. In the bush fires this summer all the buildings were burned at the mine, and these will have to be replaced. At the same time the bridges on the road were burned and the company is hoping that the Government will soon replace them.

Dividends.—Two Cobalt mining companies have dropped their bonus disbursements in the past two weeks. Instead of paying twelve and a half per cent. the Seneca Superior paid 10 per cent. on Oct. 15th. This company has now returned to the original shareholders 125 per cent., the total issued capital being less than $500,000. It is understood that developments at the mine since work was resumed at full blast are quite satisfactory.

Coniagas has declared no bonus with the six per cent. quarterly dividend.

Hudson Bay.—As the main shaft of the Hudson Bay mines has been shut down, and it is very problematical whether the working at No. 2 shaft will yield ore, the total of 5,604,168 oz., valued at $2,965,523, may be accepted as the final output from the famous old mine. The total investment was only $7,761 by its incorporators, all New Liskeard men. The end of the ore at the No. 1 shaft was reached in June, and the mine was promptly closed down. The production for the last year of the company's existence was 393,360 oz. of silver, valued at $196,435.

While no ore has yet been found by the Hudson Bay at the No. 2 shaft, south of the McKinley Darragh, yet the manager, Mr. A. H. Brown, views the possibilities of a good discovery as by no means remote.

It was stated at the annual meeting that the company now holds 540,000 shares out of the 940,312 issued of the Dome Lake Co., and that development work is very satisfactory to date. The entire board of directors was returned.

PORCUPINE, KIRKLAND LAKE, SWASTIKA

Hollinger.—One of the big compressors is now running in the new power house belonging to the Canadian Mining and Finance on Gillies Lake, and underground operations have already been extended. There are twenty-six faces of ore on the Acme alone, and recently only two drills have been working on this private property of the Timmins-McMartin-Dunlap syndicate. Many of the extra drills will be set up there. The outlying shafts of the Hollinger, which have been lying idle for the past month or so will be opened up again and more drills will be set up to assist in the sinking of the big main shaft. So far there has been barely enough power to keep ore broken ahead of the mill, now it will be possible to set up drills on development and exploration work to a much greater extent. There are many faces of ore in the mine that have been left until it was possible to obtain more air.

Dome.—During September the ore at the Dome ran two cents a ton higher than in the preceding month of August. The tonnage was also higher, but the most noteworthy feature was the high extraction. This was raised to the ratio of 99.301 per cent. as against 90.893 per cent. in August and 97.454 as a previous best in April of this year. As September was nearly two thousand tons higher than the previous month in ore treated and the grade has been gradually creeping up since May, it is certainly the best month as regards profits since early this year. As Mr. Keading has also been cutting costs the profits are growing at both ends of the scale.

Sesikinika.—As a consequence of several applications for leases from private parties, the Timiskaming and Northern Ontario Railway has asked for tenders for the right of way at the Sesikinika camp, between mile posts 175 and 178. The section includes some 36 acres of land on both sides of the railway track. The term of lease is 999 years, with a ten per cent. royalty.

The Timiskaming and Northern Ontario leased the right of way at Cobalt with greater profit to the Right of Way mine, but to none other of the many companies that took up leases.

Dome Lake.—Once more stamps are dropping in the Dome Lake mill. They have been idle for more than a year, since the Timiskaming and Hudson Bay took over control and deemed it wise to shut down the mill until there was more ore in sight.

Vipond.—The Vipond mill is now running smoothly. The third clean-up has been made with entirely satisfactory results. Underground, too, development is producing good results.

Pearl Lake.—The sale of the plant on the Pearl Lake gold mines is announced. The sale only affects the plant, not the property nor the buildings.

The Canadian Exploration Co. is shipping gold bullion to the Ottawa mint. In October the production was about $20,000. The Long Lake mine, near Naughton, is now making a small profit from the treatment of highly refractory ore. During the past three months the tonnage has been raised very considerably, and the consumption of cyanide in the mill per ton of ore treated greatly reduced. Ore was previously largely furnished from an open cut but is now being obtained from a stope at the 180 ft. level.

NEW MAPS.

The Canadian Geological Survey has just issued two new maps. Map 136A is a topographic map by W. W. Leach, of the Hazelton and Aldermere areas, Cassiar and Coast Districts, B. C. The second is a topographic map of the Craig mine property, Raglan twp, to accompany a Memoir by the late A. E. Barlow.

MARKETS

STANDARD STOCK EXCHANGE.

October 26, 1914.

	Ask.	Bid.
Cobalt—		
Bailey	.00⅝	.00½
Beaver	.21	.19
Buffalo	.85	.75
Chambers Ferland	...	.11
Coniagas	6.25	...
Crown Reserve	1.01	...
Foster	.05	...
Hudson Bay	50.00	30.00
Kerr Lake	...	4.20
La Rose	.80	.75
McKinley Darragh	.45	.42
Nipissing	5.20	5.00
Peterson Lake	.23¼	...
Timiskaming	.09½	.09
Wettlaufer	...	.04½
Porcupine—		
Dome Extension	.08½	.05¼
Dome Lake	.33	.31
Dome Mines	6.51	...
Foley	...	.20
Homestake	.20¼	...
Hollinger	18.40	17.90
Jupiter	...	.05½
McIntyre	.26	...
Pearl Lake	.02¼	...
Porcupine Imperial	.01½	...
Porcupine Vipond	.17½	...
Rea Mines	...	.10

STANDARD EXCHANGE.

The minimum scale fixed by the Exchange, and below which no sales are permitted, is as follows:—

Cobalts—	
Beaver	.17
Buffalo	.75
Chambers-Ferland	.10
Canadian	.05
City of Cobalt	.30
Cobalt Lake	.30
Coniagas	6.00
Crown Reserve	1.00
Great Northern	.04
Hudson Bay	30.00
Kerr Lake	4.00
La Rose	.70
McKinley-Darragh	.40
Nipissing	4.75
Peterson Lake	.23
Seneca Superior	2.00
Timiskaming	.07
Trethewey	.12
Wettlaufer	.04½
York, Ont.	.07
Porcupines—	
Dome Extension	.05
Dome Lake	.30
Dome Mines	6.50
Foley O'Brien	.20
Hollinger	16.00
Homestake M. F.	.20
Jupiter	.04
McIntyre	.27
Pearl Lake	.02
Porcupine Crown	.75
Porcupine Peterson	.25
Porcupine Vipond	.17
Rea Consolidated	.10
Teck Hughes	.07
West Dome	.05

TORONTO MARKETS.

Oct. 26—(Quotations from Canada Metal Co., Toronto)—
Spelter, 5½ cents per lb.
Lead, 4½ cents per lb.
Tin, 33 cents per lb.
Antimony, 16 cents per lb.
Copper, casting, 12½ cents per lb.
Electrolytic, 12½ cents per lb.
Ingot brass, yellow, 10 cents per lb., red, 12 cents per lb.

Oct. 27—Coal—(Quotations from Elias Rogers Co., Toronto)—
Anthracite, $7.75 per ton.
Bituminous, lump, $5.25 per ton.

GENERAL MARKETS.

Oct. 23—Connellsville coke (f.o.b. ovens).
Furnace coke, prompt, $1.60 per ton.
Foundry coke, prompt, $2.10 to $2.50 per ton.

Oct. 23—Tin, straits, 31.75 cents.
Copper, Prime Lake, 11.37½ to 11.62½ cents.
Electrolytic copper, 11.25 to 11.35 cents.
Copper wire, 12.75 cents.
Lead, 3.50 cents.
Spelter, 5.10 to 5.20 cents.
Sheet zinc, (f.o.b. smelter), 8.00 cents.
Antimony, Cookson's, 15.00 to 15.50 cents.
Aluminum, 18.00 to 18.50 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, soft, $48.00 to $50.00 per ounce.
Platinum, hard, 10 per cent., $51.00 to $52.00 per ounce.
Bismuth, $2.75 to $3.00 per pound.
Quicksilver, $47.50 per 75-lb. flask.

SILVER PRICES.

October—	New York cents	London pence
8.	52⅛	23 3/16
9.	51¾	23⅝
10.	51¾	23¾
12.	....	23⅝
13.	51⅜	23½
14.	51½	23½
15.	51⅜	23⅜
16.	50⅞	23⅛
17.	50⅞	23⅛
19.	50½	23
20.	50⅜	22 15/16
21.	50	22 13/16
22.	50	22 13/16
23.	49⅝	22 11/16